Vol. XVIII, Issue 1 & 2, January - December 2024

globsyn business school

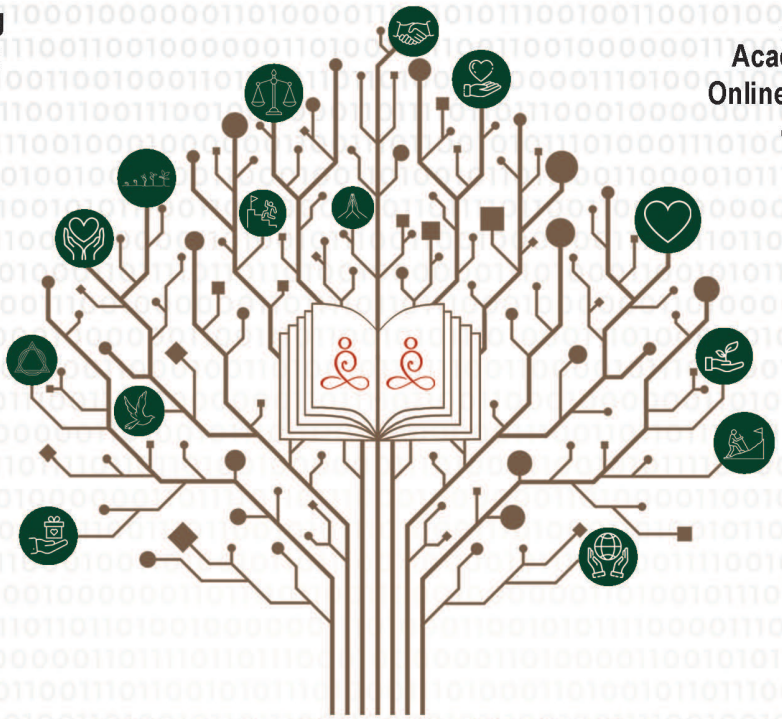
AMBITION OF THE YOUNG

GLOBSYN MANAGEMENT JOURNAL

ISSN: 0973 - 9181

Generative AI and Enhancing Skilled Workforce Efficiency: A Textual Review and Conceptual Assessment

AI and Education: AI Meets Academia, Breaking Barriers in Online Education – A Case Study of Innovation and Outcome



ETHICS, AI, AND HUMAN VALUES: PIONEERING MANAGEMENT EDUCATION FOR A SUSTAINABLE FUTURE

Ethics, AI and Human Values – A Branding Perspective: The Success of AI leading to Moral Foundation of Human Values and Ethics in Business

Sentiment Analysis in Financial Markets: A Machine Learning Approach to Predicting Asset Prices

Globsyn Management Journal (GMJ) Editorial Board

Published by Globsyn Business School, Kolkata, India

globsyn
business school
AMBITION OF THE YOUNG

Globsyn Management Journal

Globsyn Management Journal

Volume XVIII, Issue 1 & 2
January - December 2024

Globsyn Business School, Kolkata, India

Table of Contents

Globsyn Management Journal
Vol. - XVIII, Issue 1 & 2, January - December 2024

Patron-in-Chief's Desk ..... *i*
Patron's Desk ..... *ii*
Patron's Desk ..... *iii*
Editor's Desk ..... *iv*

Research Articles

- ***Implications of Reliability in Student Evaluation for Competency-Based Curricula***
  Avishek Ganguly, Soumen Mukherjee & Debaprasad Chattopadhyay 2
- ***What You See on Instagram! - The Strategic Leap of 'Meta'***
  Subhajit Biswas 9
- ***AI-Powered Content Personalization in Streaming Platforms***
  Doyel Mukherjee Prodhan & Amrita Mitra Mukherjee 15
- ***The Role and Impact of Generative AI in Enhancing Skilled Workforce Efficiency***
  Jahir Rayhan 30
- ***Navigating the AI Paradox***
  Sohom Majumder, Rupa Paul & Bratati Bhattacharyya 50
- ***Role of Spiritual Intelligence in the Era of Artificial Intelligence***
  Argha Nath & Debaprasad Chattopadhyay 64
- ***Sentiment Analysis in Financial Markets***
  Soumendra Roy 71

Perspectives

- ***Addressing AI Inequality: A Path Towards Fair and Equitable Systems***
  Indranil Ojha & Madhumita Bhattacharya 84
- ***Ethics, AI and Human Values – A Branding Perspective***
  Sutapa Bhattacharya 87
- ***AI and Education Inclusivity: Connecting the Dots to Achieve ESG Goals***
  Ishani Chakraborty & Debaprasad Chattopadhyay 89
- ***Impact of AI on Energy and Ethics***
  Soumen Guha 93

Case Studies

- ***AI Meets Academia, Breaking Barriers in Online Education***
  Atanu Mitra *99*
- ***Human Resource Planning Practices***
  Kavita Shastri & Rajendra Mishra *102*

Book Reviews

- ***Book Review on *India @100***
  Abhijit Biswas *109*
- ***Learning to Dance with Failure***
  Manas Chakravarty *112*
- ***Nexus: A Brief History of Information Networks from the Stone Age to AI***
  Tanusree Chakraborty *114*

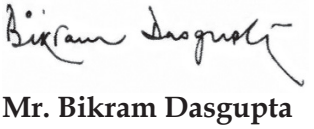
Patron-in-Chief's Desk

Today, with more than two decades' legacy, Globsyn Business School (GBS) stands amongst the very best in management education in India. This has happened because of Globsyn Group's unwavering focus on evolving GBS into a global B-School with an education edifice that promotes Innovation, Research and Technology, and the tireless efforts and commitment of the entire Globsyn family to put the B-School way ahead of the learning curve. It has always been Globsyn's endeavour to create a knowledge driven society, which not only focuses on academics but also engages in activities that goes 'Beyond Education'. Globsyn Management Journal (GMJ) is one such 'Beyond Education' initiative that helps in perpetuating our vision of building a research-driven education edifice, amalgamating academics, corporate ethics and human values in the student development process.

With our constant quest of continuous innovation in management education over the past two decades, I strongly feel that by sensitizing and educating our stakeholders we will be able to inspire the next generation of leaders to harness ethical AI for positive societal impact, ensuring that technological advancements align with the broader goals of equity and environmental stewardship.

This issue will also focus on some aspects of this vast subject, which are of immediate relevance to academicians, practicing managers, management candidates, and society members in general, so that appropriate deliberations may lead to the greater good and prosperity of humanity along with the development of universal human values in organizations and leaders.

I wish the entire Research Cell of GBS all the success for their future endeavours!



Mr. Bikram Dasgupta

Founder & Chairman
Globsyn Group

Patron's Desk

I am pleased to see the outstanding efforts of Globsyn Business School (GBS) in publishing the 18th volume of their esteemed peer-reviewed management journal. Maintaining and enhancing a world-class research publication like GMJ demands dedication, resilience, and decisive action. I extend my heartfelt appreciation to the committed faculty team at Globsyn for their tireless contributions.

The forthcoming issue of the journal, I believe, will encompass a diverse range of content, including research articles, case studies, book reviews, and perspectives. This year's theme, **"Ethics, AI, and Human Values: Pioneering Management Education for a Sustainable Future,"** underscores the focus on exploring the impact, challenges, prospects, progress of new technology, human values, and the future of AI on humanity, in particular.

GBS, driven by its core principles of Knowledge Dissemination and Knowledge Creation as the foundations for educational excellence, actively promotes student participation in research initiatives. It is truly encouraging to see GBS's initiative to include student research contributions in GMJ thus reflecting its dedication to nurturing a research-focused atmosphere.

With an editorial board composed of distinguished academicians and industry professionals from both national and international arenas, the journal's quality is assured. I convey my best wishes to the editorial team and look forward to the journal's on-going success.

I hope that the GBS academic fraternity will continue to give impetus to research culture in the times to come.

Prof. R. C. Bhattacharya

Vice Chairman
Globsyn Group

Patron's Desk

Globsyn Business School is built around an intellectually stimulating edifice of Innovation, Research, and Technology, where Research forms the foundation of the academic delivery system from which emanates all other artefacts. The Globsyn Research Cell aims at bringing together academicians, corporates, and students to share research ideas involving various management fields of interest and expertise.

As a postgraduate management institute with 23 years' legacy of continuous innovation, we have always been able to ensure that the young learners are exposed to the most contemporary research methodologies, and also develop a range of academic artefacts, not only limited to case studies or classroom learning but encompassing Seminars, Conferences Presentations, Journal Submissions, amongst others. The Globsyn Management Journal has been a significant effort in this direction. Over the years, several volumes of the Journal have encompassed topics like 'Embracing AI for Humanity', 'Innovation and Entrepreneurship in Management', 'The Next Normal: Visualizing Emerging Trends across sectors in a Post-disruptive Economy', amongst others.

I am very happy that this year, too, Globsyn Research Cell had selected such a befitting topic for the Globsyn Management Journal Vol. XVIII – **'Ethics, AI, and Human Values: Pioneering Management Education for a Sustainable Future'**. This selection of topic becomes all the more significant with the realization that we are living in an era dominated by rapid technological advancements. Therefore, it has become essential to recognize Artificial Intelligence's (AI) transformative potential in enhancing decision-making and integrating human values, along with ethical considerations, into the educational landscape.

However, to equip future managers with the skills needed to navigate the complexities of AI while prioritizing sustainability and social responsibility, Globsyn Business School has been integrating ethical AI and human values into its management curriculum – thus, fostering an environment of continuous innovation and development. Our mission has always been to provide our students with the best academic experience so that they become relevant and responsible leaders and managers, ready to take on the challenges of the corporate world from the day they graduate.

We have always believed in knowledge acquisition by application and behavior, and this is the best way for us to help our young managers become future-ready.

Mr. Rahul Dasgupta

Director & Trustee, Globsyn Business School, Kolkata

Editor's Desk

Dear Readers,

Greetings!

It is my privilege to present before you, Globsyn Management Journal 2024, Volume XVIII. The Globsyn Management Journal (GMJ), a multi-disciplinary journal, indexed in EBSCO, ProQuest Database, OCLC, ABI Inform, ICI, J-GATE, Google Scholar and several such databases, is a double-blind peer reviewed journal. Having been published over the last 18 years, GMJ has successfully positioned itself as a signature research journal for all management educators, academicians, corporates, researchers and students globally to come together, contribute and experience the power of diversified and interdisciplinary management education. This issue of GMJ (VOL. XVIII) is focused on the theme: ''Ethics, AI, and Human Values: Pioneering Management Education for a Sustainable Future". Integrating ethics into AI education is not only a moral imperative but also a pragmatic one, ensuring that future leaders are equipped to make responsible decisions. Management education must evolve to include robust discussions on ethical dilemmas posed by AI. Traditional curricula focused solely on profit maximization are no longer sufficient. Institutions must adopt a more holistic approach that encompasses human values like fairness, accountability, transparency, and inclusivity. In an era of growing environmental concerns, business leaders need to champion practices that align with sustainable development goals (SDGs). AI can play a pivotal role in fostering sustainability, from optimizing resource use to enabling circular economies. Every article in this journal will be catering towards a knowledge base which will be useful for the readers to introspect and implement Artificial Intelligence in varied and effective way for the benefit and advancement of humanity.

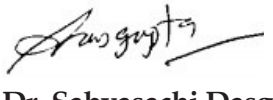
Let me also take the privilege of reminding all our readers that this is the 18th volume of our publication which signifies a decade of intellectual participation between the contributors of GMJ and readers and hoping that this fruitful journey may take this journal to newer milestones.

As an editor of this journal, I have ensured every possible level of quality research output with my team so that this journal infuses every reader with curiosity and enriches their understandings about the specific topic under discussion. The entire editorial team of GMJ conveys regards for your whole-hearted support and co-operation in facilitating the Journal to move towards the heights of success.

Wishing all of you a Happy New Year!

Thank You!

Regards,



Dr. Sabyasachi Dasgupta

Editor, Globsyn Management Journal
Faculty & Head - Research & Publications, Globsyn Business School, Kolkata

Research Articles

Research Article

The Implications of Reliability in Student Evaluation for Competency-Based Curricula

Avishek Ganguly

Additional Registrar, Department of Academics, IQCMC & H, Durgapur

Soumen Mukherjee

Dean, School of Health Sciences, The Neotia University

Debaprasad Chattopadhyay

Faculty, Globsyn Business School, Kolkata

The problems with student assessment validity were covered in a recent publication. [1] This essay discusses the problems with student assessment reliability and how competency-based curricula are affected. Note that this paper's goal is to explore dependability difficulties in the context of student assessments, with a focus on performance, formative, and internal assessments (rather than large-scale, high-stakes exams). It will make an effort to support educators in comprehending the idea of reliability, its importance in student evaluation, and how to develop reliability. Applied and practical levels, as opposed to theoretical ones, have been purposefully maintained. We shall attempt to approach reliability from an instructional perspective rather than one based on statistics.

To put it plainly, when we state that a certain housekeeper or co-worker is dependable, we mean that they have consistently performed at a high standard and that we anticipate them continuing to do so in the future. The more instances in the past a person has, the more trustworthy we believe them to be. The process of student assessment is comparable.

The traditional psychometric standards for validity and reliability were created for extensive tests (like the National Exit and Eligibility Test [NEET], which is taken by millions of people) and are not appropriate for formative or internal evaluations. [2] Table 1 displays the main distinctions between classroom/formative assessments (FAs) and large-scale exams. [3]

What does dependability mean?

Reliability can be defined as the capacity to consistently produce evaluation results or scores across time. [5] Reliability is defined by the definition as looking at scores, so it refers to the assessment data rather than the tools used for assessment. As a result, it would be incorrect to say that the Objective Structured Clinical Examination or Multiple Choice Questions are reliable because no tool is inherently reliable or unreliable. The consistency of marking is sometimes misunderstood. Allow me to give you an example of this. Regardless of performance level, examiners want to provide marks that are near to pass; nevertheless, consistency does not always equate to dependability. Feldt and Brennan [6] correctly point out that "the essence of examination is the quantification of consistency and inconsistency in examinee performance."

One important source of validity proof is reliability. [1] Student assessments are no more valuable than scientific experiment results that

cannot be replicated. Valid information regarding student achievement cannot be obtained from an unreliable assessment. Although validity is believed to depend on reliability, reliability is not the sole requirement. [7,8]

Reliability is a numerical term that can be calculated on a scale of 0–1, 1 being the most dependable, in contrast to validity. Compared to validity, which may be quite difficult to grasp, this has several advantages such as being simple to compute and understand, but it also has certain drawbacks. The degree of connection between two sets of scores is known as dependability; adding 20 students who are completely ignorant of the subject or 20 students who are very knowledgeable about it might increase reliability without altering the test in any way.

This reinforces the previous theory that consistency of performance, as opposed to consistency of scores, is a more accurate measure of reliability. Reliability has interestingly two root words: "rely" and "ability," which both refer to something we can rely on. When we approach reliability from this angle, we may get past the idea that dependability can only be demonstrated by numbers.

Repeating measurements and averaging them yields a more dependable result in biomedical research. Measurement variability is another thing that repeated measurements reveal. [9] Sadly, assessments in education cannot be repeated. After all, how can the same student take the same or a comparable test twice? The mentality, awareness, drive, and effort would differ in the two scenarios even if we were to repeat. There is inevitably some "error" in every score. Classical test theory typically assumes that an individual's observed score is the total of their true and error scores. The test is more trustworthy the lower the error score.

The idea of reliability in student assessment centres on measuring multiple students on the same characteristic rather than repeating measurements on the same student, as it is typically not feasible to have repeated measurements of the same person. [9] We are, in a sense, searching for measurement error among individuals.

Table 1: Differences between large-scale and classroom assessments

Large-scale examinations	Classroom assessments
Remove context to make them generalizable	Heavily context dependent
Items or tasks presumed to be independent	Items or tasks linked to each other or nested
Statistical assumptions require large sample sizes (e.g., >20 lakh students appeared for NEET in 2023)[4]	Sample sizes are very small (<200). Making groups and sub-groups makes them even smaller

Measurement error: what is it?

It can be relevant to include measurement error in this context. Within this particular context, an error does not indicate an oversight by the assessor or a test fault. Instead, it refers to how unimportant elements affect the score. [10] These sources of discrepancies can be either random (for example, a student who has a headache on test day may score lower than on other days) or systematic (for example, a student with poor English comprehension will struggle to understand the task on all questions). Measurement mistakes in test scores are thought to be caused by random errors rather than systematic flaws, which may reduce the test's validity but have no effect on reliability.

The standard deviation of multiple measurements can be used to estimate the amount of mistake. The standard error of measurement, or SEM, is not to be confused with the standard error of the mean, which is frequently employed in biological research.

Understanding Dependability Coefficients

Reliability coefficients can be computed in a variety of ways, as was previously said; thankfully, the interpretation of these coefficients is always the same. Anywhere from 0 to 1, where 1 denotes a perfect correlation (all variance owing to the construct being measured) and 0 denotes no correlation (all error), is how reliability coefficients are represented. If the figure is 0.8, then 20% of the range in scores is caused by measurement error and the remaining 80% is attributable to differences in genuine scores. Saying that systematic factors account for 80% of variation and random factors account for 20% is another way to phrase it. It is important to note that the interpretation of dependability coefficients should not be confused with other correlation coefficients, for which a value of 0.6 may be deemed satisfactory. [11]

What is sufficient in terms of reliability depends on the assessment's goal. In high-stakes selection tests, a score of 0.9 or above is ideal, while a score of 0.8–0.9 could suffice for other objectives. [5] It should be emphasized once more that obtaining these values for classroom evaluation may be challenging due to varying statistical assumptions and sample size variations; a value of 0.6–0.7 may be appropriate. [12] Regarding FAs and class assessments, we must adopt distinct perspectives on reliability. [13]

The Dependability of Written Evaluations

As was previously said, the degree of correlation between the two sets of scores is referred to as dependability. Test-retest reliability refers to the possibility that it is scores obtained on the same test twice. A score on a different test with comparable material and complexity could serve as another example (parallel forms). Others could include test results from the same administration after a certain amount of time (temporal stability) or scores from two separate examiners (marker reliability). Giving the student the same or a comparable test now or later is typically challenging. Split-half reliability is an achievable solution to this. This method divides the test into two halves, or odd and even items, and uses the scores from the two halves to compute the reliability coefficient. [6]

For this, the Kuder-Richardson formula (KR 20 or KR 21) might be applied. MCQs and other questions with a dichotomous marking scheme are the only ones to which these techniques apply. Cronbach's alpha, which splits the test into numerous possible halves before calculating the alpha, is an improvement over this technique. Cronbach's alpha [14] provides information on the tool's internal consistency. A low level of internal consistency would indicate that the test's items measure various constructs differently. The Spearman-Brown prophecy formula suggests that lengthening the test can somewhat improve low reliability written assessments. [12] Here are a few basic illustrations of reliability prediction using test length variations. [15] Because essay questions cover less material and have interrater variations, they are less reliable than objective questions. Some strategies to increase their reliability include structuring, employing case-based questions, creating rubrics, and using short response questions. [16]

The Dependability of Performance Evaluations

Performance evaluations pose a unique challenge. The assignments are contextual, subject to student variation, and frequently entail the assessment of several activities at once. For example, evaluating the ability to palpate the abdomen requires not just technical proficiency but also professionalism and communication skills. This is analogous to evaluating a race differently than a gymnastic performance. Reliability analysis makes the statistical

assumption that each item is reasonably independent, yet performance tasks have a lot of subtasks that are nested inside the primary task.

Case specificity, which states that one cannot expect strong performance at one task to imply good performance at another, further complicates the assessment of performance assessments. Put simply, it indicates that riding a motorcycle is not a prerequisite for being able to fly an airplane. It is necessary to evaluate each skill or ability separately in order to obtain accurate data on student accomplishment.

There is adequate evidence in the literature to conclude that performance assessments using expert subjective evaluations yield accurate findings. [17] Intercase agreement is strong in such a scenario, even when interrater agreement may be poor. [18] These evaluations offer the benefit of not only giving detailed comments but also assisting the student in considering the issue from various angles. [19] For these reasons, the subjectivity of the Mini-Clinical Evaluations Exercise (m-CEX) is seen as one of its strengths. Increasing the quantity of interactions, tasks, and observers is the key here. Sufficient reliability can be obtained with six to ten interactions annually, each on a separate case and with a different assessor. [19]

The Dependability Of Formative Evaluation

FAs offer a unique circumstance. Their main goal is to enhance learning and make advantage of assessments' beneficial effects on education. [20] The claim that interrater consistency is unimportant for FA has been made several times. [21] It has also been stated that educators guarantee the high validity of assessments by basing their conclusions on a variety of sources and supporting data. [22] Trade-offs between the various evaluation qualities, as demonstrated by available data, have already been examined. [23] High levels of educational impact and validity suggest that FA can be helpful even in cases when reliability is low.

Examining FA from a different angle is fascinating. FA isn't a quiz. Instead, it's a continuous process wherein educators modify their lessons based on information from tests, or learners modify their strategies for learning. [24] This supports our previous claim that educational impact, not reliability, should be the primary objective of FA. Thankfully, the new curriculum does not mandate that the marks earned in FA be applied to final results, allowing educators to better utilize FA to enhance student learning.

Dependability of Subjective Evaluations

The majority of the time, subjective assessments have to do with performance tasks (professionalism, communication, clinical skills, reflections, etc.). The idea that assessment is not completely impartial is becoming more and more prevalent. The MCQ, which is considered the paradigm of objectivity, is vulnerable to significant human subjectivity even in its blueprinting, stem writing, option selection and ordering, and standard setting processes. [18] Similar to this, prior to marking, a subjective decision must be taken when utilizing checklists or scale-based assessments. Most of the time, we attempt to quantify the traits objectively after making subjective decisions about them. This procedure, known as "objectification"[25], is counterproductive to increasing reliability. Expanding the number of activities, contexts, evaluations, and assessors is still the most effective way to improve the dependability of subjective [26].

It might be more crucial to shift perspectives and concentrate on evaluation fairness rather than attempting to attain objectivity. [27] Expert subjective assessments are usually required for competency evaluation. [28] Let's examine a basic illustration. Based on our subjective evaluations, we all categorize our pupils as high achievers, average, low achievers, etc. But this doesn't actually happen on the first day; rather, it happens after teachers have had a chance to

see the student over time, in a variety of settings, tasks, and circumstances. Instructors rarely make mistakes while using a scale, rating form, or checklist for this purpose. This demonstrates the validity of long-term expert subjective assessment! [29]

Is validity possible without reliability?

It is common or folk knowledge to assume that low validity will also result from low reliability. For many authors, validity can only be demonstrated by reliability.[30] The emerging consensus, however, is that validity evidence should not be limited to reliability; rather, it should be cited from a variety of sources.[31] According to some authors,[32] only very low levels of success may yield both high validity and reliability; the pursuit of maximal reliability may restrict what can be evaluated, endangering construct validity.[33] Some have also suggested that consistency among independent measures should be the primary criterion for reliability, as opposed to reliability coefficients.[13] Extrapolation and generalization could be equally significant validity evidence in terms of validity arguments [34]. This has useful uses in the context of classroom evaluations, where the small sample size or subjective nature of performance evaluation may make it impossible to obtain a reliable dependability figure. Therefore, dependability should not be measured as consistency (as in large-scale exams), but rather as the amount of information that distinguishes between the work that students submit and the ideal work (as represented by the learning objectives).[35] Validity and dependability has recently been discussed, [1] which can be seen for a more in-depth explanation.

What elements influence credibility?

Numerous elements affect an assessment's reliability. The test itself comes first and foremost. Tests that are longer are more dependable than those that are shorter. There are mathematical formulas (such the Spearman-Brown formula) [36] that can be used to forecast the test duration that will yield the required level of reliability. However, it should be remembered that each extension may not result in an equal increase in reliability. Additionally, tests that are overly lengthy might significantly impact performance and reliability due to other factors such as student attention, alertness, weariness, and motivation.

Reliability is also influenced by the kind of task. Since objective exams may sample a larger range of information and remove inter-rater variation, they are often more reliable than subjective ones. Items that lack clarity or ambiguity as well as those with a low discrimination index are less reliable. There will be little reliability if everyone receives a score of 100 or 0. Furthermore, random guessing reduces reliability.

Reliability may also be impacted by the environment in which the test is given. Low dependability and a high number of random errors can result from administering an exam in an overcrowded, hot, or damp room, with fatigued pupils, or in the presence of other distractions. Question paper leaks or other related problems will also reduce it. Variability is introduced by negative marking since risk-taking behaviors vary.[36]

In conclusion, it is prudent to bear in mind that the assessor assumes a pivotal role in competency-based assessment [37]. Enhancing the quality of questions and performance assessment through assessor training can significantly boost reliability.

The Last Word

a. Although reliability is one type of evidence supporting validity, it is not the only one

b. Rather than the tool itself, reliability is the attribute of the interpretation we draw from assessment results. No instrument is intrinsically trustworthy or untrustworthy.

c. Because of the small sample size and contextual evaluation, classroom assessments cannot

achieve the logistics of dependability of large-scale tests. We should consider instructional impact and validity while utilizing assessments rather than only focusing on reliability.

d. The dependability of the classroom and FA will be enhanced by more evaluations on more activities in more circumstances with more instruments by more assessors. Additionally, this will contribute to raising the standard of feedback—which is FA's main goal.

References

1] Singh T. Validity in student assessment: Implications for competency-based curriculum. Indian J Health Sci Biomed Res 2024; 17:1-4.

2] Leigh IW, Smith IL, Bebeau ML, Lichtenberg JW, Nelson PD, Portnoy S, et al. Competency assessment models. Prof Psychol Res Pract 2007; 38:463-73.

3] Brookhart SM. Developing measurement theory for classroom assessment purpose and uses. Educ Meas Issues Pract 2003; 22:5-12.

4] National Testing Agency. NEET 2023 Result Analysis. NEET UG Guidance; 2023. Available from:https://www.neetugguidance.in/ about-us.php?menu1_id=3. [Last accessed on 2024 Feb 08].

5] Downing SM. Reliability: On the reproducibility of assessment data. Med Educ 2004; 38:1006-12.

6] Feldt LS, Brennan RL. Reliability. In: Linn RL, editor. Educational Measurement. NY: American Council on Education; 1989. p. 105-46.

7] Downing SM. Validity: On meaningful interpretation of assessment data. Med Educ 2003; 37:830-7.

8] Kane MT. Validation. In: Brennan RL, editor. Educational Measurement. Westport: American Council on Education; 2006. p. 17-64.

9] Traub RE. Understanding reliability. Educ Meas Issues Pract 1991; 10:37-45.

10] Liningstone SA. Test Reliability: Basic Concepts. New Jersey: Educational Testing Service; 2018.

11] Fraenkle JR, Warren NE. How to Design and Evaluate Research in Education. NY: McGraw Hill; 2003.

12] Royal K. Using the spearman-brown prophecy formula to improve the quality of examinations at a medical school. J Contemp MedEduc 2017; 5:51-3.

13] Moss PA. Can there be validity without reliability? Educ Res 1994; 23:5-12.

14] Cronbach LJ. Co-efficient alpha and internal structure of tests Psychometrica 1951; 16:297-334.

15] Zach. Statology. The Spearman Brown formula: Definition and Examples. Available from:https://www.statology.org/spearman-brown-formula/. [Last accessed on 2024 Feb 08].

16] Anshu. Assessment of knowledge: Free response type of questions. In: Singh T, Anshu, editors. Principles of Assessment in Medical Education. 2nd ed. New Delhi: Jaypee Brothers; 2022.

17] Ten Cate O, Regehr G. The power of subjectivity in the assessment of medical trainees. Acad Med 2019; 94:333-7.

18] Virk A, Joshi A, Mahajan R, Singh T. The power of subjectivity in competency-based assessment. J Postgrad Med 2020; 66:200-5.

19] Norcini J, Burch V. Workplace-based assessment as an educational tool: AMEE guide no. 31. Med Teach 2007; 29:855-71.

20] Ozan C, Kinkle RY. Effect of formative assessment on academic achievement, attitudes, and self-regulation. Educ Sci Theory Pract 2017; 18:85-118.

21] Black P, Wiliam D. The reliability of assessments. In: Gardner J, editor. Assessment and Learning. London: Sage Publishers; 2012.p. 243-63.

22] Connolly S, Klenowski V, Wyatt-Smith CM. Moderation and consistency of teacher judgments. Br Educ Res J 2012; 38:593-614.

23] Earle S. Balancing the demands of validity and reliability in practice. London Rev Educ 2020; 18:221-35.

24] Popham J. A process – Not a test. Educ Leadership 2009; 66:85-7.

25] Van der Vleuten CP, Norman GR, De Graaff E. Pitfalls in the pursuit of objectivity: Issues of reliability. Med Educ 1991; 25:110-8.

26] Singh T. Student assessment: Issues and dilemmas regarding objectivity. Natl Med J India 2012; 25:287-90.

27] Valentine N, Durning SJ, Shanahan EM, van der Vleuten C, Schuwirth L. The pursuit of fairness in assessment: Looking beyond the objective. Med Teach 2022; 44:353-9.

28] Rotthoff T. Standing up for subjectivity in the assessment of competencies. GMS J Med Educ 2018;35: Doc29.

29] Cassidy S. Subjectivity and the valid assessment of pre-registration student nurse clinical learning outcomes: Implications for mentors. Nurse Educ Today 2009; 29:33-9.

30] Backman TJ, Cook DA, Mandrekar JN. What is the validity evidence for assessment of clinical teaching. J Gen Intern Med 2005; 20:1159-64.

31] Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: Theory and application. Am J Med2006; 119:116.e7-16.

32] Davis A. The Limits of Educational Assessment. Oxford: Blackwell; 1998. p. 140.

33] Stobart S. Assessing validity in national curriculum assessments. Educ Res 2009; 51:161-79.

34] Kane MT. Argumentative approach to validity. Psychol Bull 1992; 112:527-35.

35] McMillan JH. Understanding and improving teachers' classroom decision making: Implications for theory and practice. Educ MeasTheory Pract 2003; 22:34-3.

36] Traube RE, Rowley GL. An NCME instructional module on understanding reliability. Educ Meas Issues Pract 1991; 10:37-45.

37] Lockyer J, Carraccio C, Chan MK, Hart D, Smee S, Touchie C,et al. Core principles of assessment in competency-based medicaleducation. Med Teach 2017; 39:609-16.

Research Article

What You See on Instagram! - The Strategic Leap of 'Meta'

Subhajit Biswas

Student, Globsyn Business School, Kolkata

Introduction

Instagram, a free app for sharing photos and videos, was co-founded by Kevin Systrom and Mike Krieger and launched in October 2010. It grew rapidly, reaching 10 million users within a year and 1 billion by June 2018. Facebook acquired it for $1 billion in 2012. Initially available on iOS, Instagram expanded to Android, desktop, Fire OS, and Windows 10. Users can upload content like photos, Reels, and Stories, interact through comments and likes, and share with followers or friends. Instagram's square photo format was replaced with 1080p resolution in 2015, and Stories, launched in 2016, which gained 500 million daily users by 2019.

According to IBM Artificial intelligence (AI) refers to technology that allows computers and machines to replicate human abilities such as learning, understanding, problem-solving, decision-making, creativity, and independent functioning.

The rise of artificial intelligence (AI) in social media platforms, particularly Instagram, has revolutionized user engagement, content moderation, and overall platform experience. AI is increasingly integrated into areas such as content moderation, recommendation systems, customer support, augmented reality (AR) filters, and fraud detection. While these technologies enhance user experience and security, they also raise ethical concerns related to privacy, bias, inclusivity, and user trust.

This research aims to explore the ethical implications of AI in Instagram's features and systems. A primary focus is on AI and human-driven content moderation, assessing how these systems ensure fairness, inclusivity, and respect for diverse user communities. Given the role of moderation in maintaining a safe environment, the study examines how AI can understand cultural nuances and avoid reinforcing harmful biases, while supporting freedom of expression. Additionally, the research will evaluate AI-driven recommendation systems to balance personalization with fairness and prevent algorithmic bias.

Another critical area of concern is user engagement, specifically how AI-powered customer support and AR filters enhance the experience while safeguarding privacy and trust. Data privacy is central to this investigation, exploring how Instagram's AI systems respect user privacy and ensure ethical handling of personal data. The research will also delve into AI-driven fraud detection, which, while essential for security, raises questions about balancing user protection with privacy and autonomy.

As AI evolves, developing ethical frameworks for its use in social media platforms is essential. Ethical AI is about minimizing risks such as biases and privacy violations while promoting fairness and social well-being. This research will contribute to creating ethical guidelines for AI systems that align with human values, ensuring transparency, accountability, and reliability.

Ultimately, the goal of this study is to provide a comprehensive analysis of the ethical considerations surrounding AI on Instagram. By addressing content moderation, recommendation systems, privacy, fraud detection, and governance, this research will

support the development of responsible AI technologies that respect user rights, promote inclusivity, and minimize harm.

Objectives

To investigate how ethics and human values are incorporated into AI and human-driven content moderation to ensure fairness, inclusivity, and respect for diverse user communities.

To assess how AI balances personalization with ethical considerations, avoiding bias in content recommendations and promoting user well-being and satisfaction.

To examine how AI-powered customer support and AR filters enhance user experience and engagement while safeguarding privacy, trust, and ethical standards.

To explore how AI-driven fraud detection and security measures align with ethical principles, ensuring transparency, accountability, and user protection from fraudulent activities.

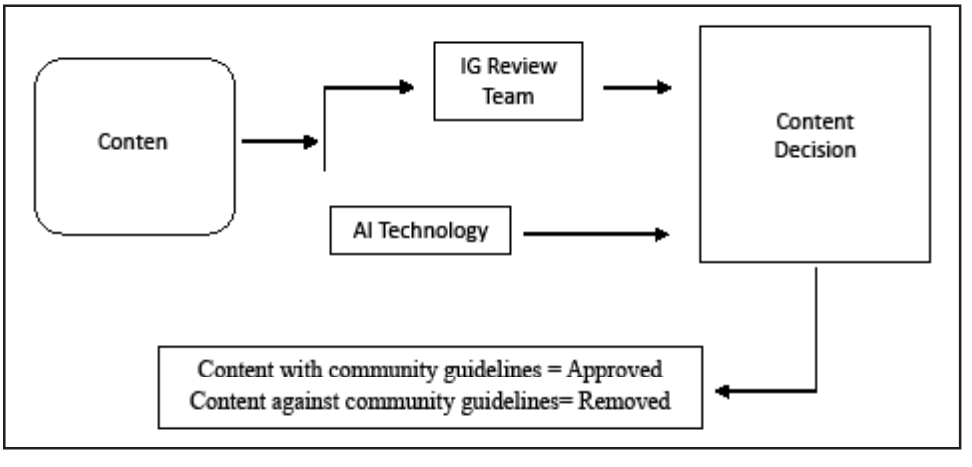
Findings

A comprehensive exploration of how Meta is embracing Artificial Intelligence to personalize user experiences, enhance content moderation and provide a safe space for their users to ensure efficiency and scalability.

Content Moderation

When content such as posts, comments, or stories violates Instagram's Community Standards, it is removed from the platform. However, if the content does not breach these standards but is still considered inappropriate, disrespectful, or offensive, it may be restricted from appearing in the Explore section rather than being removed entirely. Instagram's Community Guidelines, which apply globally, define acceptable content and aim to foster free expression while ensuring a safe environment for all users.

To monitor and take action on content that may violate these standards, Instagram employs a combination of technology and human reviewers. Artificial intelligence (AI) plays a critical role in the content review process by detecting and removing harmful content even before it is reported. In some cases, AI flags content for human review, where trained teams assess and decide its appropriateness. Thousands of reviewers worldwide are dedicated to identifying content that could potentially harm users.



AI utilizes machine learning models to identify specific characteristics in images or analyze text in posts. For example, these models can detect nudity or graphic content and determine whether it should be removed or restricted. When detailed evaluation is required, the flagged content is forwarded to human review teams for a final decision. As AI learns from these human decisions, it continually improves, refining its ability to make accurate judgments.

Instagram's policies evolve in response to societal norms, language changes, and platform updates, ensuring the content review process remains effective and relevant. If you believe your content has been wrongly removed, you can request a review of the decision.

Content Recommendation

Instagram provides a personalized user experience by using AI algorithms to recommend content, pages, or accounts based on user interests and preferences. The platform observes user interactions, such as likes, shares, and saves, as well as the accounts they follow and engage with regularly.

By analyzing past behaviour, Instagram predicts posts that users are most likely to enjoy. This intelligent content recommendation system ensures that users discover posts, reels, and accounts that align with their interests, enhancing their overall experience.

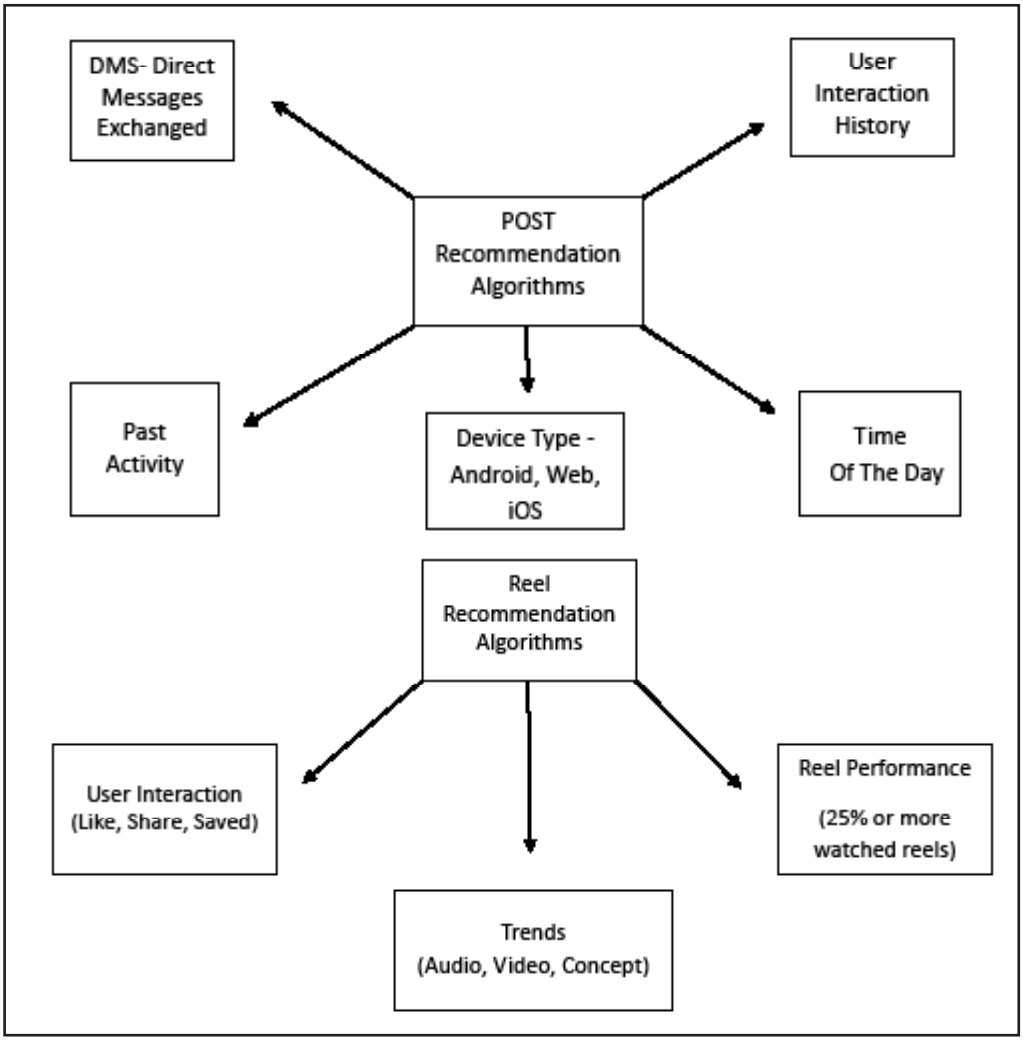


Image and Text Identification

With the help of AI, Instagram identifies objects, locations, and faces in photos, understanding the context, such as self-harm, violence, or hate. Through Natural Language Processing (NLP), Instagram analyzes text in captions, comments, or hash tags to detect offensive language, spam, or harmful messages.

This capability allows Instagram to moderate not only text but also images, improving its ability to maintain a safe and respectful environment for users.

Automated Customer Support

Instagram deploys AI-powered chat bots to handle customer queries efficiently. These bots provide instant responses to questions about account management, privacy, or reporting issues. This rapid support enables users to find solutions without needing to interact with human representatives.

AI systems also direct users to resources such as FAQs and troubleshooting guides for common issues. By managing a high volume of queries, AI-powered customer support reduces the need for human intervention and ensures faster resolution for users.

Augmented Reality (AR) Effects

Instagram incorporates Augmented Reality (AR) to enhance its camera features. AI-driven AR filters can recognize and track facial features, enabling users to apply effects like virtual makeup or changes to facial appearance. These filters can also alter surroundings, such as changing the background or adding virtual objects.

Custom filters adjust in real-time to facial movements, creating a seamless and engaging user experience. These creative and interactive features offer personalized ways to interact with content, making the platform more enjoyable and innovative.

Fraud Detection

Instagram continuously enhances security by using AI to detect suspicious activities and prevent harmful actions. AI identifies unusual patterns, such as rapid account creation or multiple login attempts from various locations, which may indicate hacking attempts.

It also monitors accounts for bot-like behaviors, such as automated commenting or mass-following, and restricts such activity to maintain a safe environment for legitimate users. By proactively addressing fraudulent behaviour, Instagram ensures a secure platform for its community.

Conclusion

Instagram's integration of AI across features such as content moderation, recommendation systems, fraud detection, and user engagement is essential in creating a personalized, safe, and engaging platform. However, the application of AI must be carefully examined through an ethical lens to ensure it aligns with human values.

AI-driven content moderation and recommendation systems have proven effective but must adhere to ethical principles like fairness, transparency, and inclusivity. Identifying harmful content, such as graphic images or offensive language, is crucial for fostering a respectful community. Yet, AI systems must be continually refined to prevent bias and discrimination. Human oversight plays a key role in ensuring that content moderation remains sensitive to cultural differences and individual freedoms, avoiding unintended harm while maintaining fairness.

AI-powered features like customer support and augmented reality filters enhance user engagement but must prioritize privacy and consent. Ethical use of personal data for recommendations and tracking interactions is vital to build user trust and safeguard against

exploitation. Ensuring transparency in how data is used helps prevent misuse and fosters a sense of security among users.

Fraud detection powered by AI is another key feature enhancing platform security, but it raises concerns about privacy and data protection. A balance must be struck between ensuring security and protecting individual rights. AI systems should be designed to prevent harmful activities while respecting user privacy and autonomy, ensuring that users are both secure and free from intrusive monitoring.

As Instagram evolves, it's essential that ethical considerations remain central in the development of AI systems, ensuring that the platform stays innovative, responsible, and accountable to its users. In the broader context, ethical AI development is critical across all sectors. Establishing strong ethical standards and regulations can significantly mitigate risks such as mass surveillance and violations of human rights. A balanced regulatory framework is essential for maximizing AI's benefits while minimizing its potential harms. Ethical AI prioritizes social well-being, ensuring that AI systems benefit individuals, society, and the environment. They should also avoid perpetuating biases related to race, gender, or nationality, promoting fairness and inclusivity. Privacy, security, and transparency are paramount, ensuring AI systems protect personal data, provide clear explanations for decisions, and remain accountable for their actions.

In conclusion, ethical AI is crucial for creating systems that are safe, fair, and beneficial to society. By focusing on human welfare, fairness, privacy, and transparency, AI can be harnessed responsibly, serving humanity in a positive and meaningful way.

Recommendations

As AI continues to shape social media platforms like Instagram, ethical considerations are increasingly important. Research is needed to ensure that AI systems operate fairly, transparently, and in line with human values across various functions such as content moderation, personalization, and fraud detection.

One key area for research is content moderation. AI plays a significant role in detecting harmful content, such as graphic images and offensive language. However, there is a need to enhance AI's understanding of cultural nuances and individual freedoms. Research should focus on developing more advanced algorithms that can identify harmful content while maintaining fairness and inclusivity. Human oversight is also essential to avoid bias, and future studies should explore how to best integrate human judgment with AI in content moderation.

Another area of concern is AI-driven content recommendation systems. These algorithms personalize user experiences but may unintentionally reinforce biases or create echo chambers. Research should aim to reduce algorithmic bias and ensure that content recommendations promote inclusivity and well-being. Balancing personalization with fairness is crucial to creating a platform that encourages diverse interactions.

User privacy and trust are also significant issues. AI features like chat bots and augmented reality filters raise concerns about the ethical use of personal data. Future research should focus on developing AI systems that prioritize user privacy while offering personalized experiences. Transparent data usage policies and consent mechanisms will help users control how their data is utilized.

Additionally, AI's role in fraud detection and platform security needs attention. While AI helps prevent fraudulent activities, it may also raise privacy concerns due to extensive monitoring. Research should explore methods to detect fraud without compromising user privacy.

Lastly, developing ethical AI governance frameworks is critical. Research should explore principles of fairness, transparency, and accountability to guide the responsible development of AI across social media platforms.

In conclusion, ethical AI research is vital to ensuring that AI systems on social media platforms operate in a fair, transparent, and inclusive manner, benefiting users and society as a whole.

References

- **Website**

Author: Instagram

Source: [URL: https://www.instagram.com/about/us/]

Author: Meta

Source: [URL: https://about.meta.com]

- **Article**

Author: Help centre Instagram

Title :How Instagram uses artificial intelligence to moderate content

Source: [URL: https://help.instagram.com/423837189385631/?helpref=related_articles]

Author: David Olsen

Title: How Does The Instagram Algorithm Work? – AI Ranking Explained

Source: [URL: https://skedsocial.com/blog/how-does-the-instagram-algorithm-work-ai-ranking-explained]

Author: Investopedia

Title: Instagram: What It Is, Its History, and How the Popular App Works

Source: [URL: https://www.investopedia.com/articles/investing/102615/story-instagram-rise-1-photo0sharing-app.asp]

Research Article

AI-Powered Content Personalization in Streaming Platforms and the Ethical Challenges and Implications: A Bibliometric Analysis

Doyel Mukherjee Prodhan

Assistant Professor, iLEAD, Kolkata

Amrita Mitra Mukherjee

Faculty, Globsyn Business School, Kolkata

Abstract

Artificial Intelligence (AI) has become increasingly prevalent in various industries, including education, marketing, and streaming platforms. In education, AI has facilitated the development of personalized digital platforms that cater to individual needs, enhancing the learning experience. Similarly, in marketing and streaming services, AI-driven personalization enables brands and platforms to offer tailored content to users, improving engagement and satisfaction. For instance, streaming platforms utilize AI algorithms to enhance content discovery and reduce subscriber churn by providing personalized recommendations. Despite the advantages, AI-powered content personalization in streaming platforms raises significant ethical concerns. These include issues related to data privacy, algorithmic bias, and the lack of transparency in recommendation systems. As AI technologies continue to evolve, there is a pressing need to balance personalization with user privacy and control over data. Furthermore, the concept of AI literacy is becoming increasingly important, empowering users to understand how AI functions and how it influences their content consumption, thereby promoting both individual and societal good. Personalized adaptive streaming techniques, such as user profiling and context-aware adaptation, are improving user experiences by delivering more relevant content. However, without strong ethical guidelines and regulatory frameworks, these advancements risk perpetuating biases and undermining user trust. Scholars have begun addressing these ethical dilemmas, but there remains a gap in comprehensive research on how AI-driven personalization in streaming platforms manages these challenges. To address this gap, this paper conducts a bibliometric analysis of AI-driven recommendations in media content, emphasizing the ethical challenges associated with these systems. By examining key trends and current research, this study aims to provide insights into how the industry can navigate issues such as bias, privacy, and transparency, ensuring that AI-driven personalization not only enhances user experiences but also upholds ethical standards.

Keywords: *Artificial Intelligence, Personalisation, Streaming, Ethics, Data Privacy, Algorithmic Bias*

Introduction

Background on Streaming Platforms

The evolution of Over-the-Top (OTT) streaming platforms has significantly transformed the media and entertainment landscape. The concept of streaming began to take shape in the late 1990s and early 2000s as the internet became more accessible (Zawislak, 2024). Initially, streaming media debuted as a proof of concept in the 1990s, followed by the era of Flash and RTMP from 2001 to 2010 (Ruether, 2023). Media streaming started with experimental live broadcasts in the 1990s, with the first livestreamed event being

a concert (Volle, 2024). Streaming platforms have undergone a cinematic revolution, with services analysing user preferences, viewing history, and time of day to provide personalized content recommendations (K-writes, 2024). In India, this shift began in 2008 with the launch of BIGFlix, gaining momentum after 2015 due to increased internet and smartphone penetration (Thakur, 2021). The rise of OTT platforms has been driven by factors such as quality content, a youth-oriented population, and the COVID-19 lockdown (Thakur, 2021). In Spain, the transition from traditional television to streaming services occurred in two distinct phases: 2006-2014 and 2015-2019 (Capapé, 2020). The success of OTT platforms depends on their streaming infrastructure and implemented strategies (Lingareddy & Damle, 2022). To address content concerns, the Indian government has introduced self-classification and a three-tier grievance handling mechanism for OTT platforms (Thakur, 2021). These developments have led to a significant shift in consumer preferences, with many opting for streaming services over traditional television (Lingareddy & Damle, 2022).

Role of AI and Personalization in Enhancing User Experience

One of the significant reasons behind the shift of consumer preferences is the personalised content offered by the streaming platforms. Personalization plays a crucial role in enhancing user experience across various digital platforms. Studies show that higher levels of personalization positively influence consumers' emotional dimensions and satisfaction (Kim & Lee, 2023). For instance, millennials with high variety-seeking tendencies may be less satisfied with highly personalized recommendations (Kim et al., 2020). While digital marketing practices don't directly affect purchase intentions for OTT platforms, they indirectly influence them through brand image and consumer engagement (Habib et al., 2022). In streaming services, adaptive video streaming techniques leverage machine learning to tailor content based on user behavior, preferences, and context (Khan, 2023). This approach extends to e-commerce, where personalization algorithms significantly improve user engagement and content relevance (Tarmizi et al., 2024). The implementation of adaptive user interfaces, predictive actions, and personalized user journeys can enhance digital experiences through data analysis and machine learning (Chandramouli, 2023). Furthermore, the integration of Internet of Things (IoT) technology in adaptive video streaming offers promising advancements in Quality of Experience (QoE) by utilizing environmental conditions and user context for optimized content delivery (Khan, 2024). While these personalization strategies show significant benefits, considerations such as data privacy, transparency, and user control remain important factors in system design (Tarmizi et al., 2024).

Research Objectives

Through a bibliometric analysis, this research aims to:

i) Analyse trends in research on AI-powered personalization in streaming platforms through bibliometric methods.

ii) Identify key themes and ethical challenges, such as privacy, bias, and transparency, in the existing literature.

iii) Map strategies proposed in scholarly works for balancing personalization with ethical practices and user empowerment.

Literature Review

A great concern that has erupted with the passage of time is the concern for personalization. Over the last decade it has been found that data science has been used largely to curate the personalised content. Let's take for example Netflix. A collaborative filtering algorithm is used to examine data including viewing history and ratings allowing Netflix

to recommend content that is most likely to match with the user's preference. (Khandelwal, K., Patel, S., et al (2023). Since the AI powered content personalization greatly improves user engagement, satisfaction and conversion rates (Bhargav Reddy, Piduru, 2023) it is also true that it has got a transformative role on the implications of digital interactions. In 2023-2024, Netflix has about 260 million subscribers, spread across 190 countries. (Antonyuk, Sergey, 2024). It has been estimated that on an average the users spend 3.2 hours each day watching content on the platform. (Antonyuk, Sergey, 2024). This has happened because over the years it has been found that personalization has greatly increased customer's viewing satisfaction. (Chen et al., 2019). Content quality, easy navigation, and according to (Mehta and Bhardwaj,2019), availability of wide range of content across locations are the key drivers to consumer satisfaction.

However the satisfaction isn't always in sync with the ethical considerations of the creative industry. As opined by (Kumari, P., Singh, Vinay Vikram, et al. 2024) improper censoring of OTT contents have had unfavourable effects as it has contributed to the breakdown of the societal and familial ties. In the name of personalization, the glorification of substance abuse, nudity and obscenity has tarnished the social fabric. The abundance of alternatives, at its backdrop has personalization as the causal factor. Collaborative and content-based filtering underpin the algorithms that shape the personalized contents affecting the behaviour and cross platform consumption and binge watching habits. (Behare, Nitesh & Jeet, Daman. (2024). The ethical consideration of AI powered content exerts its influence on the human mind, weaving an interplay between impulsivity and depressive syndromes, and more such psychological disorders. It has been observed by (Subramanian, A., et al. 2020) in their study about Binge Watching Behavior that it is a common phenomenon that binge-watching comes up as a way to escape from real-life difficulties. The addiction may lead to a number of health problems, including anxiety, sleeplessness, and depression.

Algorithmic accountability to protect ethical concerns like reduction of potential harms and negative effects, must be looked into with priority that will additionally reduce the risk of manipulation of user behaviour and avoiding the reinforcement of extreme views (Singh, Mansi et al., 2024). Beyond this, it is undeniable that the opacity of AI powered content curation leaves the consumers in the lurch as they are unable to identify how that data of their consumption is collected, and if there is a chance of a third party sharing as well (Singh, Mansi et al., 2024). There is no control over the customized personal preference as suggested the OTT platform since the analytics used is beyond the comprehension of an average user.

Methodology

Research Design

This study adopts a mixed-methods research design, combining bibliometric analysis with qualitative thematic exploration. The integration of these methods facilitates a comprehensive understanding of the subject matter by leveraging the strengths of both approaches. This methodology provides a comprehensive overview of the publication trends, influential works, key themes, and citation impact. In this study, we employ bibliometric techniques to examine the impact of AI on generating personalised and curated content for Streaming Platforms. The data for this analysis were sourced from a curated collection of academic publications, and the analysis was conducted using VOSviewer, a powerful tool for constructing and visualizing bibliometric networks. The diagrams—Density, Network, and Overlay—act as visualizations to interpret relationships among key variables, identify clusters, and trace the evolution of

the research domain of AI-powered content personalization in streaming platforms and its ethical challenges.

Data Collection

The primary data source comprises peer-reviewed journal articles, conference proceedings, book chapters, and editorials retrieved from Scopus database.

Data Collection and Preparation

Data Source: The Scopus database was selected for its extensive coverage of academic publications in technology and ethics-related fields in the social science domain.

Search Strategy: The dataset was generated using keywords such as "AI-driven personalization," "streaming platforms," "ethical implications," and related terms to capture relevant literature.

Inclusion and Exclusion Criteria:

- **Inclusion Criteria:** Publications between 2010 and 2024, focusing on themes of AI-driven content personalization, ethical implications, and challenges in streaming platforms, with substantial citations or relevance to the research focus.
- **Exclusion Criteria:** Non-peer-reviewed articles, publications outside the defined timeline, and articles with insufficient relevance to the research domain.
- **Data Cleaning:** The bibliometric data was pre-processed to remove duplicates, normalize keywords, and standardize author names.

Data Analysis Using VOSviewer

VOSviewer, a software tool for constructing and visualizing bibliometric networks, was utilized to perform various analyses, including co-authorship, co-occurrence, citation, and density visualizations.

1. Network Visualization:

- **Objective:** To map relationships between authors, institutions, and keywords, revealing influential nodes and collaborative networks.
- **Procedure:** Co-citation, co-authorship, and keyword co-occurrence analyses were conducted using VOSviewer to construct the network.
- **Interpretation:** The visualization highlighted influential authors, emerging themes, and collaborative trends, providing insights into interdisciplinary approaches.

2. Overlay Visualization:

- **Objective:** To trace the temporal evolution of research themes and highlight emerging and declining areas of interest.
- **Procedure:** Keywords were color-coded based on publication year to create a gradient representing temporal dynamics.
- **Interpretation:** This visualization revealed the progression of AI ethics and personalization technologies, identifying pioneering works shaping current research.

3. Density Visualization:

- Objective: To identify high-density research areas, highlighting thematic clusters and their relative significance.
- Procedure: Density diagrams were generated to visualize the intensity of academic focus within clusters.
- Interpretation: High-density areas indicated well-established themes, while low-density areas pointed to underexplored opportunities.

Key Findings

1. Number of Papers Published per Year:

- **Trend Analysis:** The publication trend showed a significant increase in studies on AI-powered personalization post-2015, aligning with advancements in AI technology.

- Implications: This reflects the growing academic and industry interest in the ethical and practical applications of AI in streaming platforms.

2. Citation Distribution:

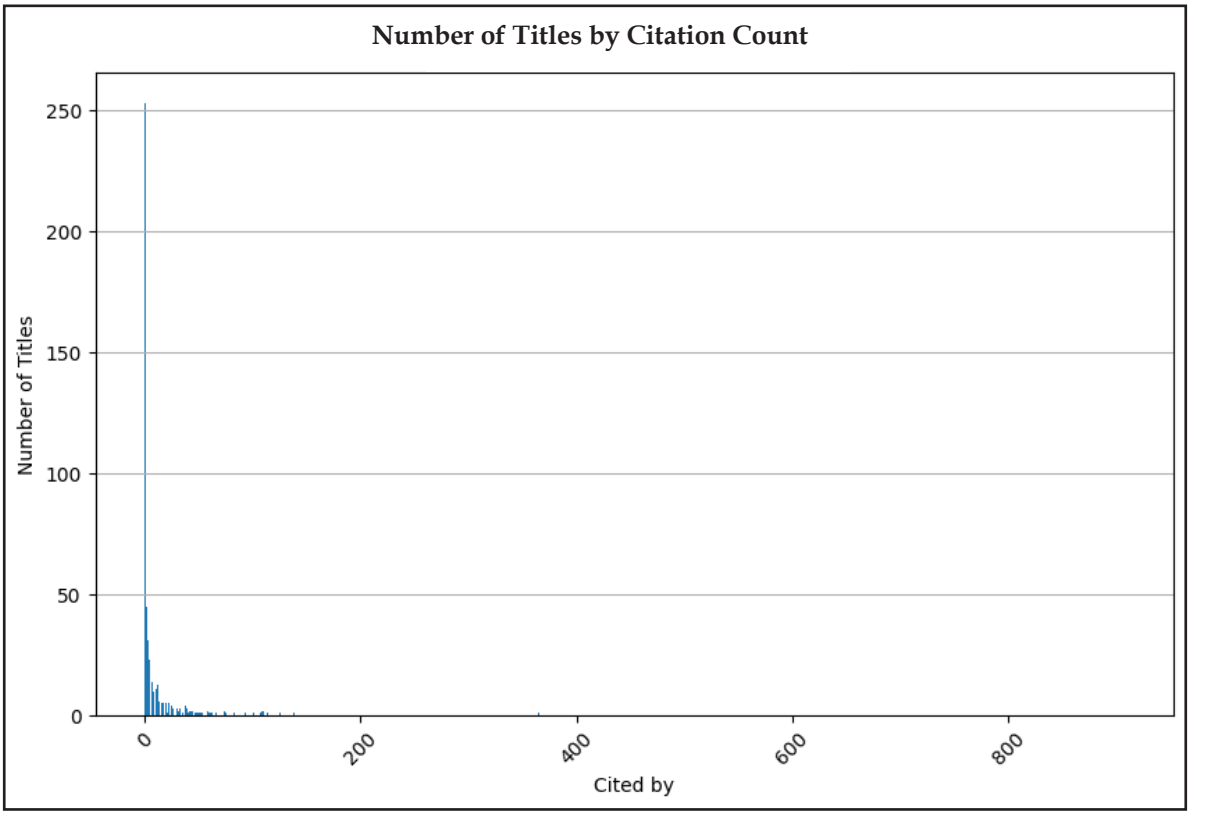
- **Analysis:** The majority of papers had relatively low citation counts, with many having fewer than 5 citations. However, highly cited papers (up to 466 citations) indicated substantial impact on the field.
- **Implications:** The disparity in citation counts suggested a mix of foundational studies and less impactful ones. Identifying highly cited papers provided insights into seminal works and influential research trends.

3. Document Types Distribution:

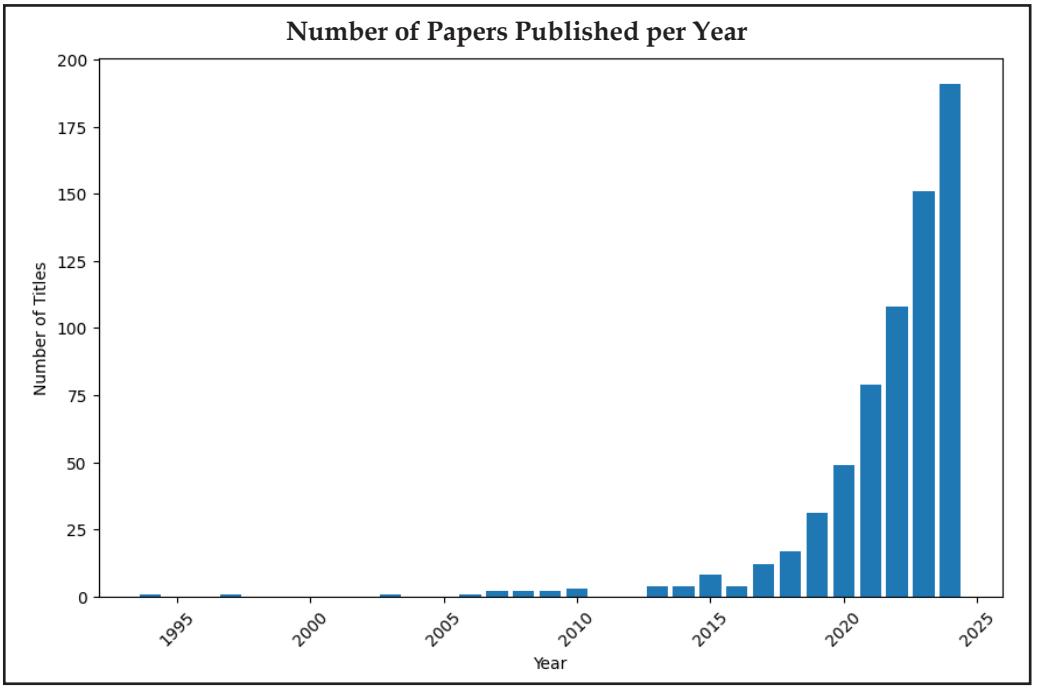
- **Analysis:** The dataset included journal articles, conference proceedings, and book chapters, with journal articles being the most predominant.
- **Implications:** This distribution emphasizes the preference for peer-reviewed journals in disseminating high-impact research.

4. Top 10 Sources by Number of Papers:

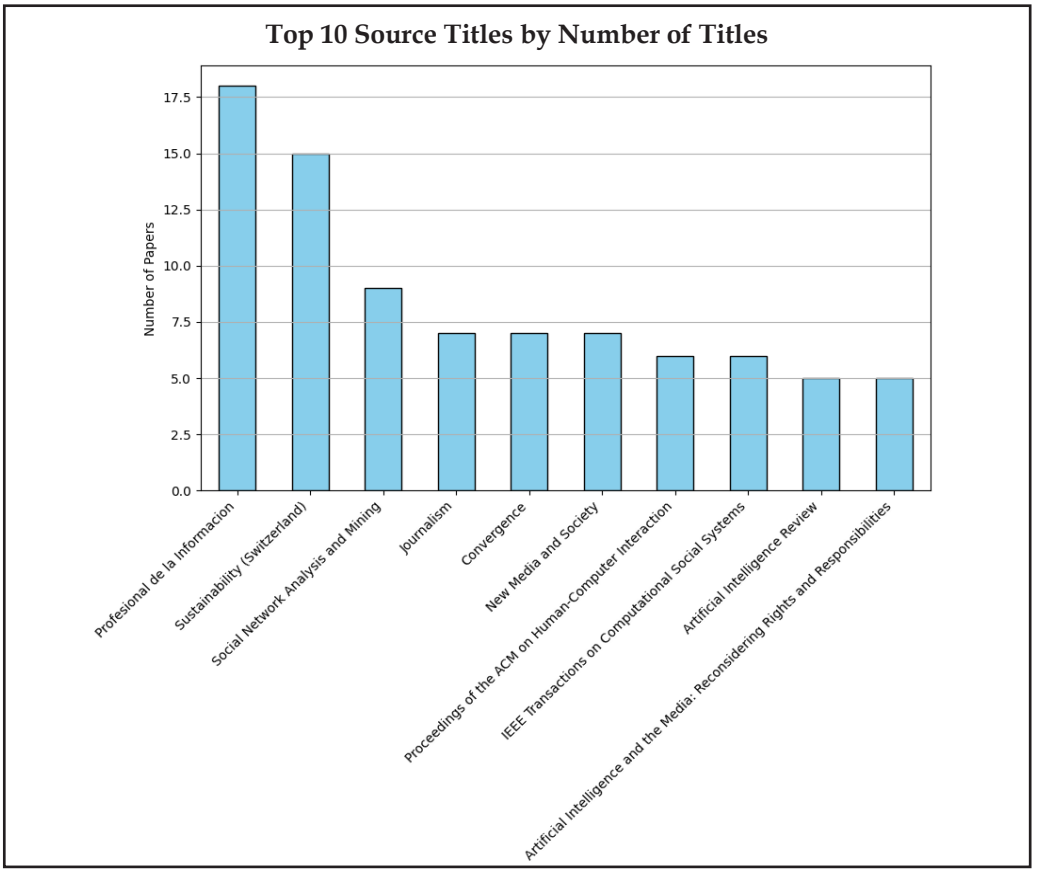
- **Analysis:** The top sources were identified based on the number of relevant publications.
- **Implications:** These sources represent key outlets for researchers in this domain.



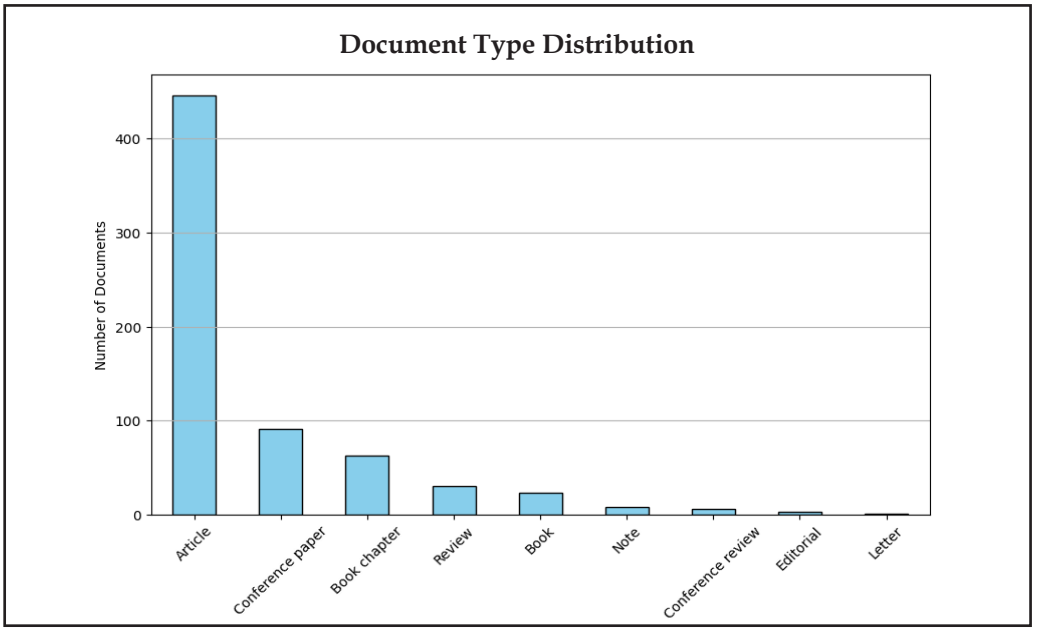
Graph 1: Distribution of citations across the selected articles



Graph 2: Distribution of publication of selected articles across the years



Graph 3: Top ten sources by number of papers



Graph 4: Distribution of the type of documents selected for analysis

The bibliometric analysis offered a comprehensive overview of AI-powered personalization in streaming platforms, reflecting the field's dynamic and interdisciplinary nature. Citation distribution highlighted key works and opportunities for further impact. Researchers and practitioners can use these insights to guide future studies, identify seminal works, and understand evolving trends. Using VOSviewer, the study mapped literature relationships and trends, providing a valuable resource for further exploration and development in this rapidly evolving domain.

Analysis and Findings

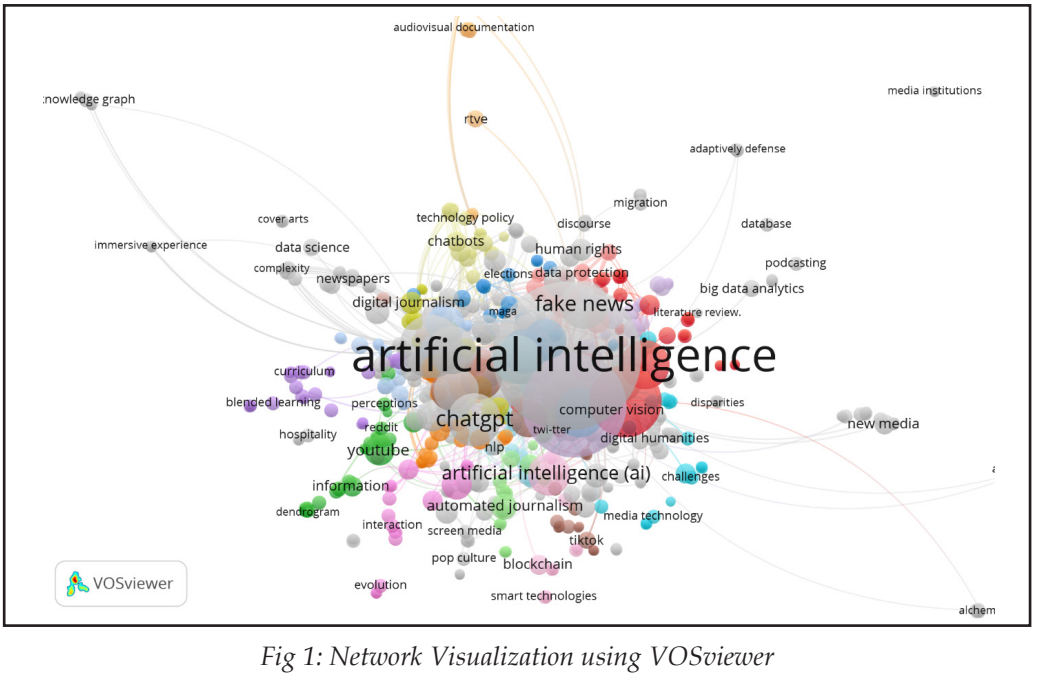


Fig 1: Network Visualization using VOSviewer

Analysis of Network Visualization

The network visualization provided offers a comprehensive view of the relationships and interactions among various keywords in the context of AI-powered content personalization and ethical implications.

Central Nodes and Clusters

1. Artificial Intelligence:

- **Central Node:** Identified as the most influential node, connecting themes such as ethics, privacy, and personalization.
- **Connections:** Linked to keywords like "machine learning" and "user engagement."

2. Clusters:

- **Red Cluster:** Focused on ethical issues, privacy concerns, and governance.
- **Green Cluster:** Addressed technological advancements and AI integration in streaming platforms.
- **Blue Cluster:** Explored user experience and engagement metrics.
- **Yellow Cluster:** Investigated personalization algorithms and data-driven insights.

Key Themes and Trends

- **Technological Integration:** AI-driven advancements in machine learning and big data analytics are transforming industries by enabling real-time analysis, personalized user experiences, and optimized decision-making. These technologies are at the core of innovative content delivery and recommendation systems, driving interdisciplinary applications.
- **Social Impact:** AI algorithms significantly influence mental health and societal dynamics. While enhancing user engagement, they can also create echo chambers, addiction, and social isolation. The broader societal implications, including shifts in public opinion and cultural diversity, warrant careful examination.
- **Industrial Applications:** AI is revolutionizing media, entertainment, and streaming by powering personalized recommendations, automating workflows, and enhancing audience experiences through technologies like virtual reality (VR) and augmented reality (AR). These innovations boost efficiency and creativity across industries.

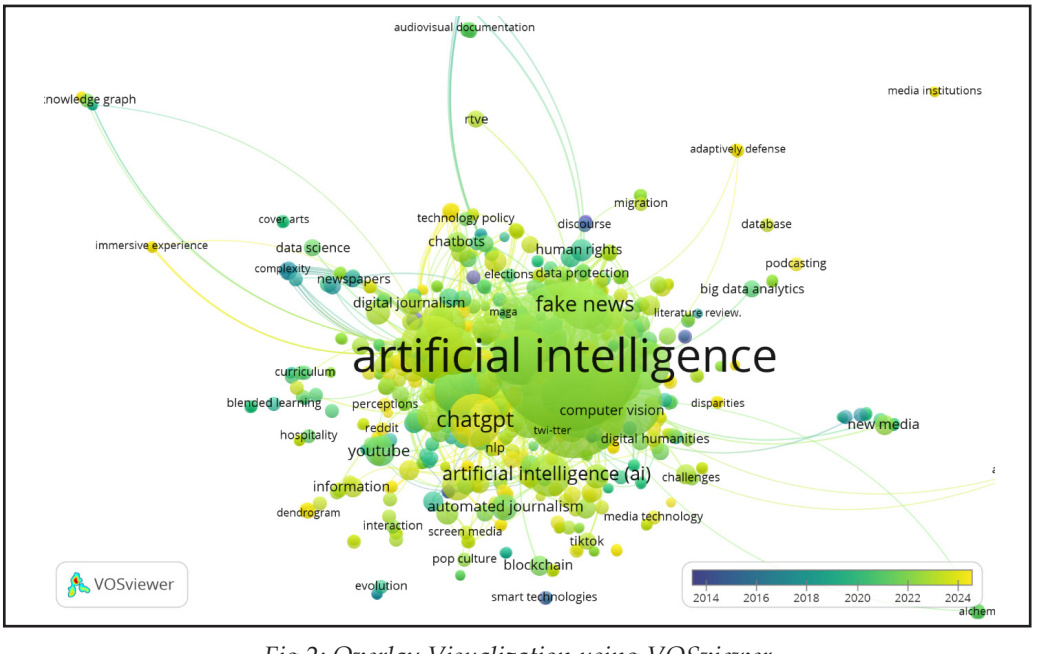


Fig 2: Overlay Visualization using VOSviewer

- **Ethical and Governance Issues:** AI's rapid adoption raises concerns about data privacy, algorithmic bias, and transparency. Addressing these challenges requires ethical frameworks, regulatory policies, and interdisciplinary collaboration to ensure responsible and fair AI deployment.

Interconnectedness and Research Hotspots

- **High Connectivity:** Nodes like "AI ethics" and "streaming platforms" showed dense interconnections.
- **Research Hotspots:** Emerging themes in algorithmic fairness and user data privacy.
- **Emerging Topics:** Exploration of hybrid recommendation systems and user-centric AI.

Analysis of Overlay Visualization

- The overlay visualization provided an insightful look into the temporal dynamics of research trends and the evolution of keywords related to AI and its applications in streaming platforms.

Central Nodes and Temporal Trends

1. Artificial Intelligence:

- **Central Node:** Maintained a dominant position across all years, indicating its enduring relevance and continuous evolution as a field of study. This suggests that AI is not a passing trend but a core area of research with sustained interest and development. Its central position implies strong connections and influences across various sub-topics and related disciplines.

2. Temporal Evolution of Key Topics:

Early Research (Blue and Green):

- **Machine Learning:** The keyword "machine learning" remains a key focus over time, transitioning from blue to green, indicating its foundational role in AI-driven personalization for streaming platforms.
- **Big Data:** Terms related to "big data" have evolved, highlighting their importance in the development of content personalization algorithms in OTT platforms.
- **Digital Technologies:** Keywords like "digital technologies" and "decision making" have remained prominent in the blue-green spectrum, suggesting their long-standing significance in AI applications for personalized content delivery.

Recent Research (Yellow and Green):

- **Personalized Content and User Experience:** Keywords such as "personalized content," "user experience," and "content recommendation" are predominantly in the yellow spectrum, reflecting the rising interest in AI-driven personalization in OTT platforms from 2020 onwards.
- **Ethics and Data Privacy:** There has been a noticeable shift towards "ethics" and "data privacy" concerns in recent research, indicating the growing awareness of the ethical implications of data usage and personalization algorithms in streaming platforms.
- **Consumer Behavior and Engagement:** Terms like "consumer behavior," "engagement," and "viewing patterns" are in the yellow-green range, indicating the rapid development and exploration of AI's impact on audience engagement and content consumption patterns in the digital streaming landscape.

Emerging and Evolving Themes

- Recent trends emphasize a growing focus on explainable AI and algorithmic transparency in the context of personalized content delivery.

Interconnectedness and Research Intensity

- Highly Connected Nodes: Topics such as "AI ethics" and "user privacy" have emerged as critical areas of research,

reflecting their increasing importance in the discourse surrounding AI-driven content personalization on streaming platforms.

- **Hotspots of Recent Research:** Notable research hotspots include ethical content personalization and hybrid recommendation systems, which are gaining traction as key areas for improving user experience and addressing the ethical challenges in content recommendation algorithms.

The overlay visualization effectively highlights the temporal evolution of research topics related to AI and Personalized content on streaming platforms. It reveals key trends and emerging areas of interest, with a notable shift towards deep fakes, journalism, ethical considerations, and digital communication in recent years. This visualization provides valuable insights into the dynamic landscape of AI research, emphasizing the importance of adapting to new trends and addressing emerging challenges in the field.

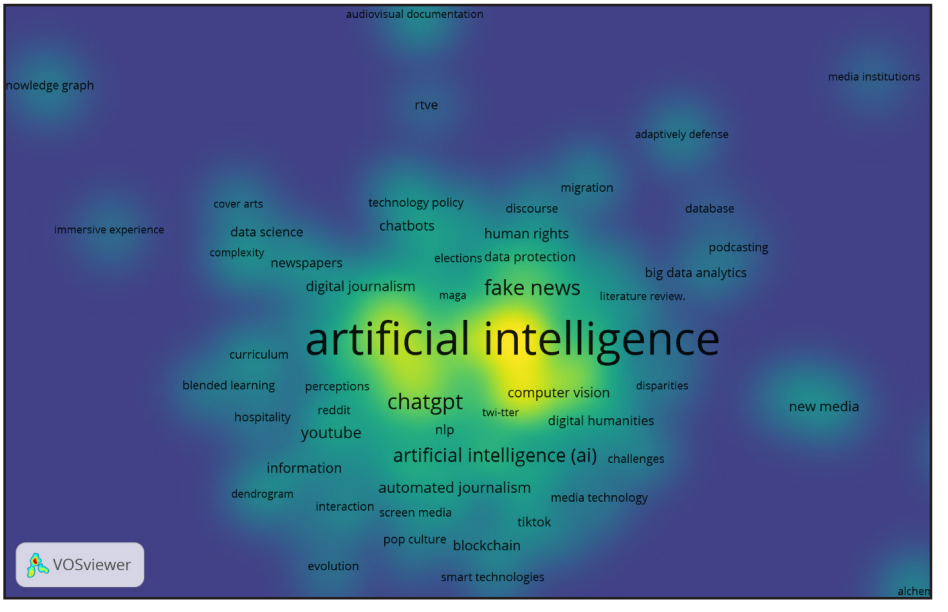


Fig 3: Density Visualization using VOSviewer

Analysis of Density Visualization

The density visualization provided offers a detailed perspective on the concentration and intensity of research activity around various keywords related to artificial intelligence (AI) and its applications, particularly in the context of curated content for streaming platforms. The colour gradient from blue (low density) to yellow (high density) indicates areas with varying levels of research intensity. Here is a detailed analysis of the density visualization:

Central Nodes and High-Density Areas

- **Artificial Intelligence:** The central node of "artificial intelligence" exhibited the highest research intensity, highlighting its role as a focal area in the development of AI-powered content personalization on streaming platforms. AI's centrality in recent studies underscores its critical role in shaping personalized user experiences, from content recommendations to viewer engagement strategies.

Machine Learning and Related Technologies:

- **Machine Learning:** In the context of OTT platforms and social media, machine learning is crucial for both content personalization and the detection of misinformation. By processing large datasets, machine learning

refines recommendation algorithms to cater to individual preferences. It also plays a pivotal role in identifying fake news and deep fakes, helping platforms detect misleading content and ensure the quality of information shared with users.

- **Big Data:** Big data is essential for data-driven decision-making in OTT platforms and social media. It enables AI systems to personalize content recommendations based on user behavior, ensuring more engaging and relevant content delivery.
- **Social Media:** Social media platforms leverage AI and machine learning for personalized content delivery and to combat the spread of misinformation. Algorithms analyze user interactions to serve tailored content while also detecting and flagging fake news, biased narratives, and deep fake content, ensuring more trustworthy user experiences.
- **Fake News:** AI algorithms play a key role in the fight against fake news by analysing patterns in user-generated content and flagging potentially harmful or misleading information. In both OTT and social media environments, AI can help distinguish between credible news and disinformation, ensuring that users are exposed to accurate and reliable content.

Deep Fake Journalism: The rise of deep fakes poses significant challenges in digital journalism and social media. AI technologies are being employed to detect deep fakes, safeguarding the integrity of news content. By utilizing machine learning models, platforms can identify manipulated videos or images and prevent their spread, thus protecting users from misleading or fabricated news.

Key Themes and Trends

The research reveals several emerging themes in the AI-powered personalization of streaming content:

- **Algorithmic Efficiency:** There is growing interest in the optimization of algorithms that power content personalization, with a focus on improving the speed, accuracy, and relevance of recommendations.
- **User Experience:** As AI systems become more sophisticated, user experience remains central to content personalization strategies. The seamless integration of AI-driven recommendations into the user interface is critical to fostering engagement and satisfaction.
- **Ethical Governance:** The ethical implications of AI-driven personalization, including issues of bias, transparency, and accountability, have become a prominent theme. Ensuring fairness and privacy in content recommendation systems is increasingly seen as integral to responsible AI governance.

Interconnectedness and Research Hotspots

- **Highly Connected Areas:** Ethical AI and hybrid systems have emerged as highly interconnected topics within the research landscape. Ethical AI focuses on addressing privacy concerns and ensuring fairness in AI algorithms, while hybrid systems combine AI technology with human oversight to improve personalization without compromising ethical standards.
- **Research Hotspots:** The key research hotspots identified in this analysis are "personalized recommendations" and "data ethics." As streaming platforms seek to enhance user engagement through tailored content, ethical considerations related to data privacy and the potential for algorithmic bias are rapidly becoming focal points of scholarly inquiry.

Discussion

Key Themes and Trends

- **Growth in Research Activity:** A marked increase in research output surrounding

AI ethics and personalization technologies has been observed, indicating the growing importance of these areas within AI-driven content personalization for OTT platforms. Scholars are increasingly focusing on optimizing algorithms while addressing ethical concerns such as privacy and fairness.

- **Diverse Research Output:** The research landscape reveals diverse themes, ranging from algorithmic design and efficiency to broader ethical governance. This variety highlights the interdisciplinary nature of AI-powered content personalization, which intersects with fields like data science, law, and user experience research.
- **Influential Sources:** Journals such as AI & Society and Ethics and Information Technology have emerged as leading publications in this field, providing platforms for the dissemination of research related to the ethical challenges and technological advancements in AI-driven personalization.
- **Emerging Research Areas:** As AI technologies evolve, the focus on "explainable AI" and "fairness in algorithmic decision-making" is gaining traction. Researchers are advocating for algorithms that not only deliver personalized content but also provide transparency and justification for their decisions, thus ensuring user trust.

Influential Works and Citation Impact

- **Highly Cited Papers:** Seminal works on ethical AI and user personalization algorithms have had a significant citation impact, reflecting their foundational role in advancing the discourse around AI in content personalization. These papers have been pivotal in shaping the academic and practical approaches to ethical and efficient AI implementation in streaming platforms.
- **Citation Disparity:** Despite the growth in research activity, there is a notable citation disparity between papers addressing technological advancements and those focusing on ethical considerations. This highlights the need for broader dissemination of research on ethical challenges to ensure a balanced approach to AI-driven personalization.

Ethical Considerations and Challenges

- **Ethical Implications:** Privacy concerns, algorithmic bias, and the societal impact of AI systems remain critical challenges in AI-driven content personalization. As streaming platforms gather vast amounts of user data to personalize content, the ethical dilemmas surrounding data ownership, consent, and the potential for discrimination in algorithmic recommendations must be addressed.
- **Balancing AI and Human Expertise:** The research calls for a hybrid approach that combines the power of AI with human expertise in content curation and ethical decision-making. This approach aims to mitigate biases and ensure that AI systems remain transparent, fair, and aligned with societal values while delivering personalized user experiences.

Conclusion

Summary of Findings

The entire ecosystem of AI-driven content personalization for OTT platforms is poised for significant transformation, marked by a surge in research focusing on optimizing technological advancements alongside ethical considerations. This study's bibliometric analysis revealed a marked increase in scholarly interest post-2015, highlighting themes such as algorithmic efficiency, ethical governance, and user experience enhancement. Content engaging with issues of privacy, fairness, and transparency has emerged as a central challenge

for streaming platforms. The overlapping of diverse research themes—from algorithmic design to ethical governance—underscores the interdisciplinary nature of the domain, necessitating collaboration among experts in data science, law, and user experience.

Contributions to the Field

This research synthesizes bibliometric data to identify trends, gaps, and emerging themes in AI-powered content personalization. It emphasizes the expanded paradigm of AI ethics and personalization, showcasing how scholars are advancing algorithms to improve user experience while addressing pressing ethical concerns. Influential journals like AI & Society and Ethics and Information Technology have provided pivotal platforms for disseminating research on ethical challenges, bridging gaps between technological innovation and ethical scrutiny. This study highlights the need to harmonize advancements in AI with the ethical imperatives of privacy, fairness, and transparency.

Limitations

The study is constrained by its reliance on bibliometric data from Scopus, possibly excluding relevant works from other databases. The analysis focuses on publications between 2010 and 2024, which might overlook foundational studies from earlier periods. Additionally, the emphasis on academic research may limit insights into practical, industry-specific challenges faced by streaming platforms.

Recommendations for Future Research

To foster a balanced approach, future research should expand by incorporating additional databases and exploring methodologies like empirical case studies and longitudinal analyses. Addressing the disparity in attention between technological innovations and ethical implications is crucial, as ethical considerations surrounding privacy, algorithmic bias, and transparency require immediate focus. A hybrid approach that combines AI capabilities with human expertise is essential to navigate these complexities. Interdisciplinary collaborations must be prioritized to develop frameworks that ensure AI systems remain transparent, fair, and aligned with societal values. Ultimately, advancing discussions around ethical challenges in tandem with technological progress will be key to harnessing the full potential of AI-driven content personalization while safeguarding user rights and fostering trust.

References

1] Antonyuk, Sergey, 2024, https://litslink.com/blog/all-about-netflix-artificial-intelligence-the-truth-behind-personalized-content

2] Behare, Nitesh & Jeet, Daman. (2024). The Art and Science of User Engagement: Personalization and Recommendations in the OTT Era. 10.4018/979-8-3693-0116-6.ch009.

3] Bhargav Reddy Piduru (2023) The Role of Artificial Intelligence in Content Personalization: Transforming User Experience in the Digital Age. Journal of Artificial Intelligence & Cloud Computing. SRC/JAICC-207. DOI: doi.org/10.47363/JAICC/2023(2)193

4] Bok, S. K. (2023). Enhancing User Experience in E-Commerce through Personalization Algorithms.

5] Capapé, E. (2020). Nuevas formas de consumo de los contenidos televisivos en España: una revisión histórica (2006-2019).

6] Chandramouli, A. (2023). Enhancing digital user experiences through personalized interfaces and predictive modelling. Journal of Artificial Intelligence & Cloud Computing, 2(265).

7] Chen, Y., Zhang, L., & Li, J. (2019). Personalized recommendation, content

accessibility and customer satisfaction in OTT video service. Journal of Business Research, 101, 228-236. https://doi.org/10.1016/j.jbusres.2019.02.007

8] Gnaneswari, G. (2023, April). Conversational Agent Architecture for OTT platform Confederation Consumer Hyper Personalization and Assistance. In 2023 IEEE International Conference on Contemporary Computing and Communications (InC4) (Vol. 1, pp. 1-4). IEEE.

9] Habib, S., Hamadneh, N. N., & Hassan, A. (2022). The relationship between digital marketing, customer engagement, and purchase intention via OTT platforms. Journal of Mathematics, 2022(1), 5327626.

10] Khandelwal, K., Patel, S., et al (2023) A Study to Know - Use of AI for Personalized Recommendation, Streaming Optimization, and Original Content Production at Netflix. International Journal of Scientific Research & Engineering Trends Volume 9, Issue 6, Nov-Dec-2023, ISSN (Online): 2395-566X

11] Khan, K. (2023). Adaptive Video Streaming: Navigating Challenges, Embracing Personalization, and Charting Future Frontiers. International Transactions on Electrical Engineering and Computer Science, 2(4), 172-182.

12] Kim, J. E., & Lee, H. M. (2023). The effect of the perceived level of personalization of OTT platform services on consumers' PAD dimensions and responsive behavior. The e-Business Studies, 24(4), 41–58.

13] Kim, K. H., Kim, A. Y., & Sung, Y. J. (2020). The Influence of Personalized Recommendation on the Millennial's Evaluation of OTT Services: Focused on the variety seeking tendency. Journal of the HCI Society of Korea, 15(3), 43-53.

14] K-writes. (2024, February 4). The evolution of streaming platforms: A cinematic revolution. Medium. https://medium.com/@k-write/the-evolution-of-streaming-platforms-a-cinematic-revolution-b9e6069356df

15] Lingareddy, V., & Damle, M. (2022, November). Video Streaming OTT Platforms: A Comparative Study of their Streaming Infrastructure with Strategies Implemented. In 2022 International Interdisciplinary Humanitarian Conference for Sustainability (IIHC) (pp. 29-35). IEEE.

16] Mehta, N., & Bhardwaj, A. (2019). Customer satisfaction with OTT platforms: An empirical study in India. International Journal of Business and Economics Research, 8(4), 159-166. https://doi.org/10.11648/j.ijber.20190804.11

17] Nanda, B., Thongam Nakra, M., & Goyal, H. (2024). Impact of OTT Platforms on Human society: A Comprehensive Review, The International Journal of Indian Psychology, Volume 12, Issue 1, January-March, 2024. DOI: 10.25215/1201.220 https://www.ijip.in

18] Punam Kumari, Dr. Vinay Vikram Singh, Dr. Raj Misra, & Prahlad Tiwari. (2024). The Role Of OTT Platforms In Influencing The Social And Ethical Values Of The Society. Educational Administration: Theory and Practice, 30(5), 5266–5276. https://doi.org/10.53555/kuey.v30i5.3773

19] Ruether, T. (2023, February 21). History of Streaming Media [Infographic] https://www.wowza.com/blog/history-of-streaming-media

20] Singh, M., Sharma, K., Kaur, A., & Keshav. AI-ENABLED CONTENT CURATION IN OTT PLATFORMS: BALANCING PERSONALIZATION AND PRIVACY. Futuristic Trends in Artificial Intelligence e-ISBN: 978-93-6252-541-3 IIP Series, Volume 3, Book 12, Part 7, Chapter 1.

21] Subramanian, A., Seetharaman, A., & Maddulety, K. (2020). Critical Review of BingeWatching Behaviour Through the Prism of Vroom's Expectancy Theory. Research Gate. https://www.researchgate.net/publication/342170874_Critical_Review_Of_Binge_Watching_Behaviour_Through_The_Prism_Of_Vroom's_Expectancy_Theory

22] Thakur, P. (2021). A Remarkable Evolution of Over-the-top Media Platforms in India: A Case Study of Business and Regulatory Trends. Global Media Journal, 19(42), 1-4.

23] Volle, A. (2024, October 24). Streaming media. Britannica. https://www.britannica.com/technology/streaming-media

24] Zawislak, G. (2024, January 28). Evolution of streaming platforms has shaped society. SAHS Pony Express https://sahsponyexpress.com/122539/focus/evolution-of-streaming-platforms-has-shaped-society/

Research Article

Exploring The Role and Impact of Generative AI in Enhancing Skilled Workforce Efficiency and Modern Workplace Dynamics for Maximum Organizational Output: A Textual Review and Conceptual Assessment

Jahir Rayhan

Assistant Professor, Department of Business Administration
Ishakha International University, Bangladesh

Abstract

Artificial Intelligence (AI) has emerged as a pivotal force in transforming job performance across various sectors. AI technologies, such as machine learning, natural language processing, and robotics, are being used to automate tasks, improve efficiency, and reduce costs as a whole. In the modern workplace and workforce knowledge, AI has become a transformational force that is altering many elements of employee's performance and organizational outputs. This paper explores the dynamic role and impacts of generative AI in in improving expert worker efficiency, work dynamics and in the modern workplace across diverse industries. The qualitative assessment kinds of methods are used through a comprehensive review of literature and conceptual studies, I highlight the multifaceted ways in which AI augments skilled human capabilities, effectiveness and efficiency and the modern workplaces by creating fosters innovation for greater organizational outputs. Assessing skilled workforce efficiency, workplace dynamics, and AI can help organizations understand its impact, develop AI integration plans, and enhance talent collaboration for better performance. In addition, AI-powered analytics offer priceless insights into performance measures, empowering businesses to streamline processes and make informed choices. Additionally, by customizing training programs to meet the needs and learning preferences of each individual, AI enables personalized learning and development opportunities. Employees can learn new skills and abilities at their own speed with adaptive learning algorithms into modern workplaces which promotes ongoing professional development and increased job satisfaction. The efficiency increases made possible by generative AI have the power to completely transform whole companies, promoting an agile and efficient culture. Businesses can increase productivity, optimize resource allocation, and boost profitability by automating repetitive processes and enhancing human talents. Adopting AI enables businesses to achieve unprecedented levels of competitiveness and productivity in the quickly changing digital environment.

Key Words: *Generative AI, efficiency, organizational output, workplace dynamics, skilled workforce*

Introduction

Artificial Intelligence (AI) technologies have great potential to be stimulants for economic and social change within the larger framework of digitization. AI has the power to change industries, businesses, workplaces, labor markets, workforce efficiency and society as a whole. Although there are still challenges in implementing generative AI, these systems can benefit customers, streamline business processes, enhance human expertise by offering answers and insights, and assist companies in gaining or preserving a competitive edge. When the need for greater strategic engagement and adaptation materializes, employers must

possess the knowledge and resources needed to decide on the best course of action that will grow their organizations and improve job prospects, worker efficiency, and the modern workplace. In this case, the purpose of the investigation is to summarize the body of research on the function and effects of AI in improving employee efficiency, work dynamics, and hiring in the modern workplace, giving employers the managerial knowledge they need to manage its continued development. Although technology's impact on jobs is complicated and always evolving, a substantial amount of research exists that can help businesses make decisions and provide insights into the different aspects of the present AI expansion process. The study examines the fundamentals of this technology as well as the recent rise of generative AI throughout the introduction.

AI is revolutionizing the workforce and the workplace, transforming how businesses operate and interact with their employees within work environment. AI has been increasingly adopted by organizations in recent years in an attempt to enhance worker effectiveness and efficiency create dynamic work environment, automate processes, improve predictive analytics for enhanced decision-making. As organizations strive for greater efficiency and effectiveness, the role of AI in enhancing employee productivity and engagement has become increasingly significant. This article explores how AI can be leveraged to create more productive and engaged workforces, ultimately driving business success. AI has the potential to fundamentally alter how we work, boosting employee productivity, cutting expenses, and improving job satisfaction.

An entirely new era in the workplace has been brought about by the development of AI, which has changed industries, redefined career paths, and profoundly changed how we operate successfully and efficiently. AI technologies are developing at a never-before-seen rate, making their incorporation into many facets of work unavoidable. Despite the potential for greater production and efficiency, this shift also presents intricate and varied difficulties, especially with regard to the dynamic and digital well-being of workers. It is critical to consider how the presence of AI in the workplace impacts the productivity of the people who make up its core in this age of constant connectivity and digital dependence. The workplace has always been a dynamic setting that changes all the time to adapt to new technology. Every wave of innovation, from the development of computers and the internet to the automation of work through automation, has changed the nature of employment. On the other hand, AI differs from conventional automation. In addition to automating monotonous tasks, it can also acquire knowledge, adapt, and carry out significant intellectual duties. Multiple issues are brought up by this change over how AI will affect the future jobs and the welfare of its employees.

There are many different components that make up the concept of digital well-being, such as social, physical, and psychological elements. Digital technologies' effects on people's physical and mental well-being, work-life balance, job satisfaction, and general quality of life are all covered. As AI continues to enter the workplace, it is critical to comprehend how it affects these aspects of digital well-being. The objective of this study article is to investigate and evaluate the various effects of artificial intelligence (AI) in the workplace and its implications for workers' digital health. Because AI technology is developing so quickly, staff must constantly learn new things and adjust to be relevant. Employers and educational institutions must work together to provide training opportunities that are effective. AI presents ways to enhance digital well-being in addition to its difficulties. Chatbots and virtual assistants with AI capabilities can help staff members who are struggling with stress or mental health concerns. For employees who lack expertise in

operating processes, predictive analytics can assist firms in identifying and resolving possible sources of workplace stress and discontent. AI can also improve workplace personalization by customizing experiences and tasks to each worker's tastes and needs, which could lead to an increase in job satisfaction and general well-being.

Technology has generally had a positive impact on workplace productivity and employee satisfaction. Employees now have greater freedom and mobility, improved communication and teamwork, and increased production and efficiency thanks to technology. The possible drawbacks of technology, such as job displacement, increased effort and stress, digital distraction, and work-life imbalance, should be understood, though. By establishing clear guidelines for technology use and offering staff assistance and training, organizations can lessen the negative effects of technology. Setting limits between work and personal time and taking breaks from technology throughout the day are two other actions that employees may take to manage their own digital well-being. Additionally, a strong online presence encourages cooperation and information exchange at work. Digital technologies including project management platforms, messaging applications, and video conferencing are crucial for efficient communication and teamwork in a globalized and remote work environment. Colleagues can more easily ask for help, share ideas, and work together on projects when staff members actively engage in these digital platforms, which fosters an atmosphere of openness and accessibility. In addition to increasing overall productivity, this also helps to create a healthy workplace culture where information is openly shared, encouraging creativity and innovation inside the company.

Finally, AI is an unstoppable and revolutionary force in the workplace and skilled workforce. One crucial component of this continuous change is its effect on workers' digital wellbeing. Although AI has the potential to increase efficiency and production, it also presents a number of issues, including the requirement for ongoing learning, privacy concerns, job displacement, and work-life balance. The purpose of this study article is to examine these intricacies in depth, illuminating the complicated relationship between AI and worker effectiveness and well-being. We believe that this investigation will yield insightful information and helpful suggestions that will help individuals, companies, and legislators navigate the changing nature of employment in the AI era.

Statement of the problem:

Significant questions have been raised about the role of AI technologies and their effects on employee modernization as a result of their quick integration into skilled worker efficiency and current workplace dynamics. In order to better understand the complex role and effects of AI on workplace dynamics and employee effectiveness, this study will look at how it affects employee mental health, creative and invented attitudes training and acquisition of new skills related to automated processes, workplace fulfillment, work-life balance, and general digital thinking. By highlighting the main obstacles and possibilities that come with using AI, this study seeks to provide useful insights on how organizations might use AI while preserving the digital notions and expertise of their employees.

Objectives of the research:

The overall objectives of the research study are to assess the role of generative AI on the enhancement of worker efficiency and contemporary workplace by investigating its influence on job roles, workforce dynamics for maximum organizational productivity, with a focus on identifying opportunities and challenges for effective integration and optimizing the benefits of AI technologies in diverse environments of work.

The research paper aims to provide a comprehensive understanding of the complex interaction between AI in the workplace and employee skill by addressing these objectives. It also offers insights and recommendations for businesses and policymakers to effectively navigate this evolving landscape.

Review of Literature

Artificial intelligence (AI) is referred to as "a system's ability to correctly interpret external data, learn from such data, and use those learnings to achieve specific goals and tasks through flexible adaptation" (Kaplan and Haenlein, 2019). AI as it is now understood refers to "agents" or systems that are able to respond in response to their surroundings (Russell and Norvig, 2020). Although the definition of artificial intelligence (AI) as "making machines capable of simulating intelligence" is clear-cut and uncontroversial (Wamba-Taguimdje et al., 2020), there have been recurring problems throughout AI's history that have been discussed by society, including job displacement, automated system flaws, and privacy protections (Buchanan, 2005).

From 1998 to 2020, emotion recognition applications in the workplace were primarily used for monitoring customer service, employee reactions to policies, detecting security threats, detecting worker availability, and detecting workers' feelings to change them. Examples include AI software in call centers to warn employees of speaking too fast or not empathic enough (Roose, 2019). AI identifying emotions has also been used at the recruitment stage, such as the automated assessment of video job interviews through face analysis and voice indications (Ajunwa, 2021). Whereas there is an increasing commercial availability of emotional AI in the workplace, it is an emerging technology surrounded by critiques on its accuracy, scientific validity, ethics, societal implications, and legality (Roemmich et al., 2023). Moreover, there is scientific disagreement about whether AI can, in fact, detect emotions (Crawford, 2021).

Innovations in generative AI have had a particularly significant economic impact due to a number of causes. The first is that they provide applications across a variety of businesses and activities. Since Chat-GPT was introduced in November 2022, generative AI has been widely used due to its adaptability. Therefore, the second factor is the ease of use and low cost of the existing AI-powered content production applications. According to a 2022 study conducted before Chat-GPT was released, 53% of employers in the finance sector and 58% of those in manufacturing across were the primary obstacle to AI adoption (Lane, Williams and Broecke, 2023, p. 85). In that regard, generative AI-based web apps are revolutionary since they are frequently free to use or only require a membership. In this sense, McKinsey has predicted that generative AI might contribute between $2.6 trillion and $4.4 trillion annually to the global economy, highlighting the technology's promising economic prospects (McKinsey & Company, 2023). R&D, software engineering, marketing and sales, and customer operations would account for nearly three-fourths of this increased value (McKinsey & Company, 2023). Its impacts will be dispersed unevenly, though, as adoption rates will range among nations, regions, and businesses of various sizes and industries (Cazzaniga et al., 2024).

According to Gilbert (2023), a more balanced perspective suggests that AI has at least three effects on employment: job creation, work augmentation, and job displacement. In reference to the latter, half of companies globally anticipate that AI will foster job expansion during the next five years (WEF, 2023a). Business intelligence analysts, sustainability analysts, and AI and machine learning specialists will be the occupations with the fastest rate of growth for employers by 2027 (WEF, 2023a). Prompt engineers, AI modelers, data trainers, and governance and ethics specialists are a few examples of the new professions that are

anticipated to arise in addition to the growing demand for already-existing positions as a result of AI (WEF, 2023b). Job demand will be impacted by generative AI since it may have major effects on a variety of work-related tasks. Compared to the automation potential, the augmentation potential is far greater: According to ILO data, only 2.3% of employment worldwide could currently be entirely automated, even though 13% of jobs may benefit from AI (Gmyrek, Berg and Bescond, 2023, p. 34).

Computers have always struggled to do activities that humans can do with ease, like talking or seeing, but have excelled at jobs requiring computation and logic (Goel and Davies, 2011). Generative AI has rapidly advanced computer capabilities to mimic human traits, with McKinsey predicting computers to master coordination, creativity, and problem-solving by 2030 or later. McKinsey predicts that by 2030, technology will excel in natural language understanding and other capacities, but not social skills (McKinsey & Company, 2023). To be sure, this does not necessarily imply that human work will be replaced; rather, it means that employers and employees must have the necessary skills to use AI tools in their favor and augment or strengthen their own capabilities.

Investing in digital skills at three different levels basic (like using computers and cellphones), intermediate (like job-specific skills with specialized software), and advanced (like programming) is the first way that upskilling is necessary (ITU, 2021). The need for AI skills that is, technical aptitudes like software engineering or data analysis has increased dramatically in recent years in connection to expanded digital powers. Applications for jobs in the United States and Brazil that required AI capabilities rose by 19% and 15%, respectively, between 2022 and 2023 (LinkedIn, 2023, p. 7). However, it is also anticipated that in the near future, there will be a greater need for social and emotional abilities (such as teamwork, conflict resolution, and emotional intelligence) (Strietska-Ilina and Chun, 2021). The corporate community is undoubtedly aware of the need for upskilling; in fact, a PwC global CEO study from 2024 found that 69% of CEOs believe that generative AI will eventually need that the majority of their workforce acquire new skills. The challenges and new opportunities in intelligent management are provided the sections that follow.

The economic production that each worker can produce on average in a given period of time is known as labor productivity. According to Cazes and Verick (2012), its levels are determined by a number of factors, including the technologies available to employees, their working environment, and their human capital. Technology advancements appear to be a major driver of productivity growth: between 1980 and 2018, technological change accounted for 40% of the variation in labor productivity in emerging markets and developing economies and roughly 50% in advanced economies (Dieppe, 2021, p. 365). According to the 2024 PwC Global CEO Survey, 64% of CEOs anticipate that generative AI will improve working conditions for their staff (PwC, 2024).

Accenture (2017) study report found that AI-powered virtual assistants can provide personalized services and support to customers, improving the overall customer experience. The study found that AI virtual assistants can answer questions and resolve issues quickly and effectively, leading to increased customer satisfaction. However, there are also potential implications of AI adoption that need to be considered.

Gartner (2020) found that AI can lead to greater innovation in the workplace. The study found that AI systems can provide organizations with new insights and perspectives, leading to the development of innovative solutions and products. AI-powered virtual trainers, like apps, may customize training requirements, adjusting the learning process for every worker

and enhancing their experience and skill development (Chen, 2023). That is, AI can be used to create better working circumstances and an improved working environment.

Rana et al. (2022) looked at the potential disadvantages of integrating AI into corporate analytics, focusing on company management's operational inefficiencies and competitiveness. They stressed that while AI provided many benefits, companies also faced challenges in realizing its full potential. Beyond the phases of research and innovation, AI has an impact on market adoption and upcoming changes to business models in organizations. The substantial advantages of AI-driven business solutions, such as higher productivity, lower operational costs, and better customer experiences, are highlighted by Soni et al. (2019). Since computer use increased in the 1990s, digital recruiting has gone through several stages. Since the 2010s, recruiters have used AI more and more to whittle down opportunities due to the large volume of prospects and offers on these platforms (Black and Van Esch, 2020).

Humans and robots must work together effectively for AI to be implemented successfully. Humans provide creativity, empathy, and critical thinking, whereas AI is excellent at processing data and automating processes. The significance of AI in improving work performance is examined in this study, which provides useful insights and doable tactics for a range of industries. Organizations must ultimately adjust and welcome this change proactively as AI develops and permeates every facet of the contemporary workplace. Businesses may set themselves up for success in a dynamic and fiercely competitive business climate by utilizing AI to enhance human capabilities, streamline operations, and stimulate creativity (Mithas et al., 2022).

The role and impact of AI on the worker efficiency and workplace has been widely researched in recent years. The literature on AI at the workplace and employee works focuses on the potential benefits, implication and challenges, future opportunities of AI adoption, including increased efficiency, improved decision making, and enhanced workforce experience.

Research Methodology

Data is derived based on the jobs of individuals and the workplace that are significant to the investigation, as this research article surveys. Secondary sources that supplied the data and analysis for this work are used throughout the full research paper, both qualitative and descriptive. This study used a mixed methods approach to examine the role of AI, its effects on the efficiency of skilled workers, the dynamics of the modern workforce for greater outputs, and its current state, adoption challenges, and future opportunities.

The research has used qualitative assessments of the study subjects to examine the literature on employee performance, the use of AI in businesses, and modern working conditions. In addition to providing information regarding its current AI implementation scenario, this will draw attention to any gaps in the literature. An analysis and appraisal of the key concepts in artificial intelligence and business, as well as the literature, and provide information about the nation's current AI application conceptual review and assessment of AI and business has focused on the key concepts, potential applications, and benefits of enhancing workplace dynamics and worker efficiency.

Data Presentation, Discussion and Assessment

Although generative AI has improved worker efficiency and workplaces, the advent of AI-powered applications has also resulted in the emergence of new employment. The goal of these AI positions is to increase workforce efficiency and enhance the workplace.

Role and impact of generative AI in enhancing skilled workforce efficiency:

AI-powered automation has a big impact on workforce dynamics and job roles since it can replace repetitive work, change current positions, and generate new tech-focused jobs. Workers will need to upskill as AI collaboration expands, emphasizing both technical and soft abilities. AI plays a pivotal role in the modern workforce, catalyzing productivity, efficiency, and innovation. The role of AI technologies and its significant effects in stimulating workforce effectiveness and efficiency can be summarized:

Generative AI-enhanced creativity and innovation of workforce:

The promotion of creativity and innovation is one of the main ways generative AI increases labor efficiencies. Conventional work models frequently depend on human innovation, which is constrained by things like personal viewpoints and time constraints. By providing new ideas, new ideas, and unique perspectives, and innovative solutions., generative AI enriches human creativity.

For example, generative AI can help with the production of visual material in the fields of marketing and design by proposing fresh color palettes, layouts, and design components. This guarantees a wide variety of ideas that might not have been investigated otherwise, in addition to quickening up the creative process.

AI in optimizing learning and skill development programs:

Generative AI enables personalized learning experiences for future workers, adapting instructional materials to individual needs and preferences. This approach increases employee satisfaction and engagement, making them valuable assets to the company. HR departments can ensure employees have the necessary skills for success.

Example: AI is used by platforms like Coursera and LinkedIn Learning to suggest tailored courses based on performance information, employee positions, and hobbies. Employee skill development is guaranteed, which directly boosts output.

Impact on performance: Employees can develop in the areas that are most important to their jobs through individualized training and development programs, which boosts productivity and job satisfaction as they gain proficiency in these areas. AI enhances worker productivity by customizing learning and growth processes. Businesses can offer tailored training plans, identifying skill gaps and suggesting appropriate resources based on performance data. This individualized approach boosts productivity, self-assurance, and ensures training aligns with roles.

AI supports workforce planning and optimization:

AI can help HR departments plan and optimize workforce allocation based on current and future needs, ensuring that the right people are in the right roles at the right time. By analyzing historical data, AI can help predict staffing requirements, enabling HR teams to allocate resources effectively. AI helps businesses predict and plan personnel needs by analyzing past data, market trends, and corporate goals, proactively handling workforce issues, reducing overstaffing and understaffing, and efficiently allocating resources.

Example: AI-powered workforce planning and optimization technologies are available through Workday and SAP Success Factors. These technologies assist HR departments in scheduling, predicting talent requirements, and sustaining team productivity levels.

Impact on output: Businesses may prevent overstaffing or understaffing and guarantee that productivity is maximized throughout their organization by using AI to analyze staffing needs and optimize resources.

AI-driven in predictive analytics for enhanced decision-making:

Generative AI enhances decision-making by providing insights through advanced data

analysis and predictive modeling, reducing errors and mitigating risks, thereby promoting organizational success. AI offers strategic workforce management insights by analyzing data from employee performance, market trends, and external factors. It can identify patterns like high turnover rates, enabling targeted retention strategies.

For example, AI-driven tools like IBM Watson provide businesses with valuable insights into consumer behavior patterns, enabling them to tailor their marketing strategies effectively. Pymetrics utilizes AI to predict candidate success in various roles, optimizing the hiring process and ensuring better job fit, thereby increasing productivity and employee retention.

AI-powered intelligent staffing and talent acquisition:

Through the use of sophisticated algorithms and machine learning, AI helps businesses to optimize their hiring procedures. Huge volumes of data, including as resumes, experience, abilities, and performance indicators, can be analyzed by AI-powered systems to find the most qualified applicants for particular positions. In addition to saving time, this automated applicant screening procedure enhances the caliber of recruiting choices, guaranteeing that businesses may effectively hire top personnel.

AI-personalized in employee training and development:

AI is also capable of tailoring training and development plans for staff members according to their own requirements and preferences. Artificial intelligence (AI) algorithms analyze employee performance data to find skill gaps and provide relevant learning materials or growth opportunities. Professional development, job satisfaction, and employee engagement are all improved by this individualized approach.

AI-powered learning platforms also make adaptive learning experiences possible, which maximize the success of training initiatives by customizing material and delivery methods to each employee's unique learning style. These are specialist roles that prepare data and design training programs to keep the AI running smoothly. They train AI models on domain-specific data and oversee their operations to ensure effectiveness and accuracy. Hence, forming a bridge between humans and AI, ensuring the technology delivers its intended benefits.

AI-automated routine tasks, freeing up time for more strategic work:

Routine and repetitive job tasks take up significant time and resources and often impair workforce efficiency. Such jobs can be effectively automated by generative AI, freeing up human workers to concentrate on more intricate, strategic, and value-added projects. Routine tasks like data input, content curation.

Example: AI systems like Zenefits and Gusto automate HR tasks, saving hours and allowing HR specialists to focus on productivity-boosting projects. Generative chatbots in customer service improve customer satisfaction and free up human resources for critical thinking and emotional intelligence.

Impact on outcome: HR managers can improve their strategic initiatives by automating repetitive processes and fostering a vibrant workplace where staff members are encouraged and enabled to give their best efforts.

AI-driven in intelligent scheduling and resource optimization:

AI-powered scheduling algorithms can optimize shift planning and resource allocation. These algorithms consider staff availability, skills, preferences, and corporate needs to create efficient and well-balanced schedules. Organizations can ensure equitable job distribution, avoid scheduling conflicts, save overtime expenditures, and maximize worker satisfaction by automating these processes.

AI-powered scheduling solutions ensure optimal resource allocation and offer real-time adjustments to accommodate unexpected events or changes in requirement.

AI-enhanced employee engagement and leading to better outcomes:

Employee engagement has a major impact on workforce and organizational outcomes. More engaged workers are more motivated, focused, and committed. AI can help HR managers track and enhance employee engagement by analyzing sentiment and feedback in real time.

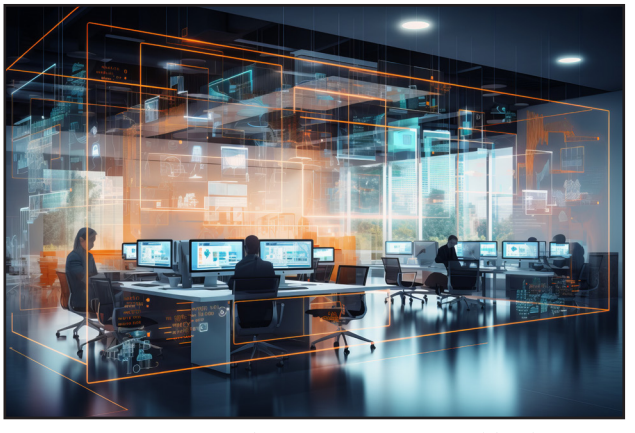


Figure-1: AI in employee engagement and leading to better outcomes

Example: AI-powered solutions like Officevibe and CultureAmp give real-time surveys and data that HR teams can use to gauge employee satisfaction and engagement. By helping HR teams solve issues before they affect productivity, these insights ensure that employees stay motivated and engaged.

Impact on output: Employees that are actively involved in the company's mission and feel valued are more productive. HR managers may monitor employee attitude with AI, which makes proactive engagement and intervention strategies possible.

AI-powered in workplace Safety and Risk Management:

AI technologies play a crucial role in ensuring workplace safety and risk management. AI-driven systems can monitor and analyze data from various sensors to identify potential hazards or anomalies in real-time. For example, in manufacturing environments, AI can detect equipment malfunctions or deviations from normal operating conditions, preventing accidents and minimizing downtime.

AI-optimized opportunities for workforce operations and higher productivity:

AI integration in employee relations has many advantages for companies, improving decision-making, productivity, and process simplification, giving them a competitive edge in the constantly changing marketplace. AI is transforming human resources through process simplification, learning optimization, engagement enhancement, and real-time performance feedback. It improves team and individual performance, turns HR departments into data-driven, strategic operations, and helps HR teams realize their greatest potential.

AI-driven real-time performance analytics:

AI increases worker productivity by offering real-time performance metrics, which facilitate ongoing progress tracking and optimization. By making data-driven, timely decisions for resource allocation and project scheduling, it facilitates the identification of bottlenecks and enhances workforce management. Software such as Tableau and Microsoft Power BI that integrates AI aids in performance metrics analysis, productivity trend identification, and inefficiency correction. In contact centers, it also improves agent productivity and service quality.

AI-enhanced communication and collaboration:

AI technologies facilitate real-time translation, forecast replies, and improve cooperation, all of which improve employee communication, teamwork, and workplace productivity. AI maximizes productivity by removing misunderstandings, scheduling meetings efficiently, and highlighting important topics of

conversation, all of which improve collaboration across geographic boundaries.

AI-powered tools like Slack and Microsoft Teams help users efficiently find information in large communication data. These advancements enhance collaboration, save time, and improve interaction quality, allowing teams to focus on content rather than technical aspects.

AI-driven employee wellbeing monitoring:

In order to maintain organizational productivity, AI can increase employee efficiency by tracking stress and wellbeing indicators, spotting trends of burnout or disengagement, and alerting managers to change workloads or provide support services.

AI-driven platforms like Ginger and Modern Health offer personalized mental health support, detecting stress and offering timely interventions. Wearable technology like Fitbit monitors physical stress indicators, enhancing employee wellbeing programs and boosting workplace efficiency by ensuring employees remain mentally and physically healthy.

AI-optimized resource allocation:

AI improves employee efficiency by optimizing resource allocation across projects and teams using predictive analytics and machine learning, ensuring timely completion, budget optimization, and maximizing productivity among team members. AI-integrated project management tools like Wrike and Asana use real-time data analysis to suggest timelines and resource allocations, while tools like Planday and Shiftboard optimize workforce scheduling, boosting efficiency and operational efficacy.

AI-enhanced quality assurance:

AI increases worker productivity by employing machine learning algorithms to automate quality control processes. By spotting errors and irregularities, it frees up employees to work at greater levels. Additionally, AI predicts faults, saving money and time while guaranteeing smooth operations by averting predicted problems. AI-powered visual inspection systems and software development tools like DeepCode enhance quality and productivity by identifying defects faster and identifying potential bugs, while also streamlining the development process and enhancing the final product.

AI-driven customer interaction optimization

AI can improve employee efficiency by optimizing customer interactions, enabling businesses to handle routine inquiries without human intervention, and providing personalized service, predicting needs, and offering tailored solutions. AI chatbots and tools like Salesforce's Einstein can handle common customer queries, predict future inquiries, and suggest responses, streamlining customer service processes and allowing employees to focus on strategic tasks.

AI-powered in addressing ethical considerations:

As generative AI is included into processes, organizations must deal with ethical dilemmas. It is imperative that responsible AI use, accountability, and transparency be prioritized in order to ensure that generative AI is a positive force. Establishing a culture of responsible AI adoption requires businesses to invest in educating their staff about the ethical implications of AI.

Role and impact of generative AI in automating modern workplace dynamic:

From streamlining communication to automating repetitive tasks, generative AI is ushering in a new era of workplace productivity, empowering teams to achieve more. Here are just a few of the many ways generative AI can improve workplace productivity today:

1. More efficient communication and collaboration: AI-powered tools are changing the way teams communicate and collaborate. Powered by large language models (LLMs), tools like AI copilots can streamline communication by automating

routine messages and facilitating seamless information sharing across the organization.

2. Smart scheduling: Effective time management is crucial for productive teams. AI can optimize scheduling by intelligently analyzing calendars, factoring in availability, time zones, and priorities to find the most suitable time slots for meetings or deadlines, maximizing efficiency.

3. Task automation: One of AI's most powerful contributions is its ability to automate a wide range of tasks, freeing up valuable time and brainpower for more strategic endeavors.

4. Writing and editing: Generative AI can streamline document drafting, editing, and proofreading by generating initial drafts, refining content, and catching errors with precision, accelerating the creation of high-quality written materials.

5. Data entry and analysis: Repetitive data entry and analysis are prime candidates for automation. AI can swiftly and accurately handle these tasks, populating databases, parsing information, and uncovering insights from complex datasets, eliminating human error and saving countless hours.

6. Project management: AI can be a powerful ally in managing projects efficiently. From task delegation and progress tracking to risk assessment and resource optimization, AI tools can provide invaluable insights and recommendations, ensuring projects stay on track and within budget.

7. Predictive analytics: By analyzing historical data and identifying patterns, AI can predict future trends and outcomes, empowering businesses to make informed, data-driven decisions. This capability is invaluable for forecasting demand, identifying growth opportunities, and mitigating potential risks.

8. Better resource and workload allocation: AI's analytical prowess extends to optimizing resource allocation and workload distribution. These tools can assess skills, availability, and project requirements, ensuring the right resources are assigned to the right tasks, maximizing productivity and minimizing bottlenecks.

9. Document summarization: Generative AI can summarize long documents, reports, or articles, extracting key points and insights, saving time from having to manually review lengthy materials.

10. Personalized email drafting and response generation: With an understanding of context and tone, AI can draft personalized emails and responses, reducing time spent on email communication.

11. Data entry and form population: AI can accurately and databases by extracting relevant information from documents or conversations, automating tedious data entry work.

12. Conversational support: Generative AI copilots can provide quick answers to common queries from employees or customers, reducing the load on support teams.

13. Workflow and process automation: By understanding and mapping out business processes, AI can automate multi-step workflows, streamlining operations.

14. Personalized training and onboarding: AI can create customized onboarding and training materials and interactive walkthroughs tailored to individual learning needs for more efficient onboarding.

15. Automated code generation and debugging: AI coding assistants can generate code snippets, suggest improvements, and help debug issues, accelerating development cycles.

16. Knowledge base creation and maintenance: Generative AI can automatically create, update, and query internal knowledge bases, ensuring access to the latest information. AI can digitaize and automate the working environment for IT skilled employees for better performance and outputs of the organization.

Benefits of generative AI to stimulate workforce efficiency and workplace dynamics:

AI has a wide range of applications in improving workplace dynamics and employee efficiency. I should examine the positive benefits of AI for the workplace and worker productivity.

1. Enhancement of job quality: AI can significantly improve job quality for many workers by automating mundane and repetitive tasks. This shift allows employees to focus on more complex and engaging work, potentially increasing job satisfaction and reducing burnout.

2. Upskilling and new opportunities: AI drives the demand for new skills and roles within the workforce, offering workers opportunities to upskill, reskill, and fill emerging positions that command higher wages and require more advanced competencies, such as AI maintenance, oversight, and ethical management.

3. Work-life balance: Automated systems offer flexible scheduling options, reducing traditional work hours and locations, thereby improving work-life balance by enabling better management of personal responsibilities and professional commitments.

4. Safer working conditions: In industries where safety is a constant concern, such as manufacturing or logistics, AI can monitor and analyze workplace environments to predict and prevent potential hazards, reducing the risk of accidents and creating a safer work environment.

5. Increased effectiveness and efficiency: AI-powered tools have revolutionized workplaces by handling repetitive tasks and enhancing efficiency. They allow employees to focus on strategic and creative tasks, reducing operational burden and fostering a creative work environment.

6. Advancements in specific sectors: AI is revolutionizing medicine and finance by providing accurate disease diagnosis, personalized treatment plans, and predictive investment strategies, reshaping industries and unlocking unattainable possibilities.

7. Personalized learning and development opportunities: AI's analysis of individual performance and learning preferences enables the delivery of customized training modules. This accelerates the learning curve and fosters a culture of continuous learning & development aligned with organizational goals.

8. Improved employee collaboration: AI-powered collaboration tools facilitate seamless teamwork, breaking geographical barriers and enabling efficient virtual collaboration. This promotes improved communication and the sharing of information among team members.

9. Streamlined project management: Integrating AI into project management systems improves efficiency by making tasks and workflows more intuitive and responsive to user needs. This enhancement ensures project timelines are met and milestones achieved.

10. AI-powered task optimization for enhanced productivity: AI significantly contributes to content production, assisting with article outlines, content analysis, and summaries to boost creativity. In fraud prevention, its continuous monitoring excels in detecting patterns, while AI-driven live chat systems streamline customer support tasks, allowing human operators to handle complex queries. Identifying mundane tasks for AI intervention enables employees to focus on strategic work, enhancing creativity, imagination, and overall productivity.

Challenges and future opportunities:

Despite the huge positive aspects, organizations must also face certain challenges when they adopt and deploy AI-powered products. Like any other new technological development, role, and significant influence, generative AI exhibits challenges.

1) Lack of human touch: The capabilities of AI are inferior to those of managerial skills

or managerial work and an over-reliance on AI might result in a decline in staff morale and real interaction with others. So, AI-based interactions may lack the human touch and personal connection that some customers prefer.

2) Job displacement: Employment rates in certain industries may be impacted by the automation of operations that have traditionally been performed by humans. Employment displacement could occur as AI technologies are used to mechanize some monotonous tasks. Organizations must effectively plan and communicate in order to lessen the possibility of job losses and provide employees with the training they need to transition into different roles.

3) Data privacy and security: The use of AI involves the collection and analysis of huge amounts of data, it raises concerns about privacy and security. AI systems manage private employee information, which raises security and privacy issues. Establishing strong data protection procedures, adhering to legal requirements, and guaranteeing decision-making processes are transparent are all imperative for organizations.

4) Workforce adaptability: Integrating AI into the workplace requires employees to adapt to new technologies and acquire new skills, which can pose challenges.

5) Initial investment and implementation: Adopting AI technologies requires initial investment and careful planning for successful implementation. The environmental and cost of generative AI are high. Large amounts of computing power are needed for the training and operation of these models, which is costly and energy-intensive. This can harm the environment and put smaller businesses at a financial disadvantage.

6) Data biases and unpredictable results: Generative AI models can produce biased or incorrect results due to inability to differentiate between real and fake data. Double-checking content before sharing is crucial to avoid such issues.

7) Ethical and legal concerns: AI raises legal and ethical concerns regarding data collection and utilization, necessitating the establishment of clear rules and regulations to ensure user privacy and transparency.

8) Training to implement AI the workplace: Employees can foster innovation, increase productivity, and establish a more flexible and responsive company environment thanks to AI's adaptability in the workplace. Finding a balance between utilizing AI's creative potential and addressing its effects on employment and ethics is crucial as businesses continue to investigate its possibilities.

9) Change management and workforce acceptance: A change in the workplace environment and employee mindset may be necessary for the adoption of AI-powered technologies. To deal with issues and encourage employee adoption of AI-driven workforce management systems, organizations must offer enough training and promote open communication; otherwise, they chance failure.

10) Skills gap and technical training needs: When AI is incorporated into the workplace, workers must learn new skills and adjust to new technology. A skills gap could result from this since some employees might not be ready for these changes. Businesses must fund training and development initiatives to keep employees abreast of the most recent developments and facilitate a seamless shift to an AI-driven workplace.

11) Dependency on technology: If systems malfunction or have problems, an over-reliance on AI could result in a dependency on technology. We must figure out how to balance AI and human intervention as we continue to integrate it into our business processes so that things run smoothly even in the event of technological failure.

12) Transparency and accountability: Due to the "black box" nature of many AI models, it may be difficult to understand how judgments are made. This lack of transparency can undermine confidence and raise questions about duties when AI systems make errors or biased decisions, as evidenced by the controversial algorithmic sentencing in the criminal justice system.

To guarantee the effective deployment and application of AI in the workplace, these issues call for serious thought and preventative actions. Organizations may optimize AI's advantages while reducing possible threats and guaranteeing a seamless shift to AI-driven workforce management techniques by comprehending and resolving these issues. The following opportunities are:

1) Generative AI is a quickly developing field of AI that can produce creative ideas, creative work, and product. The future of work is already beginning to be impacted by this technology which has the potential to completely transform a wide range of areas and jobs. This study examines several facets of a workplace and its workforce that are influenced by AI.

2) Generative AI will transform workplace efficiency by improving team communication, task management, and decision-making. Workers can concentrate on high-value tasks that spur innovation and expansion by using AI to automate difficult jobs and enhance human skills. From increased output and collaboration to better planning and resource distribution, the potential advantages are significant.

3) With AI technologies evolving at a rapid pace and their applications expanding in the context of workforce efficiency and modern workplaces, AI will provide a competitive edge to companies that can successfully integrate them into their daily operations.

4) The need for advancement in AI will transform businesses in unpredictable ways, helping the workplace be more efficient, productive, and safer. Another, the adoption of AI tools will reshape the way companies envision and implement business strategies and operations.

5) AI can be capable of analyzing sentiment and suggestions from workers using technologies such as sentiment analysis software. Businesses can address issues proactively and foster a more encouraging work environment by knowing how employees' experiences about job duties and their organizations.

6) AI tools will be applied in creating innovative and original workspaces through automation, increased accuracy, and greater imagination. This is crucial to realize that this does not imply that AI will take the place of humans in the workplace.

7) AI has the potential to foster a cooperative workplace that enables and empowers workers to perform at the highest level. AI will lead to the creation of new jobs and employee proficiency in the workplace, which will require for a combination of mechanical skills and human expertise, in addition to the development of novel technologies and processes.

8) Humans and machines working together is the way of the future. Businesses as well as people may capitalize on AI's tremendous potential and prosper in the years coming up by embracing the technology and cultivating an environment of continuous development.

AI in workplace examples:

To demonstrate how businesses may use AI to enhance their working environments, we're going to examine a few case studies from many different sectors.

AI in manufacturing:

In light of how much data the industrial sector depends on, artificial intelligence has been advancing in this field in revolutionary ways in recent years. Here are a few of the most striking examples of AI's application in manufacturing.

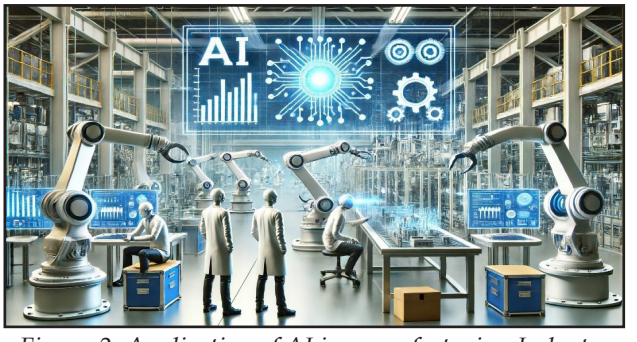


Figure-2: Application of AI in manufacturing Industry

a) Predictive maintenance: AI systems have been created to forecast when industrial equipment should be serviced or replaced, saving money and time.

b) Quality control and inspection: Before being placed in the hands of customers, manufactured products frequently undergo a certain amount of quality control to guarantee that they are up to par. Artificial intelligence (AI) equipment, like cameras and sensors, have been created to improve thorough product inspection and testing before they are put on the market.

c) Supply chain management: Supply chain management is a prime application of artificial intelligence in manufacturing. Millions of orders, purchases, materials, ingredients, etc. are usually processed by manufacturers. People's time and resources are greatly impacted when these tasks are handled manually, which is why more businesses are turning to artificial intelligence (AI) to improve their supply chain operations.

AI in finance:

The financial industry, which has always been a leader in implementing new technology to increase business safety and profitability, has numerous applications for artificial intelligence. In this episode, Agus Sudjianto discusses it: In terms of applications for banking and finance, we are using AI in a vast number of use cases, from mundane tasks to processing information and conducting surveillance. AI can drive efficiencies and create savings for finance chiefs through process automation, kick-starting analytics, and monitoring business processes for efficiency.

Figure-3: Application of AI in financial workplace

a) Fraud detection: The financial institution and its clients are protected by real-time, AI-powered fraud analysis that allows for prompt intervention and stops illegal activities.

b) Risk management: AI technologies can improve risk assessments, scenario planning, and predictive analytics by finding correlations in large datasets that are invisible to people. This results in educated choices on lending, insurance underwriting, investments, and other areas.

c) Customer service: AI is also being used by banks to provide clients with tailored product suggestions based on their past transactions and spending habits. This enhances conversion rates in addition to the client experience.

AI in healthcare:

In the healthcare industry, AI technologies are applied in various combinations to address issues. Here are a few ways AI is being applied to healthcare.

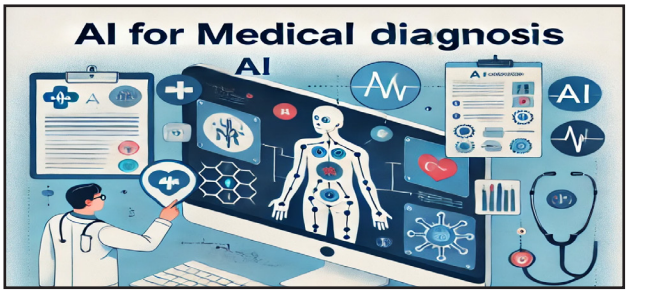


Figure-4: Application of AI in healthcare sector

a) Medical imaging and diagnostics: AI has transformed medical imaging and diagnostics by offering instruments that improve illness detection's precision and effectiveness. DataCamp's Biomedical Image Analysis in Python course has more information on this topic.

b) Drug discovery and development: AI plays a crucial role in expediting the drug discovery and development process, reducing the time and costs associated with bringing new treatments to market.

c) Public health initiatives: AI contributes in public health initiatives by offering instruments for disease surveillance, outbreak forecasting, and preventative measures.

d) Healthcare administration. AI is increasingly being used to improve healthcare operations efficiency, from scheduling to inventory and more. This sector uses ai technologies to improve patient care, diagnostics, and treatment, analyzes vast data quickly and accurately, supports medical professionals in their work, enhances administrative processes in medical settings, provides insights for better decision-making and outcomes.

AI in Education:

Education is changing as a result of AI, which makes learning more efficient and tailored for learners. Education is becoming more interesting and pleasurable as a result of this new technology, which helps customize lessons to each child's needs.

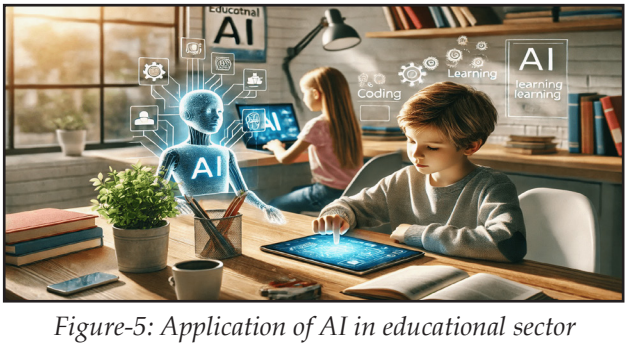


Figure-5: Application of AI in educational sector

a) AI is obviously already benefiting the higher education industry, as evidenced by its use in assessment, tailored learning, and automated grading. But for organizations without the time, know-how, or money to investigate all of AI's applications, implementing it might be intimidating.

b) Artificial Intelligence (AI) is revolutionizing education by increasing the effectiveness and personalization of learning. With the use of this new technology, education is becoming more interesting and pleasurable by customizing classes to each student's needs.

c) Everyone may learn how to leverage AI for a better learning experience by attending one of Techfunic's Gen AI Bootcamps. Our courses provide a wide range of well-liked subjects, like Python searches, computer science and programming, and coding training. By incorporating these topics, we make sure that kids not only acquire a fundamental understanding of artificial intelligence, but also improve their abilities in fields that are in high demand.

Limitations and future directions of the research

The limited number of sources of data on AI use in businesses is a major flaw in this study. As has been said time and time again, AI is still in its infancy in the workforce and workplace, and research has not yet been empirically tested. Despite efforts to gather information from a range of sources, including news articles, industry reports, and scientific publications, the total amount of data that was available was quite small. Because of this, the findings are less accessible and may not provide a comprehensive view of the state of AI in the pertinent domains. Additionally, secondary data sources were used in the study, which may have limited accuracy and dependability. The main method of gathering data from a larger range of individuals was not possible due to time and financial constraints, as well as the lack

of a consistent sample framework. Finally, the impact and role of AI in other domains have not been addressed in this research.

There are several avenues for further research on AI in business, depending on the study limitations and general information investigation. According to the report, more research should be done on the use of AI in many sectors, identifying potential barriers and limitations as well as investigating its potential for regional cooperation and international trade. The study examines how AI affects worker advancement and workplaces across different companies, as well as how it might improve work processes and have practical ramifications. However, further research is necessary to fully grasp AI's future possibilities.

Conclusions and Recommendations

In conclusion, AI enhances employee productivity by automating routine tasks and providing analytical tools for better decision-making. This shift promotes creativity, critical thinking, and increased engagement, ultimately improving organizational outcomes. AI is driving a new wave of organizational outcomes and helping workforce and their workplace maximize their impact: As the workforce becomes more complex and the demands on workforces and the departments increase, maximizing employee efficiency and overall organizational outcomes has never been more crucial. To stay competitive, organizations need to ensure that their workforce is motivated and working at peak efficiency. This is where AI emerges transforming how HR teams manage and boost employee performance and proficiency. AI integration in workplace systems encourages creativity and ongoing development, enabling staff members to learn new abilities and comprehend their responsibilities. However, personnel must be given the resources and training they need, and ethical issues must be given top priority. Achieving a balance between innovation and ethical considerations is essential as businesses continue to adopt this technology to make sure that generative AI develops into a tool that empowers workers while respecting moral principles. The incorporation of generative AI into company operations ushers in a new era of productivity, creativity, and teamwork in the workplace. AI can enhance employee efficiency by optimizing workflows, reducing redundancies, and providing insights. However, successful integration requires careful implementation, ongoing training, and ethical commitment. Prioritizing human-centric approaches, AI can complement and enhance a more efficient, agile, and innovative workforce. In this article, I have explored the role and impact of AI in modern companies for enhancing worker efficiency and dynamic working environment for maximizing the organizational outputs. I have covered the benefits of adopting AI in business settings, how to manage the potential risks to ensure a safe workplace, as well as practical considerations organizations should think about before launching an AI strategy in the workplace with keeping awareness of possible opportunities for business operations. Based the discussions and assessment of the role and effects of AI in enhancing skilled workforce efficiency and the modern workplace dynamics, some crucial suggestions can be developed:

- Companies should make workforce development investments and give staff members the chance to retrain and transition into new positions.
- To equip workers with the skills needed in an AI-driven workplace, company executives must fund reskilling and upskilling initiatives. These programs ought to focus on soft skills like flexibility, creativity, and critical thinking in addition to technical AI skills.
- The workforce must be prepared for an AI-driven future by fostering an environment of continual learning. Employers can promote a mindset that values flexibility and welcomes

the development of new abilities by encouraging staff members to view learning as a continuous process. Organizations may better manage the rapidly changing world of AI technology by instituting a culture of perpetual learning.

- Management must give ethical issues top priority as AI systems grow more and more integrated into corporate operations. Ethics in AI should be covered in workforce training, with a focus on accountability, equity, and openness. This guarantees that staff members are aware of the moral implications of AI applications and actively participate in the organization's responsible AI adoption.
- Establishing loyalty with everyone involved, staff, and clients necessitates using AI in an ethical and open manner. Companies should effectively communicate their AI goals and advantages to demonstrate their commitment to safe AI use.
- To keep ahead of AI developments, businesses can also form alliances and work together. By collaborating with AI startups, academic institutions, and industry consortia, businesses can gain access to innovative technology and insights.
- Businesses can educate staff members on the advantages of implementing AI, offer training and reskilling initiatives, and involve staff members in the process.
- Businesses should create internal standards to guarantee fairness and transparency in the absence of governmental restrictions, as well as give staff thorough training on AI and encourage comfort with its applications.
- Governments and learning institutions can help prepare the workforce for an AI-powered future by incorporating AI education into educational programs and offering vocational training programs.

References

1] Accenture. (2019). Artificial Intelligence: Improving Customer Engagement and Loyalty. Accenture. Retrieved from https://www.accenture.com/us-en/insights/artificial-intelligence/ai-customer-engagement-loyalty.

2] Ajunwa, I. (2021). The Auditing Imperative for Automated Hiring. Harvard Journal of Law & Technology, 34(2).

3] Black, J.S. and Van Esch, P. (2020) 'AI-enabled recruiting: What is it and how should a manager use it?', Business Horizons, 63(2), pp. 215–226. Available at: https://doi.org/10.1016/j. bushor.2019.12.001.

4] Buchanan, B. (2005) 'A (Very) Brief History of Artificial Intelligence', AI Magazine, 26(4). Available at: https://doi.org/10.1609/aimag.v26i4.1848.

5] Cazes, S. and Verick, S. (eds) (2012) Perspectives on labour economics for development. Geneva: International Labour Office.

6] Cazzaniga, M. et al. (2024) 'Gen-AI: Artificial Intelligence and the Future of Work', IMF Staff Discussion Notes, 2024(001), p. 1. Available at: https://doi.org/10.5089/9798400262548.006.

7] Chen, Z. (2023) 'Artificial Intelligence-Virtual Trainer: Innovative Didactics Aimed at Personalized Training Needs', Journal of the Knowledge Economy, 14(2), pp. 2007–2025. Available at: https://doi.org/10.1007/s13132-022-00985-0.

8] Crawford, K. (2021). Time to regulate AI that interprets human emotions. Nature, 592: 167.

9] Dieppe, A. (ed.) (2021) Global productivity: trends, drivers, and policies. Washington, DC: World Bank Group.

10] Gartner. The Future of Work: How AI is driving innovation. Gartner. Retrieved

(2020). https://www.gartner.com/en/information-technology/insights/the-future-of-work-how-ai-is-driving-innovation.

11] Gilbert, A. (2023) 'Reframing Automation - a new model for anticipating risks and impacts. Institute for the Future of Work (UK). Available at: https://zenodo.org/record/8099822 (Accessed: 18 February 2024).

12] Goel, A.K. and Davies, J. (2011) 'Artificial Intelligence', in R.J. Sternberg and S.B. Kaufman (eds) The Cambridge Handbook of Intelligence. 1st edn. Cambridge University Press, pp. 468–482. Available at: https://doi.org/10.1017/CBO9780511977244.024.

13] Gmyrek, P., Berg, J. and Bescond, D. (2023) 'Generative AI and Jobs: A Global Analysis of Potential Effects on Job Quantity and Quality', SSRN Electronic Journal, ILO Working Paper 96. Available at: https://doi.org/10.2139/ssrn.4584219.

14] Linkedin (2023) 'Future of work report. AI at work'. Available at: https://economic-graph. linkedin.com/research/future-of-work-report-ai.

15] Kaplan, A. and Haenlein, M. (2019) 'Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence', Business Horizons, 62(1), pp. 15–25. Available at: https://doi.org/10.1016/j.bushor.2018.08.004.

16] Lane, M., Williams, M. and Broecke, S. (2023) The impact of AI on the workplace: Main findings from the OECD AI surveys of employers and workers. OECD Social, Employment and Migration Working Papers 288. Available at: https://doi.org/10.1787/ea0a0fe1-en.

17] McKinsey & Company (2023) 'The economic potential of generative AI: The next productivity frontier'. McKinsey. Available at: https://www.mckinsey.com/capabilities/mckinseydigital/our-insights/the-economic-potential-of-generative-ai-the-nextproductivity-frontier.

18] Mithas, S., Chen, Z. L., Saldanha, T. J., & De Oliveira Silveira, A. (2022). How will artificial intelligence and Industry 4.0 emerging technologies transform operations management? Production and Operations Management, 31(12), 4475-4487.

19] PwC. Available at: https://www. pwc.com/gx/en/issues/c-suite-insights/ceo-survey.html#the-ai-opportunity.

20] Rana, N. P., Chatterjee, S., Dwivedi, Y. K., & Akter, S. (2022). Understanding dark side of artificial intelligence (AI) integrated business analytics: assessing firm's operational inefficiency and competitiveness. European Journal of Information Systems, 31(3), 364- 387.

21] Roemmich, K., Schaub, F., & Andalibi, N. (2023). Emotion AI at Work: Implications for Workplace Surveillance, Emotional Labor, and Emotional Privacy. CHI '23: ACM Conference on Human Factors in Computing Systems (p. 20). Hamburg: ACM.

22] Roose, K. (2019). A Machine May Not Take Your Job, but One Could Become Your Boss. The New York Times, 23rd June 2023. https://www.nytimes.com/2019/06/23/technology/artificialintelligence-ai-workplace.html.

23] Russell, S. and Norvig, P. (2020) Artificial intelligence: A modern approach. 4. ed. London: Pearson. PwC (2024) 'Thriving in an age of continuous reinvention'.

24] Shanbhogue, R. (2023). Generative AI holds much promise for businesses. The Economist. Available at: https://www.economist.com/the-world-ahead/2023/11/13/generative-aiholds-much-promise-for-businesses.

25] Soni, N., Sharma, E. K., Singh, N., & Kapoor, A. (2019). Impact of artificial intelligence on businesses: from research, innovation, market deployment to future shifts in business models. arXiv preprint arXiv:1905.02092.

26] Strietska-Ilina, O. and Chun, H.-K. (2021) Changing demand for skills in digital economies and societies:literature review and case studies from low- and middle-income countries. "Available at: https://www.ilo.org/publications/changing-demand-skills-digital-economiesand-societies-literature-review".

27] Wamba-Taguimdje, S.-L. et al. (2020) 'Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects', Business Process Management Journal, 26(7), pp. 1893–1924. Available at: https://doi.org/10.1108/BPMJ-10- 2019-0411.

28] WEF (2023a) 'Future of jobs report 2023'. World Economic Forum. Available at: https://www3. weforum.org/docs/WEF_Future_of_Jobs_2023.pdf.

29] WEF (2023b) 'Jobs of Tomorrow: Large Language Models and Jobs'. World Economic Forum. Available at: https://www3.weforum.org/docs/WEF_Jobs_of_Tomorrow_Generative_ AI_2023.pdf.

Research Article

Navigating the AI Paradox: Balancing Trust, Autonomy, and Innovation in AI-Augmented Workflows

Sohom Majumder, Rupa Paul

Assistant Professor, Department of Business Administration, JIS College of Engineering, Kalyani

Bratati Bhattacharyya

Director, JIS Group, Management Studies, JIS University

Abstract

In the evolving landscape of AI-augmented environments, the dynamics of human-AI interaction significantly shape creativity and innovation. This study explores the intricate relationships between reliance on AI, perceived user control, and trust in AI, analyzing their collective impact on fostering or hindering creative processes through Structural Equation Modeling (SEM). The findings reveal that while excessive reliance on AI can stifle creativity by fostering dependency and undermining user confidence, trust and perceived control play pivotal roles in empowering users, enhancing autonomy, and encouraging innovative problem-solving. Trust in AI acts as a mediator between dependency and innovation, while perceived control enables greater creative freedom, highlighting the dual nature of AI as both an enabler and inhibitor of creativity. The foundation for further research on the cultural and sector-specific aspects of AI's involvement in transforming creativity and innovation is also laid by this study.

Keywords: *AI-human interaction, user empowerment, trust in AI, creativity, innovation dynamics, dependency on AI, Structural Equation Modeling (SEM), AI design strategies*

Introduction

A revolutionary period has begun with the incorporation of artificial intelligence (AI) into a number of industries, radically altering conventional notions of creativity and innovation. AI technologies, particularly generative AI and machine learning, have evolved beyond mere tools for automation to become active participants in the creative process, significantly influencing domains traditionally reserved for human intellect. This duality of AI as both an enabler and a disruptor challenges the conventional understanding of creativity, authorship, and innovation. This study, which builds on Davis's (1989) Technology Acceptance Model (TAM), aims to investigate how AI's growing autonomy affects creativity and innovation. It focusses on the relationship between reliance on AI, perceived control, and trust in AI, as well as how these factors affect creative outcomes.

By highlighting how Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) influence user attitudes, intentions, and behaviours towards technology, TAM offers a theoretical framework for comprehending technology adoption (Davis, 1989). This model provides important insights into the elements influencing behavioural intentions and has been widely used to explain the adoption and use of technologies across a variety of disciplines. In this research, TAM serves as an inspiration for modeling the relationships between dependency on AI, perceived control, and trust in AI, highlighting the mechanisms through which these constructs influence creativity and innovation. Specifically,

Perceived Usefulness (PU) aligns with trust in AI, as users' confidence in AI's capabilities mirrors the perceived benefits of its use. Similarly, Perceived Ease of Use (PEOU) maps onto perceived control, as ease in managing AI technologies enhances users' sense of autonomy and agency.

Generative AI has revolutionized creative industries such as art, design, music, and literature, producing outputs that challenge the boundaries of human-machine collaboration (McKinsey & Company, 2020). For instance, AI-driven tools can design products, compose music, and create art, often blurring the distinction between human creativity and machine-generated innovation (Elgammal et al., 2017). While these technologies expand creative possibilities, they also disrupt notions of originality, authorship, and artistic identity. These disruptions have raised critical questions: How does AI's autonomy influence creative processes? What dynamics emerge in human-machine collaborations? What socio-ethical considerations, such as intellectual property and accountability, arise from integrating autonomous AI into creative practices (Amabile & Pratt, 2016; Wang & Wang, 2021; Haider et al., 2022).

The intricate links between reliance on AI, perceived control, faith in AI, and their combined impact on creativity and invention are examined in this study using Structural Equation Modelling (SEM). Its ability to handle latent variables and analyze intricate interdependencies makes it an ideal method for investigating these constructs (Hair et al., 2019). The conceptual framework adapts TAM principles, extending them to address the dual role of AI as a collaborator and a potential competitor in creative domains. For instance, while dependency on AI might enhance efficiency and familiarity, excessive reliance could undermine user agency, potentially stifling creative innovation (Venkatesh & Davis, 2000). Conversely, perceived control emerges as a critical factor, enabling users to navigate AI technologies effectively, thereby fostering creativity and innovation (Gefen et al., 2003).

The rapid advancements in generative AI underscore the need for nuanced exploration of its implications. Prior studies have highlighted AI's importance for fostering effective human-AI collaboration (Glikson & Woolley, 2020). Trust, often built through consistent AI performance, can influence user confidence and willingness to engage with AI tools (Mayer et al., 1995). Recent research also emphasizes transparency and user empowerment as critical factors in preserving perceived control and mitigating dependency risks (Langer et al., 2021; Lee et al., 2023). Through examining these relationships, this study adds to the expanding body of knowledge on maximising human-AI interactions by providing theoretical understandings and useful recommendations for sectors negotiating the opportunities and difficulties brought about by AI-driven innovation.

In conclusion, this study uses TAM as a model to investigate the changing relationship between AI and creativity, highlighting the necessity of striking a balance between perceived control, dependency, and trust in order to promote innovation. By simulating these interdependencies, the study seeks to offer a thorough grasp of how AI autonomy either fosters or stifles human creativity, eventually influencing how innovation and creativity will develop in a society ruled by AI.

Literature Review

AI and Creativity: A Transformative Partnership

The relationship between AI and creativity has been extensively studied, revealing both opportunities and challenges. Scholars argue that AI can augment human creativity by providing new tools for artistic expression. For instance, research highlights how AI-driven platforms like DALL-E and Midjourney

democratize access to creative tools, enabling individuals without formal training to produce high-quality art (Zhang et al., 2024). This shift not only enhances individual creativity but also fosters a more inclusive creative landscape. However, concerns persist regarding the potential homogenization of artistic expression due to reliance on AI algorithms. Critics argue that while AI can generate novel outputs, it often lacks the emotional depth and contextual understanding inherent in human creativity (Elgammal et al., 2017). This calls into question whether AI-generated art can actually be regarded as original and the importance of human contribution in creative processes.

Generative AI in Design

The application of generative AI in design illustrates how these technologies can enhance innovation while preserving human creativity. A study by Liu et al. (2023) demonstrated that generative design tools could optimize workflows and improve client satisfaction without diminishing the designer's creative input. By analyzing user data, these tools enable designers to create personalized solutions that resonate with clients' preferences while fostering a collaborative environment where human intuition remains central. Furthermore, research indicates that generative AI can stimulate creative thinking by offering unexpected solutions that challenge conventional design practices (Ranjan & Gupta, 2023). This capability aligns with the concept of creativity 4.0, which emphasizes the need for adaptive skills in an increasingly digital world (Pransky, 2019). As designers integrate AI into their processes, they must navigate the balance between leveraging technology for efficiency and maintaining their unique creative voices.

Creativity Research of Structural Equation Modeling

A potent statistical method for analysing intricate relationships in creative processes is structural equation modelling, or SEM. It allows researchers to model latent constructs such as creativity, innovation, and technology acceptance, providing insights into how these variables interact (Kline, 2015). As an example, a study by Zhang et al. (2023) had utilized SEM for exploring factors that influence Generation Z's adoption of generative AI in art design. The findings revealed that traits such as curiosity and optimism significantly impacted users' intentions to engage with AI technologies. By employing SEM in this research paper, we aim to analyze the multifaceted influences of AI autonomy on creativity and innovation systematically. This approach will facilitate a deeper understanding of how various factors— such as individual traits, technological readiness, and contextual elements—interact to shape creative outcomes in an AI-enhanced environment.

Ethical Considerations in AI-Driven Creativity

As AI continues to permeate creative industries, ethical considerations become paramount. Issues surrounding authorship, ownership, and bias in AI-generated content necessitate careful examination (McCormack et al., 2019). Algorithmic decision-making methods' opaqueness raises questions regarding creative output accountability. Moreover, biases embedded within training data can perpetuate stereotypes or marginalize certain voices within artistic expressions (Buolamwini & Gebru, 2018). To address these challenges, researchers advocate for ethical frameworks that prioritize fairness and inclusivity in AI applications (Zhou et al., 2024). By fostering public trust in AI-driven art and design, stakeholders can ensure that technological advancements enhance rather than hinder human creativity.

Theoretical Perspective

Advancement of Artificial Intelligence (AI) has rapidly revolutionized decision-making, creativity, and human autonomy across various domains. However, the integration of AI systems into daily life raises critical questions about

its implications on human perceptions, trust, dependency, and creativity. To address these concerns, Davis (1989) provides Technology Acceptance Model (TAM), a robust theoretical framework for understanding user adoption of technologies. This study builds on TAM to explore the interdependencies between four core constructs: Perceived Control, Trust in AI, Dependency on AI, and their collective impact on Creativity and Innovation. By integrating these constructs, this research aims to assess the dynamics of human-AI relationships and their implications for fostering innovation while mitigating unintended consequences such as overreliance.

Variables in TAM

TAM focuses on user perceptions and their influence on technology adoption, highlighting the following key variables:

1. Perceived Usefulness (PU): The extent to which an individual feels that utilising technology improves their performance at work (Davis, 1989).

2. Perceived Ease of Use (PEOU): The extent to which an individual thinks that utilizing a technology requires no work . (Davis, 1989).

3. Attitude Toward Use (ATT): Positive or negative feelings about using a technology.

4. Behavioral Intention to Use (BI): The intention to adopt and use a technology.

5. Actual Use (AU): The practical application and usage of the technology.

Alignment of TAM with Your Conceptual Model

This study aligns TAM constructs with the proposed model to examine how users' interaction with AI systems influences Creativity and Innovation. The alignment is as follows:

1. Perceived Usefulness (PU) → Trust in AI: Trust in AI in the proposed model reflects users' confidence in AI's reliability, consistency, and ability to provide meaningful results. This aligns with TAM's PU, emphasizing technology's perceived benefits.

2. Perceived Ease of Use (PEOU) → Control (Perceived): Perceived control corresponds to users' empowerment and autonomy while using AI systems in the model. Similarly, PEOU in TAM highlights the role of ease of use in enhancing user confidence and reducing resistance to technology.

3. Attitude Toward Use (ATT) → Dependency on AI: Dependency on AI reflects a behavioral outcome influenced by users' attitudes, aligning with ATT in TAM, which measures emotional reactions and inclinations toward adopting technology.

4. Behavioral Intention (BI) and Actual Use (AU) → Creativity and Innovation: Creativity and Innovation in the model represent the practical outcomes of integrating AI into workflows, akin to TAM's ultimate focus on behavioral intention and actual technology usage.

Hypotheses (Based on TAM and Your Model)

The study's hypotheses build on TAM constructs to evaluate the interrelationships between Dependency on AI, Perceived Control, Trust in AI, and Creativity and Innovation:

1. H1: Dependency on AI negatively influences Creativity and Innovation (Aligns with ATT negatively impacting outcomes).

2. H2: Dependency on AI negatively influences Perceived Control (Aligns with PEOU being critical to positive experiences).

3. H3: Perceived Control positively impacts Creativity and Innovation (Aligns with PEOU fostering positive outcomes).

4. H4: Perceived Control positively influences Trust in AI (Aligns with PU being enhanced by ease of use).

5. H5: Dependency on AI positively influences Trust in AI (Aligns with PU being influenced by familiarity and regular use).

TAM Constructs	Our Model Constructs	Description	Hypotheses Mapped
Perceived Usefulness (PU)	**Trust on AI**	AI reflects users' confidence in the reliability, transparency, and usefulness, aligning with PU's emphasis on the benefits of technology.	**H4**: Perceived Control → Trust in AI **H5**: Dependency on AI → Trust in AI
Perceived Ease of Use (PEOU)	**Perceived Control**	Perceived control aligns with PEOU as it captures users' feelings of autonomy and ease when interacting with AI, which enhances their engagement and confidence.	**H2**: Dependency on AI → Perceived Control **H3**: Perceived Control → Creativity and Innovation
Attitude Toward Use (ATT)	**Dependency on AI**	Dependency on AI reflects a behavioral outcome that stems from users' attitudes about using AI for tasks, highlighting both reliance and its potential drawbacks.	**H1**: Dependency on AI → Creativity and Innovation **H2**: Dependency on AI → Perceived Control **H5**: Dependency on AI → Trust in AI
Behavioral Intention (BI)	**Creativity and Innovation**	Creativity and innovation represent the outcomes of users' integration of AI into workflows, similar to TAM's focus on usage outcomes linked to behavioral intention.	**H1**: Dependency on AI → Creativity and Innovation **H3**: Perceived Control → Creativity and Innovation

Table 1. Model constructs

Perceived Control

The belief that one can affect the results in one's surroundings is known as perceived control (Rotter, 1966). Within the context of AI, perceived control emphasizes users' autonomy in interacting with AI systems. Perceived control is crucial for promoting intrinsic motivation and competence, according to Deci and Ryan's Self-Determination Theory (1985). AI systems designed with user-centric features that allow decision-making flexibility and transparency enhance the user's sense of control. Conversely, overly restrictive or opaque AI systems diminish this autonomy, potentially leading to dissatisfaction and resistance. A strong sense of perceived control fosters user confidence, creativity, and innovation, as it empowers individuals to leverage AI tools while maintaining their agency.

Hypotheses Related to Perceived Control (PC):

- H2: Dependency on AI negatively influences Perceived Control.
- H3: Perceived Control positively impacts Creativity and Innovation.
- H4: Perceived Control positively influences Trust in AI.

Trust on AI

The willingness of people to rely on AI systems because of their perceived dependability, transparency, and ethical conformity is known as trust in AI. The three main elements that establish trust are ability, honesty, and compassion, according to Mayer et al.'s Integrative Model of Organisational Trust (1995).

Trust in AI arises from consistent performance, explainability, and transparency of the system. Transparent AI designs that prioritize ethical considerations and accountability foster user trust.

Trust is critical for adoption and sustained use of AI systems, as users need to feel confident that AI tools prioritize their needs and provide reliable and unbiased outputs.

Hypotheses Related to Trust in AI (TAI):

- H3: Perceived Control positively influences Trust in AI.
- H5: Dependency on AI positively influences Trust in AI.

Dependency on AI

The term "dependency on AI" describes how much people rely on AI systems to make decisions and finish tasks.

Tarafdar et al.'s Theory of Technological Dependence (2015) describes the balance between the benefits of technology reliance and the potential drawbacks, such as reduced critical thinking and autonomy.

Dependency on AI serves as a double-edged sword: while moderate reliance can enhance productivity and efficiency, excessive dependence may erode self-efficacy and stifle creativity.

Understanding this balance is critical to identifying when dependency transitions from being beneficial to harmful for human agency and innovation.

Hypotheses Related to Dependency on AI (DAI):

- H1: Dependency on AI negatively influences Creativity and Innovation.
- H2: Dependency on AI negatively impacts Perceived Control.
- H5: Dependency on AI positively influences Trust in AI.

Creativity and Innovation

Creativity and innovation encompass the ability to generate novel and effective ideas or solutions. Amabile's Componential Theory of Creativity (1996) identifies intrinsic motivation, domain expertise, and an environment conducive to experimentation as critical factors fostering creativity.

AI systems enhance creativity by automating routine tasks, offering data-driven insights, and encouraging experimentation. However, over-reliance on AI can undermine originality and intuition by standardizing processes or overriding human judgment. Striking the right balance between human ingenuity and AI support is key to ensuring creativity and innovation thrive in AI-integrated environments.

Hypotheses Related to Creativity and Innovation (CI):

- H1: Dependency on AI negatively impacts Creativity and Innovation.
- H3: Perceived Control positively impacts Creativity and Innovation.

Conceptual Structure

The conceptual structure for this study examines the relationships between four core constructs: Perceived Control (PC), Dependency on AI (DAI), Trust in AI (TAI), and Creativity and Innovation (CI).

To investigate how human-AI interaction influences creative and inventive outcomes, the framework incorporates ideas from the

Componential Theory of Creativity (Amabile, 1996), the Self-Determination Theory (Deci & Ryan, 1985), and the Technology Acceptance Model (Davis, 1989). The framework posits that Dependency on AI negatively impacts Perceived Control and Creativity and Innovation, while fostering Trust in AI through familiarity and reliance. Perceived Control, in contrast, enhances both Creativity and Innovation and Trust in AI, emphasizing the importance of user autonomy in optimizing AI-driven processes. This interplay highlights the dual nature of AI—acting both as an enabler and a potential inhibitor of innovation.

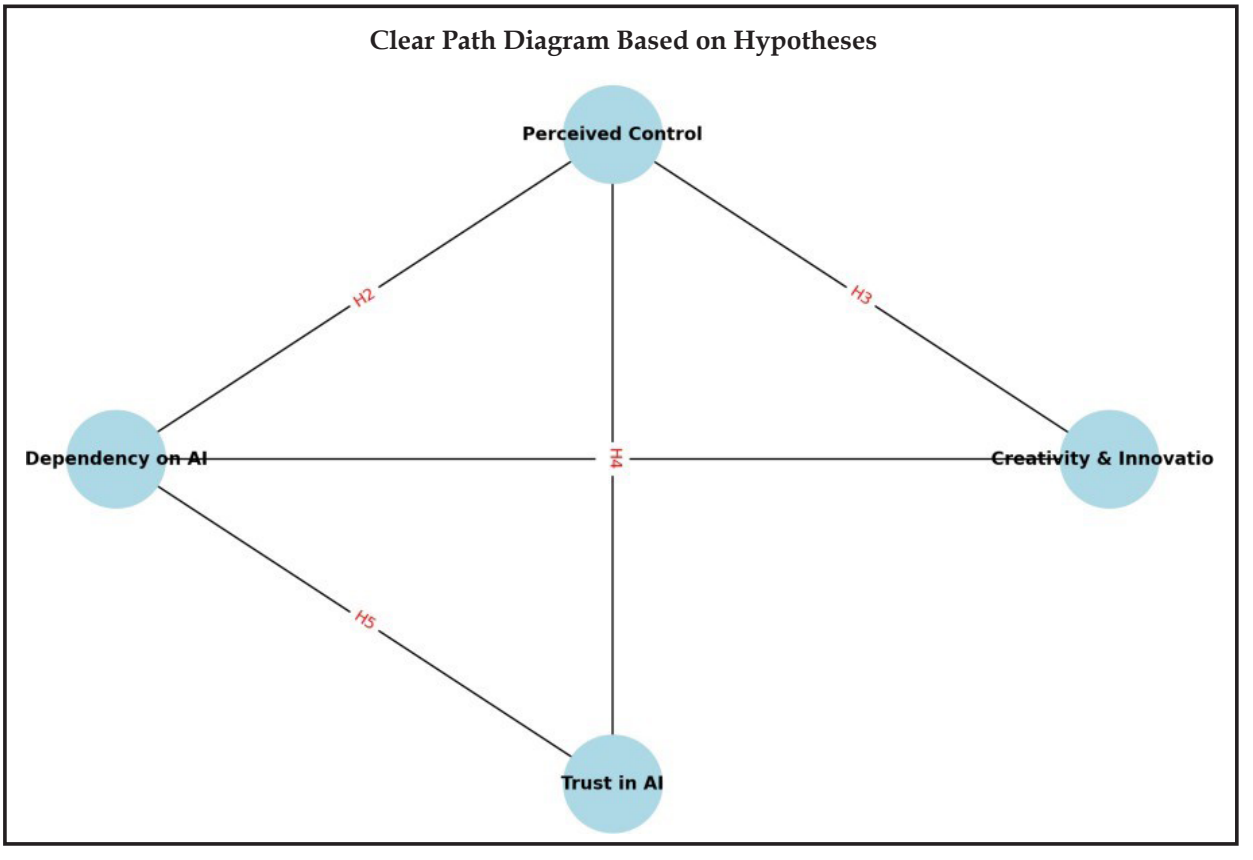


Fig. 1. Conceptual Model (Author's own creation)

The Models developed based on the hypotheses:

- Creativity and Innovation = β_1 × Dependency on AI + β_2×Perceived Control + ϵ_1
- Perceived Control = β_3 × Dependency on AI + ϵ_2
- Trust in AI = β_4 × Perceived Control + β_5 × Dependency on AI + ϵ_3

Where, β_1, β_2, β_3, β_4, β_5 are the standardized regression coefficients and ϵ_1, ϵ_2, ϵ_3 are the error terms.

Methodology

A quantitative technique was used in the study, which is crucial for empirical research. This method uses mathematical and statistical methods to measure, analyse, and look at the correlations between variables. The hypotheses were tested using a cross-sectional survey approach. In accordance with Wieland and Wallenburg's (2012) recommendations, this approach made it possible to gather, analyse, generalise, and replicate data. The

target population for the study consisted of undergraduate and postgraduate students aged between 18-30, as well as faculty members employed in private colleges across West Bengal. These groups were chosen due to their active engagement with AI technologies in both academic and professional contexts, making them an appropriate cohort for understanding perceptions, trust, dependency, and creativity related to AI usage.

A structured questionnaire that was modified from previously approved tools used in related studies was utilised to gather data. A five-point Likert scale was used to rate each component: 1 meant "strongly disagree," 2 meant "disagree," 3 meant "neutral," 4 meant "agree," and 5 meant "strongly agree." A small sample of participants was used for pre-testing the validity, clarity, and grasp of the questionnaire. It consisted of five sections, focusing on demographic characteristics and the four constructs of the conceptual framework: perceived control, trust in AI, dependency on AI, and creativity and innovation.

Of the 410 surveys that were sent out, 345 valid answers were obtained, yielding an 84.15% response rate. A powerful statistical program called JASP (version 0.19.1.0) was used to analyse the data. To examine the relationships between the variables, assess the model fit, and test the proposed mediation effects, structural equation modelling, or SEM, was used.

SEM was chosen for its ability to effectively handle latent variables and examine complex relationships between constructs. The results provided valuable insights into the interdependencies of perceived control, trust in AI, dependency on AI, and their impact on creativity and innovation.

Results and Discussion

The following table displays the descriptive statistics for each of the latent variables, which include perceived control, trust in AI, dependence on AI, creativity, and innovation. The measurement model was tested using a confirmatory factor analysis (CFA) with JASP 0.19.1.0. The model's overall goodness of fit (RMSEA) was evaluated using the following metrics: the ratio of $\chi 2$ to a degree of freedom (d/f), the root mean square residual (RMR), the goodness of fit index (GFI), the Tuck Lewis index (TLI), the norm fit index (NFI), and the root means the square error of approximation. The quality of fit indices are shown in Table 1.

Every tabulated index surpassed the predetermined cutoff. The study assessed the model's psychometric qualities, including discriminant validity, convergent validity, and reliability.

Convergent validity evaluates the degree of correlation between items intended to measure the same construct. The amount of variance collected by a construct relative to the variance brought on by measurement error is indicated by the Average Variance Extracted (AVE) values.

AVE values should preferably be more than 0.50 in order to prove convergent validity (Fornell & Larcker, 1981). All of the constructs in this study have AVE values above the 0.50 cutoff. Creativity and Innovation (CI): 0.839, Perceived Control (PC): 0.690, Trust in AI (TAI): 0.683, and Dependency on AI (DAI): 0.640. Given that the underlying latent constructs account for a sizable amount of the variance in the observed variables, this demonstrates that the constructs have excellent convergent validity.

Assessing whether constructs that are meant to be unrelated are actually different from one another is known as discriminant validity. One popular metric is the Heterotrait-Monotrait (HTMT) ratio, which indicates adequate discriminant validity when it is less than 0.85 (or, conservatively, 0.90) (Henseler et al., 2015).

The following are the study's HTMT values: TAI and DAI: 0.496, TAI and CI: 0.035, DAI and CI: 0.211, PC and TAI: 0.387, PC and DAI:

0.271, PC and CI: 0.278. Since all HTMT values fall significantly below the conservative cutoff point of 0.85, discriminant validity is demonstrated and the constructs are clearly different from one another. Convergent and discriminant validity are displayed in Tables 2 and 3, respectively. The dependability values are displayed in Table 4. Overall, the Cronbach's alpha value is higher than 0.8.

All constructs have a KMO score of 0.773 for the Bartlett's Test of Sphericity (Chi-Square and Significance levels) and Kaiser Mayer Olkin measures of sample adequacy. The findings demonstrated sufficient information for factor analysis (Hinton et al., 2004).

Additionally, a reliability test was performed, and every variable was able to surpass the 0.7 criterion. A measurement model's fit was evaluated in light of the study's exploratory nature. Following Confirmatory Factor Analysis, the model had excellent fit indices, allowing for the structural model to be analysed.

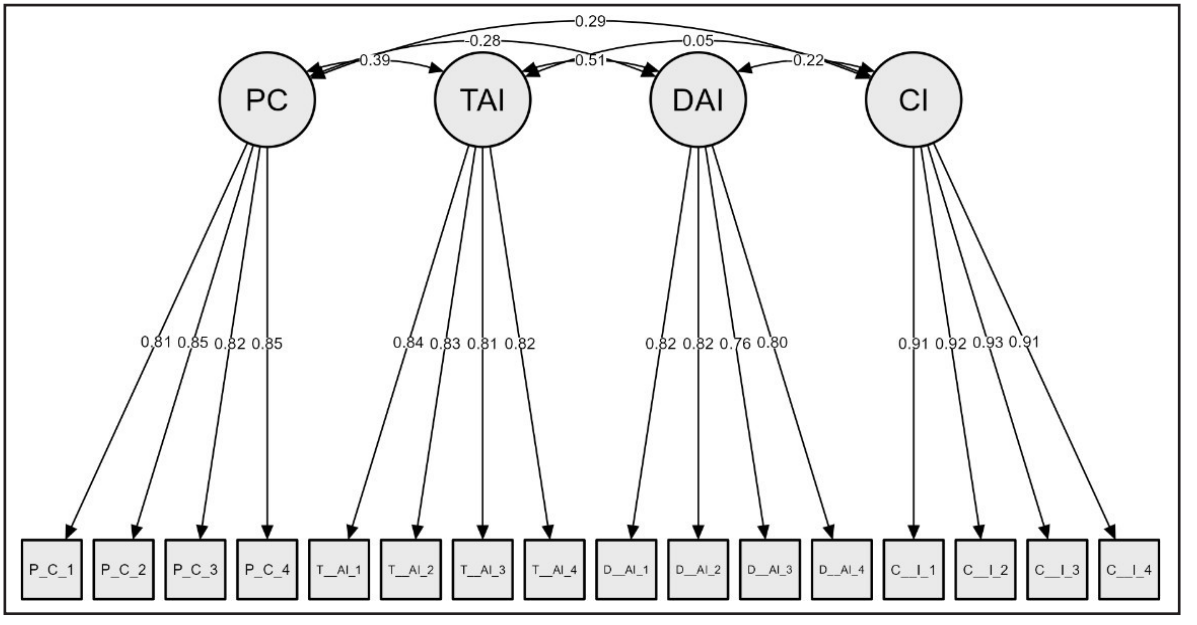


Fig. 2. CFA- Confirmatory Factor analysis

Metrics	Recommended Criteria	Measurement Model	Authors
χ^2/df	< 3	1.516	Kline (2015)
SRMR	≤ 0.08	.043	Gefen et al. (2000)
GFI	≥ 0.90	.966	(Jöreskog & Sörbom, 1984)
CFI	≥ 0.90	.934	(Bentler, 1990)
NFI	≥ 0.90	.918	(Bentler & Bonett, 1980)
TLI	≥ 0.90	.927	Tucker & Lewis (1973)
IFI	≥ 0.90	.935	(Bollen, 1989)
RMSEA	≤ 0.08	0.059	(Browne & Cudeck, 1993)

Table 2. Measurement Model Fit indices

Variable	Measurement Index	Loading Factor	Convergent Validity (AVE)	Reliability (CR)	Cronbach's α
Dependency on AI	Dependency_on_AI_1	0.771	0.640	0.890	0.876
	Dependency_on_AI_2	0.746			
	Dependency_on_AI_4	0.710			
	Dependency_on_AI_3	0.670			
Trust in AI	Trust_in_AI_2	0.684	0.683	0.896	0.896
	Trust_in_AI_1	0.678			
	Trust_in_AI_3	0.667			
	Trust_in_AI_4	0.645			
Perceived Control	Perceived_Control_2	0.825	0.690	0.898	0.899
	Perceived_Control_1	0.823			
	Perceived_Control_4	0.810			
	Perceived_Control_3	0.788			
Creativity and Innovation	Creativity_and_Innovation_2	0.936	0.839	0.954	0.954
	Creativity_and_Innovation_4	0.924			
	Creativity_and_Innovation_3	0.924			
	Creativity_and_Innovation_1	0.894			

Table 3. Results of Convergent Validity and Reliability of the overall measurement model

Note: Composite Reliability is equal to (square of the summation of the standardised loading)/(squares of the summation of the standardised loading) + (summation of error variances) and (summation of the square of the standardised loading)/(summation of the square of the factor loadings) + (summation of error variance) = Average Variance Extracted (AVE).

Heterotrait-monotrait ratio			
Perceived Control (PC)	**Trust in AI (TAI)**	**Dependency in AI (DAI)**	**Creativity and Innovation (CI)**
1.000			
0.387	1.000		
0.271	0.496	1.000	
0.278	0.035	0.211	1.000

Table 4. Discriminant Validity

Model	Hypotheses	Constructs	Standardised Estimate	Standardised errors	p-value	Remarks
Model 1	H1	DAI → CI	-0.153	0.107	.01	Significant
	H3	PC → CI	0.251	0.100	<.001	Significant
Model 2	H2	DAI → PC	-0.284	0.065	<.001	Significant
Model 3	H5	DAI → TAI	0.583	0.054	<.001	Significant
	H4	PC → TAI	0.677	0.061	<.001	Significant

Table 5. The Hypotheses and estimates

H1: Dependency on AI (DAI) negatively influences Creativity and Innovation (CI)

The association between DAI and CI has a standardised estimate of -0.153, a p-value of 0.01 and a standard error of 0.107, indicating a statistically significant negative relationship. This result suggests that an increase in dependency on AI reduces creativity and innovation. The findings align with the idea that over-reliance on AI can suppress human ingenuity, likely due to reduced critical thinking and problem-solving efforts. Thus, while AI enhances efficiency, excessive dependency may hinder originality and creative outcomes.

H2: Dependency on AI (DAI) negatively influences Perceived Control (PC)

The standardised estimate of the connection between DAI and PC is -0.284, with a p-value of less than 0.001 and a standard error of 0.065, showing a significant negative effect. This result suggests that as dependency on AI increases, users' perceived control diminishes. A potential explanation is that high dependency on AI reduces user agency and autonomy, as decision-making shifts toward the AI system. This erosion of control may lead to lower engagement and confidence in human-AI interactions, underscoring the need for user-centric designs that maintain autonomy.

H3: Perceived Control (PC) positively influences Creativity and Innovation (CI)

With a p-value of less than 0.001 and a standard error of 0.100, the standardised estimate for the impact of PC on CI is 0.251, indicating a significant positive relationship.

This result highlights that greater perceived control enhances creativity and innovation. When users feel empowered and in control of AI systems, they are more likely to use these tools effectively to complement their creative processes, leading to innovative outcomes. This supports the notion that user autonomy fosters motivation and creativity in human-AI collaborations.

H4: Perceived Control (PC) positively influences Trust in AI (TAI)

With a standardised estimate of 0.677, a standard error of 0.061, and a p-value of less than 0.001, the connection between PC and TAI is significantly positive. This finding emphasises how trust in AI is increased when perceived control is increased. Users are more likely to grow confident in the capabilities and ethical alignment of AI when they feel empowered to make choices and have control over their interactions with the system. This finding emphasizes the importance of designing transparent and user-friendly AI systems that enhance trust by empowering users.

H5: Dependency on AI (DAI) positively influences Trust in AI (TAI)

There is a substantial positive correlation between DAI and TAI, as indicated by the standardised estimate of 0.583, standard error of 0.054, and p-value of less than 0.001.

This result demonstrates that increased dependency on AI enhances trust in AI systems. This may occur because users who rely more on AI systems experience familiarity with their consistent performance, fostering confidence and trust. However, while dependency builds trust, the balance between reliance and over-dependence must be carefully managed to avoid unintended consequences like reduced user autonomy.

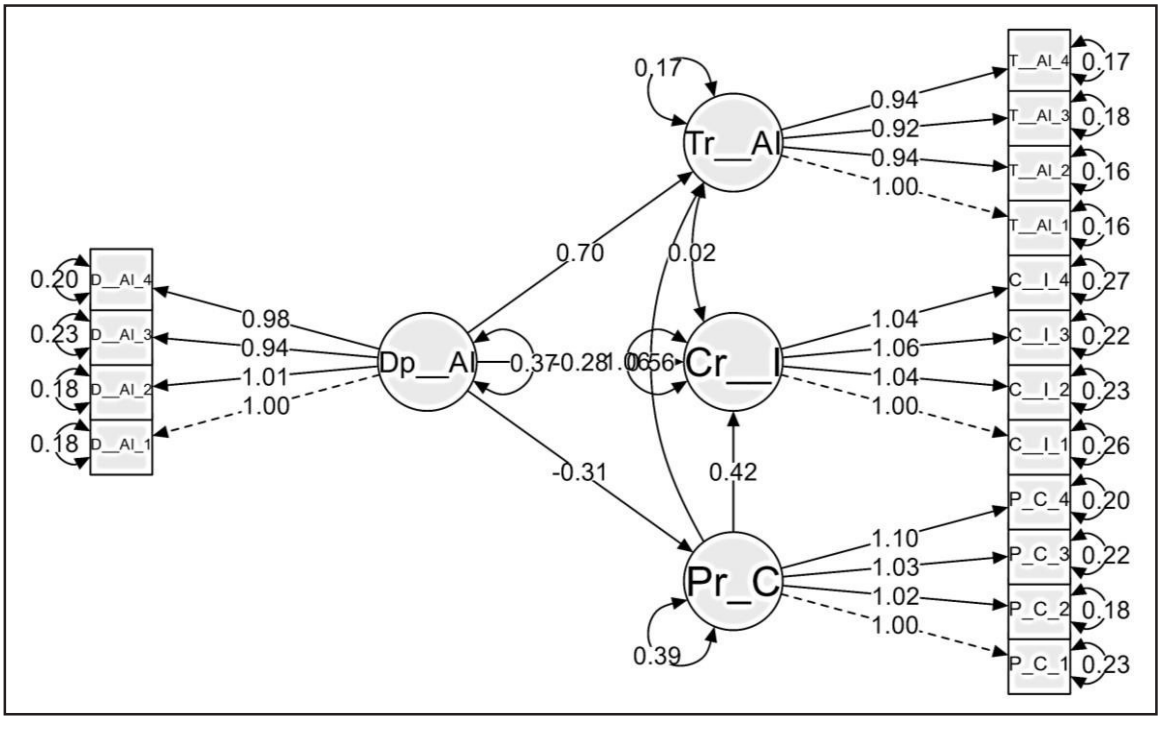


Fig. 3. Structural Equation Model of the constructs

Conclusion

This study elucidates the intricate relationships between Dependency on AI, Perceived Control, Trust in AI, and their collective impact on Creativity and Innovation within AI- integrated environments. The findings reveal a complex interplay where excessive reliance on AI negatively affects creative and innovative capacities, as evidenced by a significant negative regression coefficient of -0.153. In contrast, a heightened sense of Perceived Control emerges as a crucial factor that positively

influences Creativity and Innovation, with a robust coefficient of 0.251. This underscores the necessity for users to maintain agency over AI systems to foster creative outcomes. Moreover, the research highlights that Dependency on AI diminishes users' Perceived Control, with a substantial coefficient of -0.284, indicating that as reliance on AI increases, users may feel less empowered in decision-making processes.

This finding emphasizes the importance of designing AI systems that promote transparency and user involvement to mitigate feelings of disempowerment. Trust in AI is significantly shaped by both Perceived Control and Dependency on AI. The positive coefficients of 0.583 for Perceived Control and 0.677 for Dependency suggest that fostering user trust requires attention to both enhancing user agency and ensuring consistent, reliable AI performance. Overall, this research contributes valuable insights into optimizing human- AI interactions by balancing reliance on AI with user empowerment, ultimately promoting creativity and innovation in AI-driven contexts.

Future studies

Future research should aim to expand upon these findings by exploring several avenues. To investigate the dynamics of Dependency on AI, Perceived Control, and Trust in various industries (e.g., healthcare, education, creative arts) to understand how these relationships manifest differently across sectors. Conducting cross-cultural studies to assess how cultural attitudes towards technology influence Dependency on AI and Perceived Control, potentially affecting creativity and innovation outcomes. To Implement longitudinal research designs to examine how changes in Dependency on AI over time affect Perceived Control and Trust in AI, as well as their subsequent impact on Creativity and Innovation. Exploring methodologies for designing AI systems that enhance user control and transparency while maintaining effective functionality. This could include participatory design approaches that involve users in the development process. Collecting both quantitative data via surveys and qualitative data via focus groups or interviews in order to obtain a deeper understanding of how users interact with AI systems.

References

1] Amabile, T. M. (1988). A model of creativity and innovation in organizations. Research in organizational behavior, 10.

2] Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. Research in organizational behavior, 36, 157-183.

3] Buolamwini, J., & Gebru, T. (2018, January). Gender shades: Intersectional accuracy disparities in commercial gender classification. In Conference on fairness, accountability and transparency (pp. 77-91). PMLR.

4] Bruno, C., & Canina, M. (2019). CREATIVITY 4.0. EMPOWERING CREATIVITY IN THE DIGITAL ERA. In DS 95: Proceedings of the 21st International Conference on Engineering and Product Design Education (E&PDE 2019), University of Strathclyde, Glasgow. 12th-13th September 2019.

5] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS quarterly, 319-340.

6] Deci, E. L., & Ryan, R. M. (2013). Intrinsic motivation and self-determination in human behavior. Springer Science & Business Media.

7] Elgammal, A. (2017). Can: Creative adversarial networks, generating "art" by learning about styles and deviating from style norms. arXiv preprint arXiv:1706.07068, 6, 2017.

8] Fornell, C. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Publications Sage.

9] Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. MIS quarterly, 51-90.

10] Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice. Communications of the association for information systems, 4(1), 7.

11] Glikson, E., & Woolley, A. W. (2020). Human trust in artificial intelligence: Review of empirical research. Academy of Management Annals, 14(2), 627-660.

12] Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the academy of marketing science, 43, 115-135.

13] Hinton, P. R., Brownlow, C., McMurray, I., & Cozens, B. (2004). SPSS explained. Routledge.

14] Jia, N., Luo, X., Fang, Z., & Liao, C. (2024). When and how artificial intelligence augments employee creativity. Academy of Management Journal, 67(1), 5-32.

15] Kline, R. B. (2023). Principles and practice of structural equation modeling. Guilford publications.

16] Mayer, R. C. (1995). An Integrative Model of Organizational Trust. Academy of Management Review.

17] McCormack, J., Gifford, T., & Hutchings, P. (2019, April). Autonomy, authenticity, authorship and intention in computer generated art. In International conference on computational intelligence in music, sound, art and design (part of EvoStar) (pp. 35-50). Cham: Springer International Publishing.

18] McQuitty, S. (2018). The purposes of multivariate data analysis methods: an applied commentary. Journal of African Business, 19(1), 124-142.

19] Rotter, J. B. (1966). Generalized expectancies for internal versus External control of Reinforcement. Psychological Monographs, 80.

20] Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In Handbook of market research (pp. 587-632). Cham: Springer International Publishing.

21] Steinmetz, K. F., Pimentel, A., & Goe, W. R. (2021). Performing social engineering: A qualitative study of information security deceptions. Computers in Human Behavior, 124, 106930.

22] Tarafdar, M., Gupta, A., & Turel, O. (2015). Special issue on'dark side of information technology use': An introduction and a framework for research. Information Systems Journal, 25(3), 161-170.

23] Zhang, S., & Li, S. (2024). "Confrontation or Acceptance": Understanding Novice Visual Artists' Perception towards AI-assisted Art Creation. arXiv preprint arXiv:2410.14925.

Research Article

Role of Spiritual Intelligence in the Era of Artificial Intelligence

Argha Nath

Student, Globsyn Business School, Kolkata

Debaprasad Chattopadhyay

Faculty, Globsyn Business School, Kolkata

Abstract

Spiritual Intelligence (SI), centred on values such as care, compassion, altruism, and transcendence, plays a critical role in guiding human behaviour and decision-making. In contrast, Artificial Intelligence (AI) utilizes computer systems and technology to solve problems, simulate human actions, and automate decision-making processes that were once performed by humans. To ensure both efficiency (doing things right) and effectiveness (doing the right things) in managing people, it is essential to integrate SI with AI. Without this integration, important aspects of ethics and human values may be compromised. For instance, in recruitment, if AI algorithms are programmed with biased data, they could perpetuate discrimination, such as favouring candidates of a specific race or ethnicity while excluding others. Similarly, in training, AI-driven programs might fail to identify diverse training needs, leaving gaps in employee development. If AI is solely responsible for performance management, the emotional and developmental needs of employees—such as mentoring and holistic growth—might be overlooked. This paper argues that integrating SI with AI is crucial to mitigating such risks and ensuring a more inclusive, ethical, and compassionate approach to people management. Our study highlights the importance of combining AI's technological capabilities with SI's human-centred values to foster a supportive and resilient organizational culture. By doing so, organizations can achieve not only operational efficiency but also ethical decision-making, ensuring the well-being of their employees and the success of the organization in the rapidly evolving AI era. This integration is vital to maintaining the balance between technological advancement and human values.

Keywords: *Human Resource Management, Spiritual Intelligence, Ethical decision making, Artificial Intelligence, Technology.*

Introduction

The rapid evolution of Artificial Intelligence (AI) is transforming industries, reshaping how we interact, and raising profound questions about humanity's role in a technologically driven world. As AI increasingly takes over cognitive tasks, a new kind of intelligence—spiritual intelligence (SQ)—is gaining attention as a vital dimension of human growth, purpose, and coexistence. Drawing from a conceptual analysis of terms such as 'mind', 'intelligence', 'spirit', 'spirituality', and 'spiritual intelligence', this discussion explores their potential interconnections, particularly in relation to human nature, transhumanism, and post-humanism. Furthermore, by examining terms like 'datum', 'coding', 'language', 'energy', 'concrete', and 'abstract', the study highlights aspects of Artificial Intelligence (AI) and compares these to spiritual concepts, identifying both similarities and differences. Following a brief exploration of the concept of 'reality' and its inherent uncertainty, the discussion addresses

the mutable nature of these terms and the existential dependence some of their elements may have on the intentional actions of conscious beings. The paper warns against the dangers of reductionist interpretations of reality, which, despite claims of scientific validation, offer a closed, unquestionable explanation of diverse phenomena. Such interpretations ignore the necessity of acknowledging the unknown.

Therefore, it is argued that a holistic, synergistic view of technology and the humanities, especially those focused on intangible aspects of human experience, is essential for advancing knowledge and ensuring the responsible care of both humanity and nature. This article explores the integration of spiritual leadership principles into HRM from a holistic perspective, acknowledging the deep connection between organizational success and the well-being of employees.

Understanding Spiritual Intelligence:

Spiritual intelligence refers to the ability to connect with a higher purpose, develop self-awareness, and align one's actions with deeply held values. Unlike cognitive intelligence (IQ) or emotional intelligence (EQ), SQ centres on transcendent experiences, ethical principles, and meaning making. It involves:

- Self-awareness: Recognizing inner values, beliefs, and motivations.
- Compassion: Connecting empathetically with others.
- Purpose-driven actions: Aligning life choices with personal and universal goals.
- Resilience: Overcoming challenges with mindfulness and grace.
- Interconnectedness: Understanding the unity of life and existence.

The Era of AI: Opportunities and Challenges:

In a world increasingly influenced by AI, the need for spiritual intelligence becomes critical:

1. Redefining Purpose in a Technological Age:

AI excels in data analysis, decision-making, and automation, but lacks the ability to ascribe meaning or purpose to its actions. Humans, guided by SQ, can ensure AI is applied ethically and in service of broader human flourishing.

2. Ethical Decision-Making:

AI systems, trained on biased or incomplete data, may produce outcomes that reflect or exacerbate inequalities. Leaders and developers with strong SQ can better navigate these dilemmas, embedding fairness, justice, and empathy into AI design.

3. Resilience Against Existential Anxiety:

As AI challenges traditional notions of work and identity, spiritual intelligence helps individuals adapt, fostering resilience, acceptance, and a focus on intrinsic worth rather than external validation.

4. Human-AI Symbiosis:

Spiritual intelligence emphasizes humility and interconnectedness, which can guide humans in developing a balanced relationship with AI. This symbiosis prioritizes AI as a tool rather than a replacement for human creativity and spirituality.

Cultivating Spiritual Intelligence in an AI-driven World:

As we navigate the AI era, cultivating spiritual intelligence involves:

- Mindfulness Practices: Meditation, reflection, and journaling can enhance self- awareness and compassion.
- Ethics Education: Focusing on moral philosophy and ethical reasoning in tech education.
- Community Engagement: Building connections with diverse groups to foster empathy and understanding.
- Purposeful Leadership: Training leaders to align technology development with human- centred goals.

Literature Review:

A study conducted by Bhardwaj (2020), involving 115 HR professionals in the IT sector in the Delhi/NCR region, reveals that the integration of Artificial Intelligence (AI) significantly enhances the functional effectiveness of Human Resource Management (HRM). The research highlights a strong correlation between AI usage and two critical dimensions: innovation and usability. By leveraging AI, HR functions can streamline processes, improve decision-making, and foster adaptability in dynamic workplace environments. Organizations stand to gain additional strategic advantages by embedding AI into their HR practices, enabling them to optimize operations while driving forward-looking innovations.

In addition to technological advancements, leadership rooted in spiritual intelligence offers a powerful approach to enhancing organizational effectiveness and employee well-being. According to Silingiene (2016), the interaction between a leader's spiritual intelligence and the organization's service quality fosters new values and enhances daily practices, contributing to improved service delivery. Leaders with spiritual intelligence understand and respond to customer expectations by creating flexible systems that minimize errors while upholding trust, responsibility, and awareness. These values establish a foundation for an organizational culture that prioritizes accountability and collaboration.

Spiritual intelligence, as Zohar and Marshall (2000) describe, represents the ability to access deeper meanings, values, and purpose, enabling individuals to lead with integrity and authenticity. This form of intelligence extends beyond cognitive and emotional capabilities, providing a framework for decision-making that aligns with ethical and universal principles. Amram and Dryer (2008) elaborate that spiritual intelligence integrates qualities such as mindfulness, transcendence, and the capacity for inner peace, which are crucial in addressing complex organizational challenges and fostering innovation.

A conceptual review by Hernández (2021) delves into the intricate relationships between mind, intelligence, spirit, and spirituality, particularly in the context of human nature and post-humanism. Hernández contrasts the mechanistic nature of AI with the transformative potential of spirituality, advocating for a harmonious balance between technology and the humanities. This perspective emphasizes the need to view spirituality as a lens for holistic problem-solving, countering reductionist approaches to organizational growth.

Wang (2019) explores the role of spiritual leadership in intrinsically motivating employees, enhancing task performance, and promoting knowledge-sharing and innovation. Drawing on Chinese cultural perspectives, Wang demonstrates that leaders' spirituality is a pivotal resource for driving engagement and organizational behaviours that support long-term productivity. Through the integration of AI-driven innovations and spiritually intelligent leadership, organizations can create a workplace culture that balances operational efficiency with a commitment to ethical and value-driven practices.

Objectives:

Our study has two key objectives:

I. To investigate the relationship between spiritual leadership and artificial intelligence in the context of Human Resource management.

II. To assess the potential advantages of integrating spiritual leadership principles into HR management practices.

Methodology:

Data was collected using purposive sampling from fourteen HR professionals across India through a self-developed questionnaire, yielding quantifiable data for analysis. This quantitative study is complemented by descriptive research.

In our research, productivity and enhanced employee experience were selected as the dependent variables, while artificial intelligence was treated as the independent variable. The perspectives of HR professionals on the use of AI were measured using a 5-point Likert scale and a dichotomous scale.

Results:

The pie chart (Fig. 1) illustrates HR professionals' perception of integrating spiritual leadership and AI into HRM, with 64.3% endorsing this idea in our study. Additionally, the majority of respondents (78.6%) recommended that spiritual intelligence should be integrated with artificial intelligence (Fig.2).

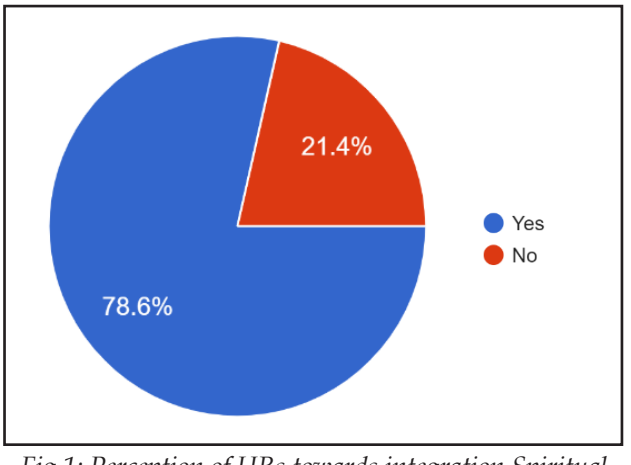


Fig 1: Perception of HRs towards integration Spiritual Intelligence need to be integrated with AI

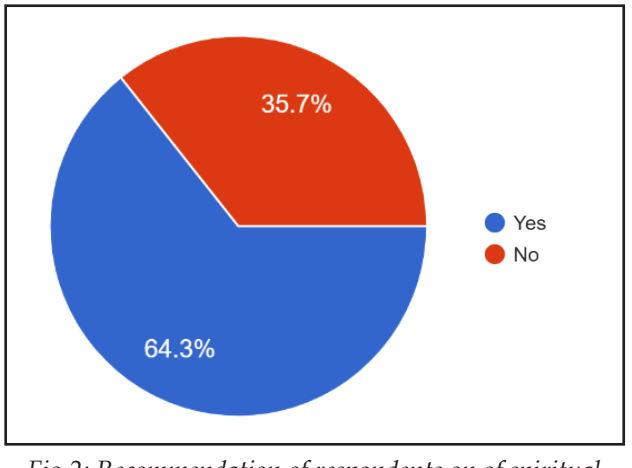


Fig 2: Recommendation of respondents on of spiritual leadership and AI into HRM

The majority of respondents (91.27%) agree that spiritual intelligence fosters empathy and is effective in building resilience within an organization. Additionally, spiritual leadership is seen as a key factor in promoting happiness in the workplace (Fig. 3).

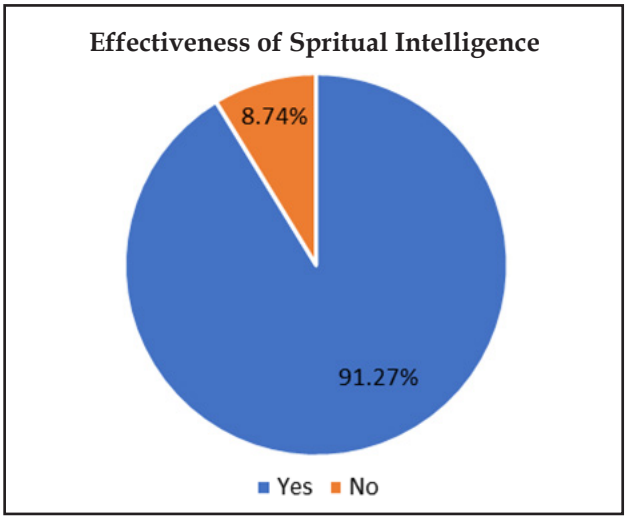


Fig 3: Effectiveness of spiritual intelligence and Spiritual Leadership percentage in an organisation

Discussion:

Artificial Intelligence (AI) has profoundly transformed numerous industries, including customer service, healthcare, transportation, finance, and education. In Human Resource Management (HRM), AI's potential to revolutionize operations is especially pronounced.

Through automation, AI handles repetitive and mundane tasks, allowing HR professionals to focus on strategic objectives and value-driven initiatives. For instance, AI-driven chatbots and virtual assistants address candidate queries during recruitment, providing instant support and improving the candidate experience. Machine learning algorithms predict employee attrition risks by analysing historical data, enabling proactive interventions.

Automated assessment tools enhance the accuracy of evaluating candidates' skills and competencies, ensuring a more objective hiring

process. These innovations streamline HR workflows, reduce administrative burdens, minimize errors, and generate actionable insights into workforce behaviours and trends. The cumulative impact is an overall increase in productivity, employee engagement, and organizational profitability.

However, as businesses integrate advanced AI systems into their processes, a need arises for a balancing mechanism that ensures technology aligns with human-centric values. This is where the concept of Spiritual Intelligence (SI) becomes highly relevant.

Spiritual intelligence, defined as the ability to apply values, ethics, and deep human understanding to decisions and interactions, complements AI's analytical capabilities. While AI excels at processing data and making logical predictions, SI addresses the emotional, ethical, and empathetic dimensions of leadership and decision-making.

The fusion of AI and SI in business decision-making represents a unique integration of analytical and emotional intelligence—akin to the cooperation between the left and right hemispheres of the brain. The left hemisphere's focus on logic and data analysis is mirrored by AI's capabilities, while the right hemisphere's emphasis on emotions and ethical considerations aligns with SI. Together, this synergy fosters comprehensive decision-making, ensuring technological advancements are rooted in human values.

In our study, 64.3% of HR professionals recognized the potential of integrating spiritual leadership with AI, with 78.6% recommending that SI principles should complement AI technologies in HR.

The data underscores a prevailing belief that spiritual intelligence enhances AI's effectiveness by embedding empathy, ethical awareness, and resilience into technological processes. A substantial 91.27% of respondents emphasized that SI contributes to fostering empathy and resilience within organizations, while spiritual leadership was identified as a critical factor in promoting workplace happiness and employee well-being.

The findings highlight that while AI can optimize operational efficiency, it is SI that ensures these advancements are leveraged to build a supportive and resilient organizational culture. Leaders who embody spiritual intelligence inspire trust, encourage collaboration, and align technological goals with ethical practices. For example, an AI-driven performance evaluation system can identify trends and patterns in employee productivity, but a spiritually intelligent leader interprets these results with compassion, addressing underlying concerns such as stress or disengagement.

The integration of spiritual leadership with AI ultimately creates a balanced organizational environment, combining the precision of technology with the compassion and foresight of human values. This symbiosis not only enhances productivity and profitability but also nurtures a workplace culture where employees feel valued, inspired, and connected. As organizations continue to embrace AI, the concurrent adoption of spiritual intelligence principles will be vital in shaping an era where technological progress is harmonized with the human spirit.

The Future of Spiritual Intelligence and AI:

Incorporating spiritual intelligence into the discourse around AI ensures a balanced and ethical integration of technology into human life. By fostering SQ, humanity can retain its core essence, using AI to amplify well-being, address global challenges, and deepen our collective sense of meaning and purpose.

Spiritual intelligence offers a roadmap for living with integrity, mindfulness, and interconnectedness in an era where machines may shape much of our future but cannot define its meaning.

Conclusion

The integration of Artificial Intelligence (AI) with Spiritual Intelligence (SI) in Human Resource Management (HRM) represents a transformative approach to navigating the complexities of modern workplaces.

While AI optimizes HR operations, streamlines processes, and provides data-driven insights to enhance decision-making, it cannot address the emotional, ethical, and human-centric aspects of leadership and organizational culture. This is where Spiritual Intelligence plays a pivotal role, infusing AI's capabilities with empathy, ethical awareness, and resilience, ensuring that technology serves to enhance, not replace, human values.

Leaders who embody Spiritual Intelligence interpret AI-driven insights with compassion and ethical responsibility, fostering trust, collaboration, and employee well-being.

The fusion of AI with SI ensures that technological advancements align with ethical practices, promoting a supportive, inclusive, and human-centred workplace culture. As organizations continue to evolve in the digital age, SI offers a necessary counterbalance to the impersonal nature of technology, ensuring that human values remain central in decision-making processes.

Our study highlights that HR professionals recognize the value of integrating Spiritual Intelligence with AI, particularly in fostering empathy, resilience, and workplace happiness.

While AI drives operational efficiency, the development of spiritual intelligence remains critical in guiding organizational growth. As technology advances, the need for human-centred leadership grows, making the integration of AI with Spiritual Intelligence essential for creating compassionate, purpose-driven, and ethical workplaces in the era of AI.

References

1] Bhardwaj, G., Singh, S. V., & Kumar, V. (2020, January). An empirical study of artificial intelligence and its impact on human resource functions. In 2020 International Conference on Computation, Automation and Knowledge Management (ICCAKM) (pp. 47-51). IEEE.

2] Budhwar, P., Malik, A., De Silva, M. T., & Thevisuthan, P. (2022). Artificial intelligence–challenges and opportunities for international HRM: a review and research agenda. The International Journal of Human Resource Management, 33(6), 1065-1097.

3] Chakraborty, S.K. and Chakraborty, D. (2008). Spirituality in Management: Means or End? New Delhi: Oxford University Press.

4] Chattopadhyay, D. (2023, December 6). Artificial Intelligence and human resource management. Globsyn. https://www.globsyn.edu.in/blog/ai-and-hrm.

5] Hamilton, R. H., & Sodeman, W. A. (2020). The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources. Business Horizons, 63(1), 85-95.

6] Hamilton, R. H., & Sodeman, W. A. (2020). The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources. Business Horizons, 63(1), 85-95.

7] Hernández, J. F. C. (2021). Artificial intelligence and spirituality. IJIMAI, 7(1), 34-43.

8] Kaur, M., & Gandolfi, F. (2023). Artificial Intelligence in Human Resource Management-Challenges and Future Research Recommendations. Revista de Management Comparat International, 24(3), 382-393.

9] Quin, R,E.(2005).Moments of Greatness: Entering the Fundamental State of Leadership. Harvard Business Review. July-August, 74-85.

10] Shamir B.; House R.J. and Arthur M.B. (1993). The motivational effect of charismatic leadership: A self-concept based theory. Organization Science.4:577–594.

11] Silingiene, V., & Skeriene, S. (2016). Links between the spiritual intelligence of the leader and an organization's service quality: A theoretical approach. Engineering Economics, 27(1), 56-65.

12] Thompson, M.(2004). Spirituality as faith in relation to Management, Spirituality and Ethics in Management. Netherlands: Kluwer Academic Publishers.

13] Wang, M., Guo, T., Ni, Y., Shang, S., & Tang, Z. (2019). The effect of spiritual leadership on employee effectiveness: An intrinsic motivation perspective. Frontiers in psychology, 9, 2627.)

Research Article

Sentiment Analysis in Financial Markets: A Machine Learning Approach to Predicting Asset Prices

Soumendra Roy

Faculty, Globsyn Business School, Kolkata

Abstract

Sentiment analysis with machine learning is reshaping the financial markets and providing new ways to predict asset prices. In this paper, we examine the theoretical underpinnings and practical implementations of predicting asset price movements with sentiment as informed by unstructured data sources such as social media texts or financial news.

The study suggests that the importance of sentiment-driven models is increasing, especially for markets characterized by volatility and inflow or outflow based on information inputs to help identify where investor psychology has a significant effect in decision-making.

They are using machine learning algorithms, unsupervised and supervised models as well as deep learning methods to get sentiment analysis from all that data by applying natural language processing (NLP).

This is then merged with conventional quantitative techniques in prediction modelling. The paper describes several different supports- vector machine (SVM), decision tree and recurrent neural network to predict sentiment-based trading.

By going through countless case studies that serve as real-world examples you can understand how this is used in practice, and see what hedge funds, algorithmic trading firms to even LV2 celebrities using sentiment analysis for market signals.

They voice ethical and regulatory concerns to protect against their flavor of sentiment-based trading becoming its own new form of market manipulation or unfair algorithms.

The paper ends by discussing the boundedness of some existing models and possible future research directions, stressing further improvements in machine learning-based sentiment analysis for real-time financial applications.

Keywords: *Sentiment Analysis, Machine Learning, Financial Markets, Asset Price Prediction, Natural Language Processing, Algorithmic Trading.*

Introduction

Financial markets are complex, driven by economic data, corporate earnings and people's psyche. Because of the growth of unstructured social media, news portal data, and forum data, the stock market analysis process has evolved.

Extracting opinions from text through sentiment analysis has been crucial for predicting asset prices.

Introduction and Relevance of Sentiment Analysis in Financial Markets

Emotions are what cause market anomalies as per Behavioral Finance Theory. Mainstream models often do not account for the human aspect of opinion formation, so machine learning-based ways of quantifying news sentiment can be a replacement.

An example of sentiment's impact would be the 2021 GameStop short squeeze when rampant sentiment on r/WallStreetBets drove the stock up significantly. Tesla stock, like the Boston, has also responded sharply to CEO Elon Musk's tweets, and it wasn't even the 2018 "Funding secured" one that generated its immediate peak.

Figure 1: Stock Prices of APPL from 1.1.2020 to 1.1.2021 (Source: Yahoo Finance)

Social media platforms significantly influence stock prices. For instance, sentiment analysis of StockTwits data has been used to predict stock movements.

Correlation Between Sentiment and Stock Price

Positive sentiment spikes often align with stock price increases, while negative sentiment correlates with declines. For example, during the week of December 28, 2020, optimism over Apple's plans to expand into the electric car industry was a key driver of the stock rally.

Objectives of the Research

The integration of sentiment analysis with machine learning models for prediction of asset price has been the focus of this research. It aims to:

- Improve Prediction: With an aim to derive the return prices of assets, explore how use of unstructured data such as social media & financial news, being able to draw out the sentiment underlying effects on assets help generate prediction.
- Bridge the Gap: Fill in the holes left by classical finance which does not include non-fundamental behaviors of investors.
- Support for Real-time Trading Decisions: A Conceptual Framework for Sentiment-driven Algorithmic Trading for Investors, Traders, and Hedge Funds.

Example:

Algos deployed by hedge funds including Two Sigma and Renaissance Technologies which consider AI-powered models also including broader market sentiment have surpassed standard benchmarks.

Research Problem Statement

Classic models such as CAPM and Black-Scholes depend heavily on historical prices and volumes while neglecting qualitative sentiment

information, which leads to unpredictable or sudden changes in the market near-real time prediction less competitive.

This study offers a conceptual framework that incorporates real-time sentiment analysis utilizing sophisticated machine learning models.

Research Questions:

- How can we interpret sentiment data for translating into actionable trading signals?
- What machine learning models are most suitable for sentiment based forecasting?
- Will sentiment analysis lead to more accurate financial predictions?

Example Insight:

For example, during the 2016 Brexit Referendum, social media sentiment analysis was more predictive of market volatility than conventional models.

Theoretical Foundations of Sentiment Analysis in Finance

For instance, sentiment analysis can help quantify how people feel about something based on unstructured data such as social media posts, news and reports. From marketing applications, we went to predicting asset prices by using machine learning models.

Definition of Sentiment Analysis and Its Relevance in Finance

Now, for a bit of formalities, Sentiment Analysis is an aspect of Natural Language Processing (NLP) that extracts and categorizes opinions, emotions, or sentiments in a piece of text. In finance, sentiment analysis is the process of measuring the emotional tone of the market so traders and analysts can read the market's situation by analyzing investor opinions, market or news headlines, and public commentary.

Transition from Marketing to Finance:

Sentiment analysis tracks investor sentiment, applied to the financial markets, but was initially used for customer reviews. Tweets by Tesla CEO Elon Musk, such as his post about suspending Bitcoin payments in May 2021, led to a price drop of 17% in response, showing that market disruptions also can also be driven by sentiment.

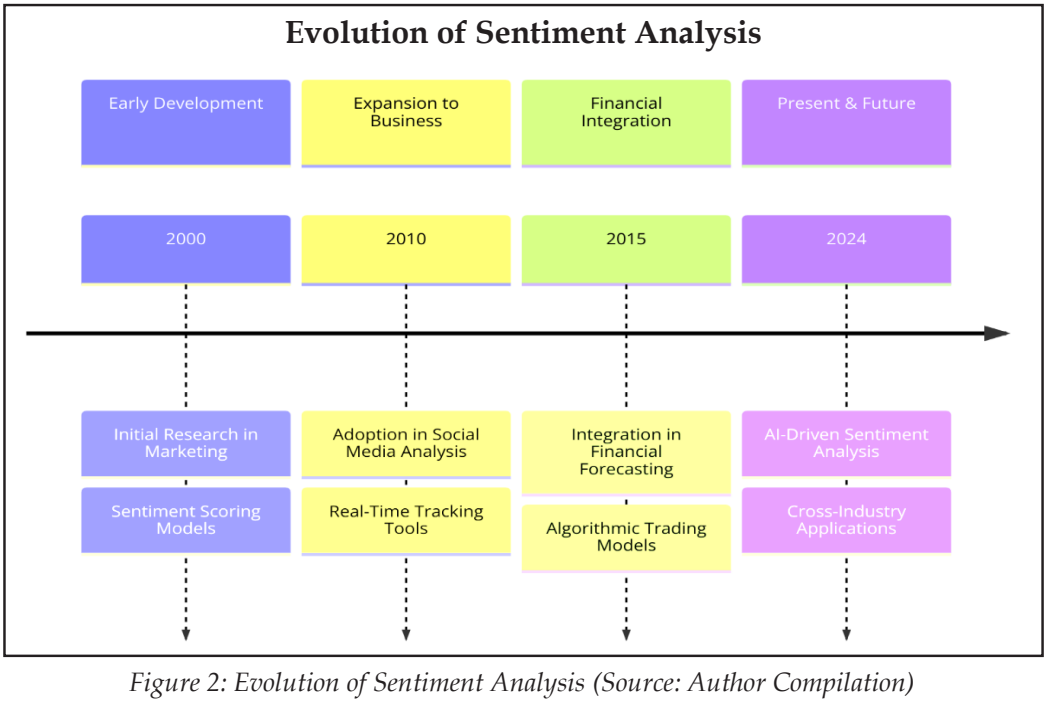


Figure 2: Evolution of Sentiment Analysis (Source: Author Compilation)

Types of Sentiment Analysis

1. Binary Sentiment Analysis:

Output positive or negative text classification. For example, if the earnings call transcripts are labeled optimistic or pessimistic.

2. Multi-Class Sentiment Analysis:

Contains different levels of sentiment (positive, neutral, negative). For example, Reuters news forecasts parsed as bullish, neutral or bearish.

3. Aspect-Based Sentiment Analysis

Concentrate on key financial attributes like revenue or CEO performance. For example, you can analyze, sentiment of sales and expenses in earnings calls.

4. Emotion Detection:

Recognizes feelings such as fear or greed. Example: Lingo such as "panic" during the COVID-19 crash warned of market downturn risks.

Recent Developments in Social Media's Impact on Stock Markets

Recent articles highlight renewed interest in GameStop shares following cryptic posts by 'Roaring Kitty' (Keith Gill), a prominent figure in the 2021 meme stock phenomenon. His enigmatic messages have reignited discussions on platforms like Reddit's r/WallStreetBets, leading to a notable surge in GameStop's stock price. This resurgence underscores the significant influence of social media sentiment on market dynamics, as retail investors rally behind such signals, reminiscent of the earlier trading frenzy that challenged traditional market norms.

Sentiment Analysis Techniques

1. Lexicon-Based Approaches:

For financial text analysis, I prefer using predefined sentiment word lists — like Loughran-McDonald.

For instance, by applying sentiment models on contractual agreements, we can assign scores to earnings call transcripts that further help gauge company performance.

2. ML-based Models:

- Traditional ML I: Supervised learning with SVM or Naive Bayes on labeled datasets
- Unsupervised Learning: Identifies the sentiment using models such as K-Means Clustering or LDA.

3. Hybrid Models:

By combining lexicon-based and ML approaches.

For example, hedge funds combine news sentiment scores with Twitter information in hybrid models.

4. The Secret Weapon: Deep Learning and Transformers

The same ideas behind models like BERT and GPT-4 support improved sentiment prediction by looking at context.

For example, two sigma uses such models for sentiment-based investment decisions.

Theories Linking Sentiment to Asset Prices

A. Efficient Market Hypothesis (EMH):

Prices incorporate all information, so sentiment affects prices less.

For example, during the Brexit, social media sentiment suggested risks ignored by traditional models.

B. From a Behavioral Finance Perspective:

While sense is based on fundamentals, sentiment leads to irrational investor behavior, which creates bubbles and crashes.

The dot-com bubble, for example, was driven by investor overconfidence.

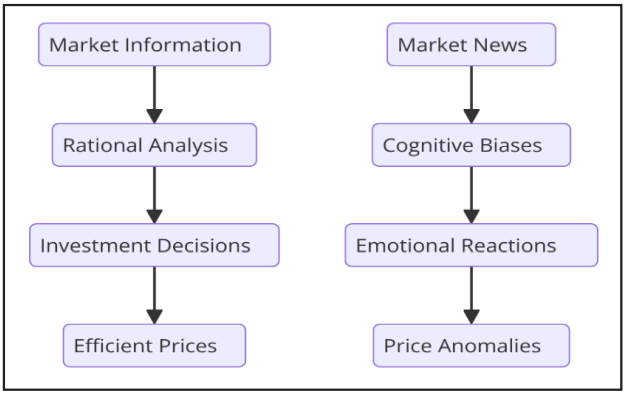


Figure 3: Comparison between EMH and Behavioral Finance (Source: https://www.researchgate.net/publication/375552037_The_Dynamic_Interplay_of_Market_Forces_and_Human_Behavior_A_Critical_Review_of_Efficient_Market_Hypothesis_and_Behavioral_Finance)

C. Role of Noise Traders:

- "Noise traders" trading based on sentiment rather than fundamentals - leading to temporary distortions in the market.
- Example: In 2021, retail investors with an optimistic sentiment, due to Reddit, bought GameStop (GME) stock en masse, sending the price up despite bad fundamentals.

D. Sentiment as a Market Driver:

In literature, there exist cases where sentiment driven asset prices despite stable fundamentals. Tweets by Elon Musk about Dogecoin pushed its price around so much that they highlighted sentiment's potential to be a speculative market driver.

Data Sources for Financial Sentiment Analysis

The diverse unstructured data sources on which financial sentiment analysis is based provide predictive signal for asset prices. These platforms can be social media, financial news outlets, earnings reports, and investor forums.

Unstructured Data Types

1. Social Media: Twitter, StockTwits, and Others

Social media can reflect real-time investor sentiment, sometimes ahead of news reports.

Think about this for a second: Tesla's stock rally in January 2021 on the heels of Elon Musk's tweet about Bitcoin.

2. Financial News (Bloomberg, Reuters, CNBC, etc.):

Share how financial news analysis and breaking news impact asset prices.

For example, in August 2022 positive U.S. inflation data led to a 3% rise for the S&P 500.

3. Earnings Call Transcripts (I.e., SEC Filings):

Guidance from management provides clues for what to expect going forward.

Example: Amazon's cautious earnings call the third quarter of 2022 punctured its stock with a 5% decline.

4. Investor Forums and Communities (e.g., Reddit's r/WallStreetBets):

Collective trading opinions are formed on forums.

(Example: The January 2021 GameStop price spiked 1700% based on some crowd discussion on Reddit.)

Financial sentiment analysis relies on diverse unstructured data sources, offering predictive signals for asset prices. Key platforms include social media, financial news outlets, earnings reports, and investor forums.

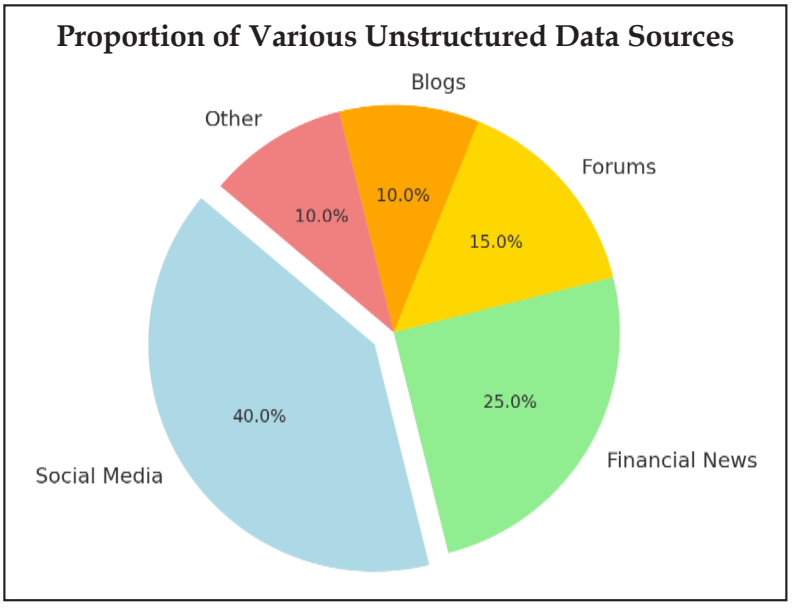


Figure 4: Proportion of Various Unstructured Data Sources (Source: https://edgedelta.com/company/blog/what-percentage-of-data-is-unstructured)

Challenges in Using Unstructured Data for Financial Analysis

The core challenges to financial sentiment analysis using unstructured data are:

Volume:

Types of large-scale data processing: There are o< 500M tweets sent every day.

Variety:

It should be noted that data varies from short tweets to lengthy financial reports, so all of which required different processing techniques.

Veracity:

and fake news/fake accounts have also been an issue with social media data. For example: A fake tweet about a merger with Tesla in July 2020 caused brief havoc in the market.

Noise and Spam Filtering:

Finances forums have slang terms like "to the moon" or "HODL" that meaning requires contextual understanding.

Text Data Pre-processing Techniques

Tokenization:

Word tokenization or Phrase tokenization. For example: "Tesla stock is rising fast" → list of words = ['Tesla', 'stock', 'is', 'rising', 'fast']

Stemming and Lemmatization:

Reduces words to root forms. For example: "Profits increasing steadily" → ['profit', 'increase', 'steady'].

Stopword Removal:

Strips out common words such as "the" and "is."

Normalization:

Lowercases the text, removes symbols, and corrects mistypes. Example: "$TSLA is on FIRE!!! 🔥🔥🔥" → "tesla fire".

Handling Slang and Jargon:

Understands phrases such as "Short the dip" or "Diamond Hands."

Financial Sentiment Analysis using NLP

NLP turns unprocessed text into practical intelligence:

NER: Identifies companies and assets. For instance: "Amazon CEO Andy Jassy" → {Entity: "Amazon"}.

Part-of-Speech Tagging: Finds words which carry sentiment. e.g. "Tesla's stock soared" → {Verb: "soared" → Positive}

Sentiment Lexicons: Utilizes dictionaries such as Loughran-McDonald to represent financial sentiment.

Sarcastic Text & Context: Detecting the Challenger Sarcasm Challenge with Models like BERT & GPT-4

All these barriers will not stop NLP techniques from providing key insights using different, unstructured data and getting predictions financially driven by sentiments.

Machine Learning Models for Sentiment-Based Asset Price Prediction

Machine learning (ML) has revolutionized asset price forecasting by combining conventional market metrics with a real-time sentiment analysis. ML models analyze huge amounts of unstructured text data in financial reports, social media posts, and news articles, which delivers more agile and precise predictions.

Financial Prediction: Machine Learning in Action

This functionality needs to be designed specifically for the requisite business domain, and is based on data-driven modeling and heuristics.

Models such as ARIMA and GARCH depend on historical price data and are unable to include real-time sentiment. In comparison, ML models utilize unstructured data to adjust to changing market sentiment.

ML Advantages:

- Support Vector Machines (SVM): Used to classify sentimental data as positive or negative.
- Random Forests: Dealing with complex market indicators and sentiment scores.

For example, during the 2021 GameStop (GME) short squeeze, traditional models failed to account for the stock's rally, whereas a sentiment-based ML model could detect positive sentiment on subreddits devoted to this stock as it began to peak on r/WallStreetBets.

Supervised learning models

The supervised models predict market behaviour derived from the sentiment induced features using a labelled dataset.

1. Logistic Regression:

- Application: Classifying the sentiment of news headlines.
- For example, a Reuters headline declaring that U.S. inflation is on the right track (in 2022 Statistics) could produce an upward forecast of the S&P 500.

2. Decision Trees:

- Use Case: Conditional rules for prediction on price based on buy/sell sentiment.
- It could be a company that issues a press release stating "record-breaking profits," which could result in a spike in that company's share price.

3. Support Vector Machines (SVMs):

- Use Case: Use in Trading to identify market sentiments.
- Example: An SVM could classify Elon Musk tweets as "bullish" or "bearish" and anticipate swings in Tesla stock.

4. Training & Validation:

- Models trained on the Financial Phrase Bank, twitter data using sentiment tags, validated on precision, recall, or F1-scores

Unsupervised Learning and Clustering Techniques

Unsupervised models identify clusters driven by sentiment and those indicative of market anomalies without any need for labeled data.

1. K-Means Clustering:

- Use Case: Sentiment clustering

- Eg: Categorising news articles under positive earnings, market volatility, etc.

2. Latent Dirichlet Allocation (LDA)LDA: frowning: (LDA):

- Use Case: Sentiment detection on Topic modeling.
- Case in point: Using Reddit's r/WallStreetBets to search for patterns such as "short squeeze" or "buy the dip."

Deep learning and more advanced models

- As, deep learning models are adept at interpreting complex text, providing them a contextual understanding of a sentence, and they excel at capturing changes in market sentiment.

1. Recurrent Neural Networks (RNNs):

- Use Case: Continuity of sentiment tracking from tweets or news feeds
- Examples: Price predictions based on Tesla tweets.

2. LSTMs (Long Short Term Memory)

- Use case: Time-series sentiment forecasting.
- For instance: Monitoring Bitcoin discourse on Twitter to predict market fluctuations

3. BERT and Transformers:

- Use Case: Dedicated sentiment analysis from financial documents.
- Sample: Applying BERT based techniques to detect subtle change in sentiment from Bloomberg news

Machine learning (ML) has transformed asset price prediction by integrating traditional market indicators with real-time sentiment analysis. ML models can process vast unstructured text data from financial reports, social media, and news articles, enabling more dynamic and accurate forecasts.

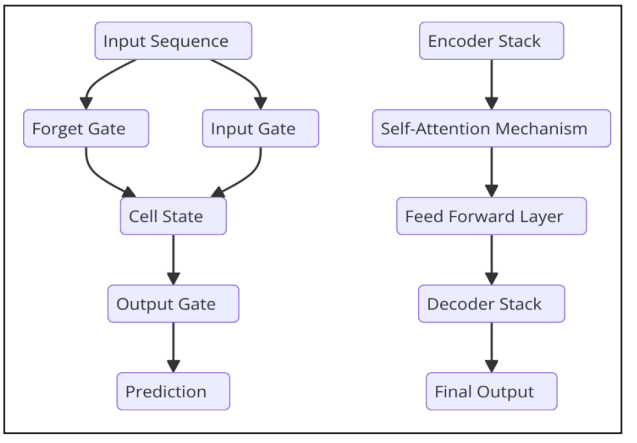


Figure 5: Architectures of LSTM and Transformer models (Source: https://blog.finxter.com/transformer-vs-lstm)

Hybrid Models Combining Sentiment Analysis with Traditional Financial Metrics

Combining sentiment analysis with market indicators strengthens financial models:

1. Sentiment-Augmented Technical Indicators:

Example: An algorithm could buy Apple stock if its sentiment score > 0.8, RSI < 30, and price < moving average.

2. Fundamental-Sentiment Fusion Models:

Example: Combining earnings-per-share (EPS) with sentiment analysis from earnings call transcripts for quarterly earnings forecasts.

Machine learning models have revolutionized asset price prediction by blending sentiment analysis with technical and fundamental indicators. From SVMs and random forests to advanced models like BERT and LSTMs, these tools enable dynamic and accurate forecasting, unlocking new potential in sentiment-driven trading strategies.

Case Studies: Real-World Applications of Sentiment Analysis in Financial Markets

Sentiment analysis went from academic research to a key financial strategy that informs hedge funds, trading platforms and investors on how to predict, manage portfolios and respond

to market volatility. This part emphasizes the applications in financial markets.

Hedge Funds and Algo Trading

In the world of finance, hedge funds use sentiment analysis for algorithmic trading by scanning data from news outlets, social media and financial news.

Industries: Renaissance Technologies, Two Sigma

Renaissance Technologies, a well-known hedge fund, is believed to rely on models based on sentiment that can analyze news and analyst opinions, as well as images from satellites. For example, Two Sigma uses NLP models to analyze earnings call transcripts and news sentiment, allowing firms to execute trades earlier than others.

How Algorithmic Trading is Powered by Sentiment Analysis:

- Data Integration: Sentiment data sources for ML models such as BERT and LSTMs are provided by platforms like Bloomberg and Reuters
- Real-Time Trading Signals: The buy orders appear when positive sentiment in the market spikes.
- Risk Mitigation: Anomaly detection based on sentiment avoids losses on stop-loss orders.

Implementation in Platforms and Retail Investing

You cannot get something for nothing and that is true; retail traders are benefiting from sentiment-driven tools provided by Robinhood, eToro and WeBull, which allow you to set real-time alerts for stocks going viral.

Case Studies: Robinhood and Sentiment-Based Investment

Robinhood keeps track of sentiment for popular stocks. The best known event of sentiment-driven trading was the GameStop (GME) short squeeze from Reddit's r/WallStreetBets. Sentiment analysis has evolved from academic research to a key financial strategy, helping hedge funds, trading platforms, and investors improve predictions. This section highlights real-world applications in financial markets.

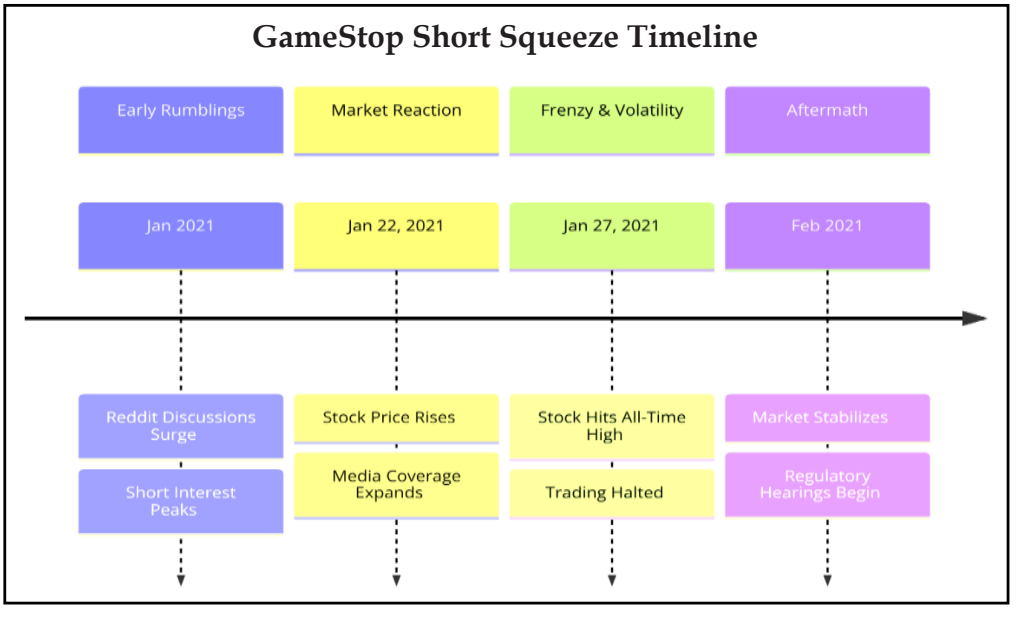


Figure 6: GameStop short squeeze (Source: https://view.genially.com/ 607e29a39e1e8d0cf7742305/ interactive-content-gamestop-timeline)

Sentiment Analysis in Predicting Market Volatility

During major geopolitical and economic events, sentiment analysis acts as a good indicator to predict volatility in the market as rapid changes in global sentiment can be tracked on it.

Case Study I: Brexit Referendum (2016)

Negative sentiment on social media indicated heightened market uncertainty ahead of the final vote during the Brexit Referendum

Market Impact:

- GBP/USD Exchange Rate: Dropped 8% in a single day, breaking its previous record for the largest one-day decline.
- FTSE 100 Index: Plunged and later rebounded.

Case Study 2: COVID-19 Market Crash (March 2020)

Unprecedented market volatility has been brought about by COVID-19 pandemic. Social media sentiment analysis noticed spikes in keywords such as "global recession" and "market crash," which launched selloffs.

Market Response:

- Negative Sentiment Indicators, March 2020 global panic selling
- News of vaccine trials in April 2020 drove positive sentiment and high returns to biotech and tech stocks such as Moderna and Amazon.

These examples illustrate the way that sentiment analysis is transforming market forecasting, allowing for more accurate asset price predictions and smarter portfolio management.

Ethical Considerations and Challenges in Using Sentiment Analysis for Trading

Therefore, the increased use of AI and machine learning driven services with a sentiment focus deepens ethical and regulatory concerns. Some postulate models that respond to sentiment in the market and news/social media summaries use trends, which worries manipulation by AI through news and social media, or regulation of these growing uses in the current cap market.

Ethical Considerations of Sentiment Analysis Based Trading

Market Manipulation Risks:

Pump and dump schemes which exploit AI-driven trading by disseminating manipulated information and thus influencing prices

For instance, in 2021, during GameStop (GME) short squeeze, Reddit's r/WallStreetBets propelled GME's stock from $17 to $480 and raised the issue of sentiment manipulation.

Bias of AI Models and Their Adverse Effects:

By rewarding overexposure on social media with upward momentum and feeding off popular stocks readings got developed and lost, sentiment models may tend to amplify market biases and sentiments over more controversial companies and when there is a very large size of firms unpresented on any outlet.

Case in point: The artificial-intelligence-fueled bubble following Elon Musk-triggered surges in Tesla stock.

Regulatory Challenges

Lack of Clear Regulation:

The decentralized nature of social media platforms challenges regulatory agencies such as the SEC to define and monitor AI-driven trading effectively.

Ensuring Market Fairness:

This creates an uneven playing field as institutions with access to better algorithms and tools can gain unfair advantages leading to this.

Here is a case study on the same: The SEC investigated potential market manipulation following the GameStop incident but struggled to establish intent in decentralized platforms such as Reddit.

Future Directions and Conclusion

I expect that the application of sentiment analysis to financial relationships will continue its rapid development into financial markets supported by the ability to harvest and process also in near real-time all kinds of data as well as innovations in emotional modelling targeted correlations and spanning different markets. In conclusion, sentiment-based models have exhibited considerable predictive power, yet issues surrounding model interpretability, data quality, and ethical considerations persist.

New advances in Sentiment Analysis for Finance

Scale Real-Time Sentiment Analysis

Hedge funds are now analyzing millions of points of news and social media data in real time.

For instance, during the 2020 U.S. Presidential Election, some of the real-time models predicted an upsurge in the market post-Biden victory on account of anticipated fiscal stimulus policies.

Financial Modeling with Multi-Emotion:

Coming models will sense feelings such as fear, greed and optimism.

An example is the Fear and Greed Index by CNN Money, which uses several indicators to gauge market sentiment. Essentially, models, such as BERT and GPT-4, could widen such indices by examining the emotional sentiment in tweets, as well as headlines.

Models for Cross-Market Sentiment:

Sentiment in one market can spill over into another.

For example, bearish price action in Asian stock markets can indicate a potential downtrend in European and U.S. markets.

Limitations of Existing Models and Directions for Future Research

Accuracy of sentiment is a function also of data quality:

Social media data have misinformation and fake news. We need better spam filters and fact-checking models.

Interpretability and Transparency of the Model:

Models based on deep learning like the BERT and LSTMs are "black boxes." Explainable AI (XAI) will help regulators and investors understand transparency through research.

Sentiment Analysis for Multilingual and Cross-Cultural Settings:

Most existing models are designed primarily for the English language, which reduces their global utility. Cross Language analysis could be improved with use of Bi-Lingual models like mBERT.

Not Actually Understanding Context:

Sarcasm, context-shifting and idiomatic phrasing pose difficulty for sentiment models.

Bushism: "Tesla is soaring … into the abyss!" could confuse emotion models that lack contextual awareness.

Conclusion

By incorporating real-time emotional signals extracted from unstructured data sources, machine learning-based sentiment analysis has revolutionized and significantly improved financial prediction models. Key takeaways include:

Improved Market Prediction Accuracy:

Models based on real-time sentiment outperform in prediction.

Destruction of Traditional Models:

Sentiment analysis is superior to traditional models (i.e., ARIMA and GARCH) that neglect behavioral market drivers.

Widespread Industry Adoption:

Sentiment-based trading helps hedge funds such as Renaissance Technologies and trading

platforms such as Robinhood make better decisions.

Final Thoughts

In summary, the future of sentiment-driven trading is in constructing AI models that are transparent, multilingual, and explainable, with a focus on data-driven insights as well as ethical responsibility. Overcoming hurdles in data quality, model interpretability, and worldwide sentiment monitoring, sentiment analysis has the potential to reveal new opportunities in asset price forecasting, transforming the financial sector.

References

1] Bloomberg. (2020). Real-time market sentiment tracking for financial trading. Retrieved from https://www.bloomberg.com

2] SEC. (2021). GameStop Trading Investigation: Market Manipulation and Social Media Impact. U.S. Securities and Exchange Commission. Retrieved from https://www.sec.gov

3] BERT Developers. (2018). Bidirectional Encoder Representations from Transformers (BERT): Improving NLP Performance for Sentiment Analysis. Proceedings of the NAACL-HLT Conference. Retrieved from https://arxiv.org/abs/1810.04805

4] Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. The Journal of Finance, 25(2), 383-417. https://doi.org/10.1111/j.1540-6261.1970.tb00518.x

5] Loughran, T., & McDonald, B. (2011). When is a liability not a liability? Textual analysis, dictionaries, and 10□Ks. The Journal of Finance, 66(1), 35-65. https://doi.org/10.1111/j.1540-6261.2010.01625.x

6] Reddit r/WallStreetBets. (2021). GameStop Short Squeeze and Retail Trading Trends. Retrieved from https://www.reddit.com/r/wallstreetbets

Perspectives

Pespective

Addressing AI Inequality: A Path Towards Fair and Equitable Systems

Indranil Ojha

Director-Technology, Amber Tag Analytics Pvt. Ltd.

Madhumita Bhattacharya

Faculty, Globsyn Business School, Kolkata

Abstract

As artificial intelligence (AI) becomes increasingly integrated into decision-making systems, concerns about fairness and equality have gained significant attention. AI systems, often trained on historical data, can inadvertently perpetuate biases that disproportionately affect marginalized groups, such as women, racial minorities, and the economically disadvantaged. The decisions made by such systems vary widely across genders, ethnicity or other groups even though all other inputs remain the same. This paper explores the current state of fairness in AI, addressing key challenges, trade-offs, and potential solutions. We highlight how biased training data, lack of diversity in development teams, and inadequate auditing mechanisms contribute to disparities in AI outcomes, leading to issues like higher misidentification rates among darker-skinned individuals in facial recognition systems and unequal access to opportunities in AI-powered hiring platforms.

A significant challenge in achieving fairness lies in the inherent trade-off between fairness and accuracy, where optimizing for one often comes at the cost of the other. While numerous fairness metrics have been developed to address these disparities, no single metric can fully capture the complexities of fairness across all contexts. Therefore, interdisciplinary approaches that include not only technical solutions but also legal, ethical, and social considerations are essential to building equitable AI systems.

Looking forward, increased transparency and explainability in AI, as well as continuous auditing and accountability frameworks, are critical steps toward achieving fairness. By ensuring that AI systems are designed and evaluated with inclusivity in mind, we can work towards reducing algorithmic bias and fostering a more equitable society.

Introduction

Fairness in AI refers to the absence of bias or discrimination in AI systems, especially in how algorithms treat different demographic groups. Fairness is critical, especially in sensitive areas like hiring, healthcare, criminal justice, lending, and education where AI decisions can significantly impact people's lives. One notable case occurred in Detroit in 2020 involving a man named Robert Williams, an African American who was wrongfully arrested due to a facial recognition system's erroneous match. The system mistakenly identified Williams as a suspect in a theft case based on grainy surveillance footage, even though the video footage did not clearly show the suspect's face. This case gained widespread attention because it illustrated how facial recognition technology disproportionately misidentifies people of color, particularly black individuals.

Current State of Fairness in AI

Fairness has become a central issue in AI. As AI systems are deployed more broadly, instances of bias and discrimination have drawn public

attention. Some real-world examples where AI systems have been found unfair are

- Facial Recognition: Higher error rates for people with darker skin tones.
- Predictive Policing: AI models disproportionately targeting minority communities.
- Hiring Algorithms: AI models that prefer male candidates due to biased training data.

In their analysis of commercial facial recognition systems, Buolamwini and Gebru found that error rates varied dramatically across gender and skin tones. For light-skinned men, error rates were as low as 0.8% whereas for dark-skinned women, error rates soared to 34.7%.

A 2016 analysis of COMPAS, an AI system used to predict recidivism in the U.S., found that the system falsely labelled black defendants as high risk at almost twice the rate (44.9%) as white defendants (23.5%).

Sources of Bias in AI

AI models learn from data, and real-life data frequently has bias. Sometimes this is due to erroneous sample collection processes. Even if data is accurate, it may indeed have some minority categories that are inadequately represented.

Imbalanced data in training model is a well-known problem. Even after enormous amount of work done to solve this, only partial success has been achieved so far.

Algorithms themselves can introduce bias through design choices. For instance, optimization metrics like accuracy might not capture fairness if they focus on overall performance but ignore disparities between groups.

Humans who build, train, or deploy AI systems may unintentionally introduce bias through their own assumptions, choices, or oversight.

Methods for Addressing Fairness

Researchers have developed various fairness metrics to measure whether an AI system is treating different groups equally. Examples include:

- Demographic Parity: Ensuring equal outcomes across different groups.
- Equal Opportunity: Ensuring that qualified individuals from different groups have the same chances of favourable outcomes.

Beside the choice of the right metric, various algorithmic techniques for mitigating bias are also being helpful, such as:

- Pre-processing: Cleaning or balancing biased datasets before training the model.
- In-processing: Modifying algorithms during training to ensure fairness constraints are met.
- Post-processing: Adjusting the outputs of AI models after training to achieve fairer outcomes.

Real-World Efforts Toward Fairness

Many tech companies like Google, Microsoft, and IBM are investing in fairness research and building frameworks to make AI systems more equitable. IBM's AI Fairness 360 is an open-source application checks for fairness, and takes appropriate actions, in different phases of model development. Google's What-if Tool is another open-source toolkit that is web-based. It enables users to analyze, without writing a single line of code, if an AI model is adequately free of bias. There are many other such tools from Aequitas, Arize or Fairlearn.

With the growing concern over fairness in AI, a large group of researchers and practitioners have come together to form the Fairness, Accountability, and Transparency in Machine Learning (FAT/ML) community. There are other groups such as MIT's Media Lab, Microsoft's Fairness, Accountability, Transparency, and

Ethics (FATE) Research Group or Algorithmic Justice League (AJL) working with similar objective. These organizations represent key players working toward advancing fairness and accountability in AI. They contribute through research, policy advocacy, and practical tools for reducing bias in AI systems.

Governments are stepping in to regulate AI fairness, with examples such as the EU's AI Act or efforts in the U.S. to regulate AI in employment and lending.

Ongoing Challenges in Achieving Fairness

- **Trade-offs Between Fairness and Accuracy:** This trade-off occurs when optimizing an algorithm for fairness can reduce its overall predictive accuracy, because AI systems trained on biased or imbalanced data perform better for majority groups but worse for underrepresented ones that contribute less to the aggregate performance.
- **Conflicting Definitions of Fairness:** Different fairness metrics can conflict. For example, improving fairness based on demographic parity may violate fairness based on equal opportunity.
- **Global Fairness Considerations:** Fairness is culturally specific, so AI systems deployed globally may have to balance different social norms or notions of fairness.
- **Complexity in Contexts:** AI decisions in different domains (e.g., healthcare, criminal justice) involve unique complexities, making it difficult to create one-size-fits-all fairness solutions.

Future Directions for Fairness in AI

- **Interdisciplinary Approaches:** Since the challenge goes beyond technical solutions, computer scientists alone cannot resolve the issues, and collaboration between ethicists, sociologists, legal scholars, and policymakers is crucial to understand how fairness can be defined and applied in various social contexts.
- **Continuous Auditing and Accountability:** AI models can evolve or degrade as they encounter new data, potentially introducing biases that were not present during initial development. Regular audits can detect these emerging issues and ensure that AI systems remain fair and equitable in their decision-making processes.
- **Explainability:** Explainability means whether the AI models act as black boxes, or if their predictions are explainable by logic. It is a key research area in AI and it plays a crucial role in addressing fairness. By making AI systems more transparent, explainability helps users and developers understand how decisions are made, allowing them to identify and address potential biases.

Conclusion

While significant advancements have been made, the journey toward truly fair AI systems is still ongoing. Stakeholders such as researchers, companies, governments, and the public have to stay vigilant in pushing for fairness in AI, recognizing that it's an evolving and collective responsibility.

Pespective

Ethics, AI and Human Values – A Branding Perspective

Sutapa Bhattacharya
Managing Director – DIA Brands Consultants, Adjunct Professor, Taylor's University, Malaysia

According to the Economist, a noted international news magazine, we live in a world in which we have more strident governments in power than ever before. A situation which is paradoxical even as corporations all over the world are mandated to incorporate corporate governance and practices like DEI (Diversity, Equity and Inclusion) and ESG (created in 2004) that were probably intended to promote and sustain Human Values for a better world, for all.

Without delving too deeply into the theory of Human Values, we know that ESG and the concept of SDGs (2012) were introduced to strengthen the importance of Human Values in a more economic and sustainable sense. There are various definitions of Human Values but a generally accepted one would be based on "values are the virtues that guide us to take into account the human element when we interact with other human beings. Human values are, for example, respect, acceptance, consideration, appreciation, listening, openness, affection, empathy and love towards other human beings."

As per the Oxford dictionary, ethics are "the moral principles that govern a person's behaviour or the conducting of an activity."

While possibly related, human values also do encompass other negative values of avarice, dishonesty and jealousy among others. Hence, the importance of ethics in life and business as a means to overcome the base human traits.

To claim that Human Values are a recent phenomenon would be misleading. Human Values have always existed and been deemed important through religion, spirituality and culture. However, as business and life has become more complicated with growing emphasis on returns, share prices and expediency, there has been a growing need for a more structured framework to ensure the achievement of transparency, accountability and universal human goals that benefit society beyond the needs of business. And maybe the SDGs and ESG frameworks in business, finance and the economy.

It has barely been a couple of years since ChatGPT made Artificial intelligence (AI) mainstream and in a short time frame evolved with a number of powerful and innovative tools. AI which refers to technologies that enable computers to perform a variety of functions, ranging from understanding, translation of language, huge volumes of data analysis, making recommendations and today even coming up with personas, strategies all in shorter time frame than possible by any human, has become the buzzword of the corporate business environment.

AI has the capability of discerning and analyzing large volumes of data that businesses have had with them for years but did not know how to make utilize for decision making and focused strategies. It is no wonder that businesses, big or small are looking towards the possibility and potential of AI in driving business and competitive advantage in an increasingly challenging business environment.

However, industry, governments and managements are also proceeding with caution. Whilst the business benefits have been made widely apparent, what is still unclear is whether

the results of AI adoption will really help to uphold Human Values, whether machines can follow ethical principles, without having a "conscience"?

There are also the wider probable social impacts of job loss and job replacement to be considered, whether the output would be impersonal and cold, whether human behavior is really as predictable as AI believes it is. As human behavior differs in so many ways, based on culture, beliefs and life experiences as well as a myriad of other factors.

In all the excitement and anticipation of the AI wave and the high expectations of the impact on business in terms of productivity, personalization and cost management, better decision making, better risk management, reduction of human error, there is simultaneously the less highlighted impact on loss of jobs, effect on human lives and income loss.

AI promises speed and accuracy; speed has been proven. However, ML still evolves, accuracy is still to be strongly evidenced. A cursory google search will demonstrate that most AI communication are largely based on the promise of the multitude of possible benefits. Although a number of businesses particularly SMEs have benefited, there remains a degree of diffidence in adopting AI by the majority. Use of AI in branding and marketing has already started. The ultimate intent of branding and marketing, unlike other corporate functions like Finance and Engineering has always been in the interest of not just the company but the benefit of the customer and other stakeholders with mutual gain as the end goal.

In that respect, using AI to enable better utilization of existing data that allows for personalization, better and easier customer experiences, based on more accurate customer understanding of their needs and behavior is to be welcomed. Moreover, if as anticipated it reduces human error and bias, whilst delivering superior solutions is more satisfying to customers experientially and can become a strong competitive advantage.

However, other issues such as data protection, third party data usage restrictions etc., have highlighted some shortcomings which are being sought to be overcome with synthetic Gen AI. The added advantage often touted to the branding and marketing functions are the time saving in research, analytics, strategy and creative development. Data that has been lying with organisations but without the human capacity to collate, analyse and come up with solutions that can assist in precise marketing is a huge step in the often, uncertain world of marketing where customers and markets are constantly evolving, often at a mercurial pace. The reality does not always match this promise with examples of racial bias coming up in Meta and misleading claims and inaccurate creative outputs of poor quality or generic strategies and creatives churned out.

However, this is expected to improve over time with Machine Learning and more tinkering from the AI providers. Nevertheless, for now at least in Branding and Marketing, it has been found that the human input is still necessary to extract the best outcome and alternative.

Ultimately, the success of AI will depend on its development journey in the next few years and on the minds and intentions of those leading the charge. Humans are an ingenious race who can use their intelligence to reach the highest pinnacle of "good" but can also misuse technology and new knowledge for the wrong purposes as we well know with inventions like the bomb and more such examples. With the right focus on the pursuit of AI for better and unbiased outcomes for people and not just for the company and on empowering employees to move on from repetitive tasks to more evolved tasks and inputs, this can indeed ensure a solid foundation of human values and ethics in business, not just for employees, customers and other stakeholders but for future generations.

Pespective

AI and Education Inclusivity: Connecting the Dots to Achieve ESG Goals

Ishani Chakraborty

Assistant Manager – WeSchool, Bengaluru

Debaprasad Chattopadhyay

Faculty, Globsyn Business School, Kolkata

Introduction

In an era defined by unprecedented environmental challenges and social responsibility, artificial intelligence has become one of the key contributors towards ESG. Aligning with India's ESG goals, the education sector needs to be equitable, inclusive and resilient. To support this journey AI could be one of the salient attributes.

The Indian management education sector has witnessed widespread integration of technology into teaching and learning activities. NEP 2020 emphasized that education should not be limited to academic learning only, and must include necessary vocational skills to facilitate an overall development of the learner's life.

Consequently, professional development for educators has been considered important vis-à-vis increasing awareness for AI tools and incorporating active learning. In recent past the Education Ministry explored how digital technologies, artificial intelligence, and big data might impact the overall education pedagogy.

The use of digital technologies in addressing issues of accessibility, quality, and equity within the education system, as well as the creation of interactive, personalized, and engaging learning experiences.

Keywords: *inclusive education, quality education, educational sustainability, ESG goals, equitable education*

Nurturing Globally Responsible Citizens for Sustainable Future

'One Earth, One Family, One Future'

In an era defined by pressing environmental challenges along with the urgency of sustainable development, the concept of sustainability has emerged as a beacon of hope for a better future. As the custodians of knowledge and the architects of tomorrow's leaders, higher education institutions hold a unique responsibility in fostering a greener, more sustainable world.

It is unanimously agreed in the action plan to accelerate progress on the ESG Goals that teacher capacity must be built, education is recognized as an essential tool for human dignity, and digital transformation is a means to empower people. These goals can be achieved by investing in digital infrastructure and providing access to technology for all citizens. On the other hand, AI in education has revolutionized personalized learning, tailoring educational experiences to meet the needs of individual students.

SDG Targets and Indicators Related to Sustainable Education

Although SDGs do not have a specific goal dedicated solely to "sustainable education" (Holfelder, 2019), however, elements of sustainable education are integrated into various other SDGs, particularly in SDG Goal 4, which put emphasis on quality education (Biancardi,

2023). Sustainable education is an essential aspect of achieving sustainable development, as it involves fostering awareness, holistic knowledge, contemporary skills, universal values, and attitudes that contribute to a responsible society (Olsson, 2022).

Quality education ensures acquiring comprehensive learning and practical expertise that would further support gender equality, global citizenship, culture of peace and non-violence, cultural diversity and an overall sustainable lifestyle (Haseena and Ajims, 2015). This target emphasizes the integration of education for sustainable development (ESD) into the learning process.

It calls for educational institutions to incorporate themes related to sustainability, environmental stewardship, human rights, and cultural diversity into their curricula. By promoting ESD, individuals are equipped with the necessary tools to understand the interconnectedness of social, economic, and environmental issues, besides making informed decisions that contribute to a more sustainable future (Fomba et.al, 2023).

Indicators of Quality Education

The indicators related to quality education include specific measurements that assess the extent to which education for sustainable development is being implemented within the education system.

The proposed indicators consist of the extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment. The proposed indicator aims to evaluate the integration of global citizenship education and education for sustainable development at various levels of the education system, from policymaking to classroom instruction. It helps to gauge the progress made in embedding sustainable education principles within the education sector. Additionally, countries may adapt or modify the indicators based on their national contexts and priorities.

Sustainable development vis-à-vis quality education: NEP 2020 and Current Trends

The UN 2030 Agenda for Sustainable Development highlights the importance of quality education. The agenda emphasizes lifelong learning opportunities and inclusiveness. Education in the information age is aimed at connecting the general trends. Education plays a vital role in building new perspectives for sustainable development, which must take care of social and cultural reforms. For sustainability to thrive, it must be woven into the fabric of education. In line with similar ethos, National Education Policy 2020 (NEP 2020) now promotes the following facets in the Indian education sector:

Holistic education: Irrespective of a student's gender, race, ethnicity, socioeconomic status, or geography, holistic education ensures their overall development, which includes social, emotional, mental, physical, and cognitive aspects.

Borderless learning: After the Pandemic, the education sector has become increasingly digitized and technologically driven. It has become 'borderless' as the education system has gone from local to global.

Inclusive learning and educational equity: An inclusive educational system ensures that every qualified person has the chance to obtain education regardless of their gender, caste, religion, language, race, colour, political opinion, nation or social origin, or economic situation. Individuals' diverse interests, aptitudes, and capabilities can also be accommodated through a wide variety of education opportunities (Patfield et.al, 2022).

Digital and blended learning, lifelong learning: Adoption to e-learning technologies is now

facilitating lifelong learning for individuals. Teachers across the globe are now encouraged to explore and adopt evolving e-learning technologies. E-learning offers personalised digital platforms to connect students globally. It has also brought in significant change in terms of student assessment methods. Blended learning is expected to support executive learning or lifelong learning as well.

Education for active citizenship: In order to foster democracy and civic participation locally, nationally, and internationally, education is crucial. To be successful in this complex and fast-changing environment, higher education institutions must develop outcomes-based curricula. In order to make informed and adequate decisions, students need be agile and think critically.

In India, as well as around the world, we are seeing a reorientation of an economic model that emphasizes education and training the youth, in order to ensure sustainability. In NEP 2020, the concept of 'Education for active citizenship' is also stressed. NEP 2020 places sustainability at the centre of education rather than just as a superficial promise.

Nurturing Seva Bhaav through Education: In this 'brittle', 'anxious', 'nonlinear' and 'incomprehensible' (BANI) world, values of compassion, empathy and love are urgencies to be developed at an early stage in learners who can contribute to the betterment of society. In early 2022 both All India Council for Technical Education (AICTE) and University Grants Commission (UGC) started registration for Vidyanjali Higher education – a scheme for support to the students, faculty members, and institutions through volunteerism. As per this scheme serving or retired faculty members, scientists, retired government officials, self-employed and salaried professionals, alumni etc., can offer remedial classes/training to the needy students. Corporates and NRI are encouraged to support higher education institution to build the necessary infrastructure. Ethical literacy can spark an inner recognition of the interdependence of life, integrity, and humility - this awakening of the self is 'Sewa Bhaav' and can distinguish India from the rest of the world.

Building an Inclusive Educational Ecosystem for Global Challenges: The international debate on inclusive education is now in its silver jubilee, nonetheless, consensus remains elusive. The UNESCO 2017 guidelines air that every learner matters and matters equally. As a principle supporting and welcoming diversity amongst all learners, inclusive education has become a global focal point. By embracing this view, academic world should aim to eradicate social exclusion caused by discriminatory attitudes toward a particular social class, ethnicity, religion, gender, and physical or mental ability. Education is a fundamental right of every human being, and a just society is based on the principles of inclusive education. Human rights and inclusive education are increasingly getting significant attention across the globe.

Steps for building Inclusive Educational Ecosystem

The concept of 'learning to live together' is based on the three domains of Cognitive, Socio-emotional, and Behavioral learning. Learners are empowered to make informed decisions and take responsible actions for the environment, economic viability, and unbiased society for themselves and for the next generation. In other words, it is a learning process that helps us live sustainably.

AI in Personalized Learning

- Adaptive Learning Platforms: AI-powered systems adjust the curriculum and learning pace based on a student's performance, strengths, and weaknesses. Examples include systems like Khan Academy's adaptive tools and platforms such as DreamBox.
- Intelligent Tutoring Systems (ITS): These systems simulate one-on-one tutoring

by providing customized feedback and explanations. For instance, Carnegie Learning's MATHia offers real-time assistance in mathematics.

- Data-Driven Insights: AI analyzes vast amounts of data from students' interactions with learning materials to identify patterns and provide actionable insights for educators and students.
- Natural Language Processing (NLP): NLP tools, such as AI-driven essay graders and chatbots, offer personalized support in writing and comprehension tasks.

Conclusion

Education plays a crucial role in the lives of people. It nurtures inclusiveness and promotes shared goals that the world focuses to meet. When we talk about sustainable development, a lot of changes have to be done, not only in terms of policy and processes but also in terms of social, economic, and cultural reforms. The thrust towards quality and sustainable education at global level is a wholesome approach to include each and every aspect such as pedagogy, curriculum design, delivery, learning environment, school environment and teacher capacities performed to the optimum level of available resources.

Through multi-dimensional, multi-disciplinary, 'Seva Bhaav' and humanistic approach, we can equip our students to adapt to the sporadic BANI world. By reorienting education and learning environment it can be ensured that every student has an opportunity to acquire knowledge, skills and values that empower him/her to contribute to a more sustainable future.

Reference

1] "About Vidyanjali – Higher Education", https://vidyanjali-he.education.gov.in/

2] For Support to the Students, Faculties & Institutions through Volunteerism, https://www.ugc.gov.in/pdfnews/7459412_VidyanjaliGuidelines.pdf

3] Quality Education, https://www.undp.org/sustainable-development-goals/quality-education

4] Agenda for sustainable development and quality education, https://www.coe.int/en/web/education/agenda-for-sustainable-development-and-quality-education

5] Holfelder, AK. Towards a sustainable future with education?. Sustain Sci 14, 943–952 (2019). https://doi.org/10.1007/s11625-019-00682-z

6] Biancardi, A., Colasante, A. & D'Adamo, I. Sustainable education and youth confidence as pillars of future civil society. Sci Rep 13, 955 (2023). https://doi.org/10.1038/s41598-023-28143-9

7] Olsson, D. et.al., The effectiveness of education for sustainable development revisited – a longitudinal study on secondary students' action competence for sustainability. Taylor & Francis Online, (2022). https://doi/full/10.1080/13504622.2022.2033170

8] Haseena V. A, and Ajims P. Mohammed, Aspects of Quality in Education for the Improvement of Educational Scenario. Journal of Education and Practice, (2015).

9] Fomba, B.K., Talla, D.F. & Ningaye, P. Institutional Quality and Education Quality in Developing Countries: Effects and Transmission Channels. J Knowl Econ 14, 86–115 (2023). https://doi.org/10.1007/s13132-021-00869-9

10] Patfield, S. et.al., Towards quality teaching in higher education: pedagogy-focused academic development for enhancing practice, Tailor & Francis Online, https://doi/full/10.1080/1360144X.2022.2103561

Pespective

Impact of AI on Energy and Ethics

Soumen Guha

[GAICD] [MIEAust] [M-ASME], Managing Director, Sustech Engineering Pty Ltd, Perth

Introduction

Artificial Intelligence, AI as is commonly called, is a logical step in the progress of science and information technology. The growth of civilisation and prosperity of humankind is built on newer and newer innovations. Newer innovations lead to increased productivity. At every juncture humanity faces the eternal challenge – how can the fruits of innovation and productivity gains be used for the benefit of society. For AI, this question is much more complex, but not totally novel. There is fear that AI will turn humans into redundant onlookers as the whole idea of being a human, the ethics and values of society, is abandoned or changed beyond recognition. But is this inevitable? Or is technology agnostic? As history has shown, technology can be wielded for good or evil according to the wishes of the wielder.

With the evolution of humanity some ethics and values related to survival and base instincts have remained the same and some others have emerged with the development of complex societies. The impact of AI on ethics and human values in the energy industry itself is significant and multifaceted. There are serious and valid concerns that AI can be a powerful tool to the detriment of humanity in the wrong hands. But our focus in this article is on AI's socially legitimate use for the energy world.

In this article we explore the challenges and opportunities that AI presents in relation to some key umbrella concepts in the area of ethics and values relevant to the energy industry.

We conclude in this article that while AI presents significant challenges for access to energy for all, it also offers promising prospects for enhancing human life with assured and proper distribution of it. The future will likely depend on how society navigates these complexities, balancing innovation with ethical considerations.

The Environment

The Challenge

AI has direct environmental impact, as the energy consumption and carbon footprint of developing and running AI systems is huge. There are serious ethical questions about implementing AI solutions, as it requires resource-intensive data centres. This is especially concerning where the efficient use of energy, to support increasing energy demand while maintaining carbon neutrality is the challenge of our times, and AI may usurp that energy.

There are further ethical concerns that the use of AI for efficient generation of short term profit in the energy industry may be environmentally and socially unsustainable in the long term. For example, the geological exploration data that has been accumulated by the industry over centuries, can well be analysed by AI for even more efficient and accurate detection of locations of fossil fuels. This can then lead to cheaper production costs of fossil fuel. But questions will remain – How much of these efficiency gains and technological advancements will be equally distributed? Will it disproportionately benefit certain populations or parts of the society and harm others vulnerable to climate change?

The Opportunity

Sustainability requires environmental steward-ship, and necessitates a focus on equity and

access to energy resources. Renewable energy is the answer. Sources, including solar, wind, hydroelectric, and biomass now makes up for close to half of the total electricity generated globally. But continuous development in renewable energy technology, storage and logistics is necessary. AI itself can assist in this endeavour. As a simple example, predictions of renewable energy generation can be made based on weather modelling. This data is used to configure and schedule the consumption points and activate the storage units downstream.

AI can help in modelling energy resources, generation, transmission, conveying, distribution, and consumption of energy. It can improve, optimise, and forecast energy consumption and production, reducing the environmental impact of energy production and consumption. Large AI models with granular data can predict demand and ensure proper energy planning and energy security to remote areas. Through this process, both energy costs and carbon emission may be reduced. In our journey of net zero and to restrict the global warming to 1.5°C, AI can play a big role.

Transparency, Accountability, and Decision-Making

The Challenge

AI can be used to spread misinformation including creating deepfakes, false propaganda, thus impacting public trust and social cohesion. It has the capability to undermine basic norms of human social engagement and communication and erode ethical norms around truth and trust in media and institutions, both public and private. This has the potential to also harm trust in energy providers.

Technology generally gallops ahead of regulations. In these early days of AI, a governing structure around AI is yet to develop. What we have is self-regulation of AI, entirely dependent on the ethics and conscience of the technology owner.

In the field of energy, AI is used in major grids including smart grids and energy management systems based on collected big data of individual customers and institutions.

The risk of a breach of data privacy, intentional or accidental, is heightened, and the potential for exploitation remains. Energy companies are institutions that rely on public trust to operate.

Transparency is key to operate this business and generate confidence in energy companies. AI may be used to undermine this confidence. The whole data handling system in energy operations can be turned unethical with the help of AI.

AI making decisions affecting people's lives, including energy distribution, raises ethical questions around accountability, bias, and transparency. It raises questions such as what data was the AI trained on? What are its biases? What was the method followed to come to the decision? Is there an audit trail that can be independently verified? These are hard questions to answer for AI as it stands.

The Opportunity

As large data pools can now be captured, algorithms can now collect data, analyse and establish patterns, and also aberrations of those patterns, to establish derivative algorithms. These can be used to enforce transparency and accountability in decision making processes.

In the field of energy, where data is well structured and documented historically, when statistically analysed, can show some patterns. These patterns can be processed and presented through conventional computer programming to assist data driven decision making.

This is what has been practised for many decades now by business analysts and decision makers. One can imagine how much data can be co-related and compiled from these well-structured datasets, increasing the ease of well informed decision making.

For the energy sector to avail these benefits, ensuring the AI system relied on for decision-making itself is fair, transparent, and accountable is key. This means accountability by design. Firstly, this will require transparency in the dataset being used by the AI. For example, current and historical data used by the AI, such as energy exploration, generation, transmission, consumption, profitability, productivity, production, and sales need to be made available to the public. Secondly, the method and underlying assumptions informing the AI system used for decision-making, needs to be made available. This may even include disclosing the algorithm as it evolves. Lastly, AI systems need to be developed in a way that produces an audit trail that is then periodically audited by an independent entity. Taking these steps at the beginning will ensure the most value addition by AI in the long-term, by combining both efficiency and accountability.

Greater accountability will also require development of ethical governance structures for AI. This will likely be a balance between data protection laws and regulations and those enabling the ethical deployment of AI. On one hand regulations will be required for access to information to further refine the AI model for energy sufficiency at the grassroot level. On the other hand, regulations will be required to protect this data from being misused by entities controlling energy.

Equality

The Challenge

Establishing equality is probably the biggest challenge in the face of the rapid progress of AI. Like all technology, AI is not immune from the inherent biases in our society. In the absence of conscious effort to counter this, AI will be inevitably predisposed to delivering unequal outcomes for different groups and people. It is more likely to continue to perpetuate existing inequality including disadvantage and marginalisation in all its forms, including socio-economic, racial, cultural, physical, mental, and gender disadvantage. AI can even exacerbate existing biases present in society and economics to multiple folds as present data will be used to feed and train algorithms which will drive AI in its increasingly major role in different aspects of modern systems and our lives.

An AI system functioning on the algorithm prioritising supply of energy to profitable consumers and maximum return on investment on energy infrastructure will not favour communities that use less energy or needs high maintenance cost. Energy distribution surcharge may be increased or such location profiles may not be entertained for new energy supply lines. While this makes absolute business sense, these biases will affect disadvantaged communities and perpetuate even for inequality and disadvantage. You may have already experienced this first hand where some areas of a city has cable faults on a regular basis. AI will exacerbate these trends further, without further intervention.

Global inequality will be more pronounced if AI is uncritically configured to optimise energy distribution. It will be incentivised to direct energy to main consumer centres, which are megacities of industrialised nations. Existing inequalities between countries and communities may be scaled up.

The Opportunity

Energy is a basic need for modern life. Ensuring fair access to energy as per ones needs is a fundamental human right. Identification of systemic biases, participation of different social groups in decision making for matters related to energy can provide necessary perspective and AI can be trained taking into account diverse perspectives. At the level of personnel engaged in the development of AI systems, the issue of inequality requires collaboration, inclusive dialogue between social and political cross-section of the population. Social training of technologists and proactive ethical

considerations is needed. These will not happen in days or months. But a conscious effort needs to be made to keep equality front of mind from the very start of rolling out an AI system.

At the policy level smart grids can be designed based on data on the energy consumption patterns and storage requirements as per the lifestyle of the community. Development of smart grids with syncing options can allow for the real time management of energy generation, making the whole energy production and distribution enterprise more capital efficient. This in turn can help in predictive pricing of energy and assisting policy-makers with forward planning and resource allocation.

With the access to global data, the use of AI in the decentralised energy sector can reduce the project capital costs and operating costs and increase the availability and reliability of the energy. With the efficient management of energy supported by AI, this decentralised model can eventually become commercially viable for renewable, explored and mined energy sources. This journey has started. A decentralised model of energy management can have the benefits of an AI system, while also ensuring energy usage fit for local conditions.

AI can also promote fair trade of energy between producers and consumers. For example, AI may be able to bring in information on energy sources and prices with specific suggestions to the consumer about the right place to buy. To the energy producer, AI can identify the solvent consumer most in need. AI can empower communities with more informed decision making process about where to invest for their energy security.

It is not easy to achieve energy equality. It may sound Utopian at times. It needs cooperation, information sharing and access to big data and the latest technological developments in AI. However, if the proper legal frameworks exist, it is only a matter of time that even small groups of researchers or interested amateurs will have this information and can work cooperatively to use AI for energy solutions.

The Workforce

The Challenge

Respect and dignity of labour and the right to participate in the workforce has become an integral value in the modern world, in theory if not always in practice. With the advent of AI, the threat to availability of work is looming large in people's mind. Concerns are being raised that automation driven by AI may lead to significant job loss. This will impact the whole economy as unemployment will give rise to loss of income and purchasing power. Automation driven by AI may displace workers in traditional energy sectors.

The Opportunity

New technologies have made some jobs redundant while creating new ones. If we take world population data at the time of industrial revolution (1 billion people approximately), we can see that productivity growth has now grown to support approximately 8 billion people, 8 times as many people.

If we can envision and unleash the field of knowledge, fundamental sciences, music, arts as means of productivity increase and well-being of the society then there is still a huge amount of work that has not been touched yet. This holistic vision and resources to carry it out can become possible through the use of AI. With the power of AI, collective reasoning and problem solving can become accessible. Co-operation not competition can become the zeitgeist. A proper vision for the future validated by data is needed. An education and reskilling programme for retraining and support for affected workers for the jobs of future and Workforce Transformation is needed. In the intermediate transition period economic support is needed to stop increasing inequality and the need.

AI itself can be used to assist in this transition process. AI can be used to predict the productivity gains achievable by implementation of AI in the energy industry.

AI can be used to predict the job losses in the energy industry. A future vision can also be projected by AI and the jobs of the future can also be delineated. Programmes design by AI can be rolled out after proper human validation for education and reskilling of the people who will lose their job and also for the people who will require upskilling.

AI can even be used to make the future workplace safer. It has been observed that disadvantaged people especially in non-industrialised nations, face more unsafe working conditions and have more injuries and fatalities. AI can provide this insight into the data and situations and suggest preventive operation procedures to achieve safer working conditions in energy production in the decentralised model.

Conclusion

AI will progressively impact our modern life, including energy. It has the potential to increase productivity and efficiency. With AI, more carbon neutral energy can be discovered and energy made available more equitably over the globe. But technology is agnostic. AI can also erode the fabric of ethics and values that societies are built on. But a decentralised model of ownership of this technology can have the benefit of collective wisdom and open up a world of opportunity.

AI presents numerous opportunities to enhance efficiency and sustainability in the energy industry, it also brings ethical challenges that must be carefully navigated. Balancing innovation with human ethics and values—such as protecting the environment, equality, transparency and accountability, and dignity of labour—will be essential for fostering a just and sustainable energy future.

Case Studies

Case Study

AI Meets Academia, Breaking Barriers in Online Education: How Georgia Institute of Technology's AI-Powered Learning Revolution Leverage Its Online Computer Science Master's Program? – A Case Study of Innovation and Outcome

Atanu Mitra

Faculty, Globsyn Business School, Kolkata

Abstract

The case study "AI Meets Academia, Breaking Barriers in Online Education: How Georgia Institute of Technology's AI-powered learning revolution leverage its online Computer Science Master's Program? – A case study of Innovation and Outcome" explores the pivotal impact of artificial intelligence (AI) on higher education, particularly within Georgia Tech's online Master's in Computer Science program. Faced with challenges such as high dropout rates, low student engagement, and inconsistent learning outcomes, Georgia Tech partnered with industry leaders to develop an AI-driven adaptive learning platform. Key features of this system include personalized assessments, customized learning paths, real-time feedback, and AI-based intellectual tutoring.

The AI-powered platform resulted in significant improvements regarding pass rates, dropout rates, and student participation. The system's integration of machine learning algorithms, natural language processing (NLP), and data analytics tools simplified the creation of a personalized learning environment. This innovation not only enhanced student outcomes but also improved accessibility, especially for students with disabilities.

Regardless of challenges like data integration, teachers training, and balancing personalized learning with standardized education, the project positively proved how AI can transform online education. Georgia Tech's AI-driven platform won numerous awards, including the EDUCAUSE Award for Innovation and the Sloan-C Award for Brilliance in Online Education.

In conclusion, Georgia Tech's pioneering efforts in AI-driven teaching have set a new standard for adaptive learning, indicating the power of AI to enhance engagement, retention, and student success in higher education.

Background

Georgia Institute of Technology, a prestigious research university, is a public research university and institute of technology in Atlanta, Georgia, United States, established in 1885 recognized for its potential of AI to personalize education and improve learning outcomes. With the fast progress of technology, the university intended to create a helpful learning environment with the help of AI for its Online Computer Science Master Degree program and finally invented the virtual teaching assistant, "Jill Watson,".

Issues with Georgia Tech's online Master's program in Computer Science

- High dropout rates
- Low student engagement
- Inconsistent learning outcomes

Objective

To address all the mentioned issues University intended to install AI driven Learning Mechanism.

Solution

To cope up with the issue, Georgia Tech partnered with IBM, Udacity and AT&T to cultivate an AI-driven adaptive education platform and for this they used:

- Machine learning algorithms to evaluate student data (like TensorFlow),
- Natural Language Processing (NLP) to measure student reactions,
- LMS integration and
- Data Analytics Tools (Tableau and PowerBi) for the analytics purpose.

Strategy of implementation

- Partnership with IBM, Udacity and AT&T.
- Development of AI-powered adaptive learning platform & Integration with the existing LMS.
- Faculty training and support.
- Continuous platform improvement.
- Developmental stage: 12 months.
- Pilot launch: 2014
- Full Scale Launch: 2015

Key Features of the Applied Platform

- **Adaptive Assessments:** These assessments dynamically adjust their difficulty based on each student's performance. This ensures that students are challenged properly, fostering growth without causing hindrance.
- **Modified Education Paths:** Students receive tailor-made recommendations for study materials that align with their individual learning styles and needs. This customization helps them focus on areas where they need more preparation and support.
- **Real-Time Feedback:** Students benefit from immediate feedback on their assignments, allowing them to understand their mistakes and learn from them promptly. This timely response enhances their learning process and encourages continuous improvement.
- **Intellectual Tutoring:** AI-powered teaching systems provide tailored, one to one support to students. These type of systems can guide students through multifaceted topics, confirming they get the assistance they need when it is actually required.

Result of the Applied AI driven Platform

- Increase 20% pass rates.
- Dropout Declined up to 15%.
- Student participation increased to 30%.
- 90% of students reported improved learning experience.
- 25% increase in students with disabilities.

Challenges faced and Lessons Learned

Implementing AI-powered learning at Georgia Tech presented several challenges and valuable lessons.

- One of the prominent issue was ensuring data quality and integration because reliable data is vital for actual implementation of an AI systems.
- Additionally, getting faculty and providing adequate training were essential to help educators to grip these new technologies totally.
- Another challenge was balancing personalization with standardization, ensuring students received tailored support while maintaining a consistent educational framework.
- Additionally, addressing concerns about AI-driven decision-making was crucial, as stakeholders needed to reliance that these systems would improve the educational experience.

These challenges underlined the importance of teamwork, transparency, and continuing

assessment in attaining innovative learning resolutions.

Awards and Recognition after implementation of AI driven platform

- EDUCAUSE Award for Excellence in Innovation, 2016
- Sloan-C Award for Excellence in Online Education, 2017
- Power Learner Potential Organization Award, 2024

Conclusion

Georgia Institute of Technology's revolutionary implementation of an AI-powered adaptive learning system has transformed its online Master's program in Computer Science, setting a standard in higher education. This innovative approach uses advanced technologies such as machine learning, natural language processing (NLP), and cognitive computing to create a dynamic, personalized learning understanding for each student.

Through machine learning algorithms, Georgia Tech's AI-powered system analyzes student performance to identify challenges and adjust content difficulty, providing personalized support. Natural language processing enhances interactivity with AI assistants like "Jill Watson," answering routine queries in real-time, allowing faculty to focus on more complex issues. Cognitive computing simulates human thought, fostering deeper interactions and creating a personalized learning environment that mimics one-on-one instruction.

The impact of this AI-powered system has been important. Student results have improved through tailored learning paths and timely involvements, helping to boost engagement and retention. Furthermore, the online format, enhanced by AI, has made the program more accessible to a broader audience, breaking down geographical and logistical barriers and enabling students from diverse backgrounds to pursue advanced education in computer science.

Overall, Georgia Tech's implementation of AI in its online Master's program showcases how cutting-edge technology can redefine education by making it more flexible, adaptive, and student-centered, while maintaining high academic standards.

Recommendations

- Institutes should invest to develop AI-powered adaptive learning infra.
- Faculty training and support should prioritize to cope up the AI-driven pedagogy.
- Ongoing assessment and evaluation should guide platform enhancements.
- For innovation partnership among educators, researchers, and industry leaders is must.

Final Thoughts

Georgia Tech's AI-powered adaptive learning initiative stands as a shining example of educational innovation, showcasing how AI can revolutionize teaching and learning. It highlights the immense potential of AI to improve student success and reshape the future of education.

References

1] "Georgia Tech's Online Master's in Computer Science" (Georgia Tech website).

2] "Adaptive Learning in Georgia Tech's Online CS Master's" (EDUCAUSE Review).

3] Wikipedia.org (www.wikipedia.org)

Case Study

Human Resource Planning Practices: A Case Study of Cadilla Pharmaceuticals Jammu

Kavita Shastri

Faculty, Globsyn Business School, Kolkata

Rajendra Mishra

Professor, The Business School, University

Abstract

Emerging trends in service / product and process technology and various changing human resource functions in manufacturing in recent decades' demand for a competitive edge in human resource planning practices. The present research study focuses on Human Resource Planning Practices being adopted at Cadila Pharmaceuticals (Samba manufacturing unit, Jammu (J&K). This research aims to figure out the practices, employee perception and measures adopted by Cadila Pharmaceutical for its Human resource planning practices. Chi square test is applied at (.05 or 5%) significance level to check the validity and authenticity of data given by the respondents. Findings suggests that it is difficult to assess accurate HR planning practices because practices itself do not produce right or wrong answers, but it is definitely helpful in finding the series of alternatives from which the right course of action can be chosen.

Introduction

The human resource in an organisation, especially with respect to the availability of talent is primarily dependent on its Human Resource Planning and talent acquisition practices. There is a big risk of the presence of inferior or poor quality human resource, if these human resource planning practices are disrupted or a systematic approach for the same is not followed. When Human Resource Planning in an organisation is not appropriate or lacks a scientific approach, the major result is a disturbed pool of human resource i.e. excess or scarce human resource in terms of both quantity and quality. Therefore, a scientific, systematic, effective and rational approach to Human Resource Planning is essential in every progressive organisation. The performance of human resources who work for an organisation makes them responsible for taking it to greater heights. Human Resource Planning protects the organisation from selecting the wrong people whose under achievement could result in huge costs to the organisation. Human Resource Planning focuses on recruiting human resource with the adequate skills and competencies to do their jobs effectively thereby taking the organisation towards the path of progress. Human Resource Planning is the most important component of the entire human resource system of an organisation. The success of this component determines the total quality of human resource in the organisation. Human Resource Planning is a very important and crucial portion of the complete business or corporate plan of an organisation, therefore if Human Resource Planning wishes to be successful it needs to analyze and anticipate the organisational goals and objectives for a given period of time.

Cadila pharmaceuticals was founded by late Shri Indravadan Modi. The flagship Company of the Ahmadabad based Zydus Group is one of India's strongest and largest integrated Pharmaceutical Companies. It presently ranks

amongst the top 5 in the domestic formulations pharmaceutical market with a market share of 5.85%. The company has their manufacturing facilities at Ahmedabad, Ankleshwar and Vadodara in Gujarat, Ponda in Goa, Samba in Jammu, Raigarh in Maharashtra and Solan in Himachal Pradesh. Cadila healthcare ltd. the flagship of Zydus Cadila group was setup in 15 may 1995 and the company became a public limited company in July 1996.

Scope of the Study

Human resource planning is crucial to Cadila Pharmaceuticals. Labor market supply and demand factors, work and family considerations, and equity and diversity issues are rapidly taking place. For example, The Company has an older age profile and its workforce is on the mature spectrum and significant numbers of senior staff are approaching retirement, which means valuable corporate knowledge could be lost.

Hence, in this dynamic scenario, the importance of human resource planning can't be neglected. On the other hand, appropriate HRP practices require assessing the arrangement of services offered by HR department. Hence effective implementation of HRP policies secures utmost importance. This research work focuses on practices, employee perception and measures adopted by Cadila for Human resource planning.

Objectives of the study

- To analyze the practices used by Cadila for HR Planning.
- To study the employee's perception about the HR Planning Practices at Cadila.
- To identify the measures adopted by Cadila for HR planning Practices.

Hypotheses

- The HR Planning practices have positive effect on demand and supply of employees at Cadila.
- Employees have negative perception about the HR Planning practices at Cadila.

Sampling plan

- **Sample Unit:** Employees and officials from HR department of Cadila located at Jammu
- **Sample Size:** 100 employees.

Research approach

Survey (Primary data is collected through self-structured questionnaire).

Findings of the Study

1. Cadila HR Planning targets are achieved in time?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	40	40%
2	Agree	40	40%
3	Strongly disagree	10	10%
4	Disagree	10	10%

$\chi 2 = 41.8$ df = 3, $\chi 2$ (.05) = 7.73

When it is asked to the Cadila officials that Cadila properly works out on HR Planning, then majority of 40 % and 40 % respondents were strongly agreeing and agree respectively while only 10% disagree and 10% strongly disagree.

The chi square value radically shows that opinion of the respondents was significantly identical when asked about HR Planning.

2. Are adequate measures adopted for human resource requirement?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	35	35%
2	Agree	25	25%
3	Strongly disagree	26	26%
4	Disagree	14	14%

$\chi 2 = 41.6$ df = 3, $\chi 2$ (.05) = 7.81

On asking the respondents about adoption of appropriate HR requirements, the group of 35 % and 25 % strongly agree and agree respectively and only 26% and 14% disagree and strongly disagree respectively. The chi square value entirely shows that the opinion of respondents was significantly similar and majority of employees are in favor that Cadila adopts appropriate practices.

3. Is Cadila having sufficient number of employees?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	14	14%
2	Agree	38	38%
3	Strongly disagree	40	40%
4	Disagree	16	16%

$\chi 2 = 17.36$ df = 3, $\chi 2$ (.05) = 7.81

When it was asked whether Cadila is having sufficient employees, then only 14% were strongly in favour and 38 % agreed. While majority of 40 % and 16 % disagreed and strongly disagreed respectively. The chi square value shows that the opinion of respondents was significantly different on this fact.

4. Present employees are overloaded with work in CADILA?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	14	14%
2	Agree	21	21%
3	Strongly disagree	24	24%
4	Disagree	41	41%

$\chi 2 = 17.4$ d f= 3, $\chi 2$ (.05) = 7.83

On asking to the respondents that Current employees are overloaded in CADILA, only 14 % and 21 % of them were strongly agree and agree in that order and mass of 41 % were disagree and 24 % were strongly disagree with the statement. Also chi square value depicts that the opinion of respondents was significantly different.

5. Work equally distributed among the employees because of existing HR Planning Process?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	10	10%
2	Agree	23	23%
3	Strongly disagree	27	27%
4	Disagree	40	40%

$\chi 2 = 25.36$ df = 3, $\chi 2$ (.05) = 7.81

Whether work is uniformly distributed among the employees, only 10 % strongly agreed and 23 % agreed While the majority of 40% and 27 % disagreed and strongly disagreed respectively. The chi square value shows that the opinion of respondents was significantly different on this fact.

6. Does HR find good candidates from non-traditional methods when necessary?

S. No.	Opinion	No.	Percent (%)
1	Excellent	09	09%
2	Good	21	21%
3	Adequate	47	47%
4	Poor	23	23%

$\chi 2 = 30.4$ df = 3, $\chi 2$ (.05) = 7.81

On how well HR finds good candidates from nontraditional sources, only 23 % said poor and 47 % of them said adequate and 21 % said very good while 09 % said excellent. Also chi square value depicts that the opinion of respondents was significantly different.

7. Cadila has comprehensive job-descriptions for all the positions?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	30	30%
2	Agree	36	36%
3	Strongly disagree	11	11%
4	Disagree	23	23%

$\chi 2 = 14.26$ df = 3, $\chi 2$ (.05) = 7.87

When asked whether the employees Cadila have job-descriptions, then 30 %

were strongly agree and 36 % were agreed. The chi square value completely shows that the opinion of respondents was significantly different on this fact.

8. HR Planning in the organization helps to analyze effective utilization of human resources?

S. No.	Opinion	No.	Percent (%)
1	Strongly agree	16	16%
2	Agree	46	46%
3	Strongly disagree	14	14%
4	Disagree	24	24%

$\chi 2 = 31.96$ df = 3, $\chi 2$ (.05) = 7.81

On asking to the respondents that HR Planning helps to analyze effective utilization of human resources, 16 % and 46 % of them were strongly agree and agree in that order and 24 % were disagree and 14 % were strongly disagree with the statement. Also chi square value depicts that the opinion of respondents was significantly different.

9. Rate the performance of HR department in HR Planning Process?

S. No.	Opinion	No.	Percent (%)
1	Excellent	12	12%
2	Good	20	20%
3	Adequate	50	50%
4	Poor	18	18%

$\chi 2 = 39.6$ df = 3, $\chi 2$ (.05) = 7.81

On asking respondents to rate performance of HR department in HR Planning, only 18 % said poor and 50 % of them said adequate and 20 % said very good while 12 % said excellent. Also chi square value depicts that the opinion of respondents was significantly different.

Findings

- Majority of the employees are quite satisfied with HRP practices and view the Cadila as a good organisation to work.
- Most of the employees of Cadila belongs to different age groups and are spending dissimilar service period with the organization.
- The management of Cadila, Jammu has defined the HR planning process and system within the organization. But some officials were not sure about it.
- HR planning is a regular process in Cadila which is conducted by the human resources department after a regular or defined time span.
- Most of the officials were having a different view regarding the transparency in the process of HR Planning.
- Somewhere employers do not adequately and transparently communicate recruitment process.
- Manpower in such areas where there are high levels of demand is partially provided.
- It is found that employees are more committed towards their job to get higher reward and appreciation. This attitude towards their jobs is a sign of good job description.
- Most of the employees agree that work allotment is somewhat partial.
- Employees have mutual cooperation and share their experiences to help the other employee that is a symbol of good HR planning.
- Most of the employees especially ground level employees are not happy with physical working conditions.
- Most of the officials were in the favor that they consider all the factors that facilitate the HRP process.
- Most of the officials were in the favor that they maintain the record of the employees.

- More than 60 % employees are satisfied with the performance of HR department at Cadila and remaining is waiting for the change in some policies for effective HR planning and audit

Recommendations

Establishing a HR Planning framework is a major achievement, that enables an organization to ensure how best to use its human resources to achieve outputs and outcomes. Employee plays crucial role in the success of business organization, it is important that organization should put consideration and careful planning into human resource practices. Human resource planning is something that you can learn and improve on through experience and effort. HRP helps to link the long term purpose, goals and objectives of the HR function/HR plans. It also examines what people are presently doing in their jobs in the organization.

- Changing culture requires leaders to understand the learning process dynamics and how the learning and unlearning of assumptions and beliefs can be manipulated to modify human needs and behavior.
- Effective HRP requires equal standards against which procedures and implementation of policies are assessed. In the absence of equal standards, policies are assessed with subjectivity, which may destroy the process of HRP.
- One training program should not be designed to serve a numerous of purposes because it may be unclear and difficult & results into failure. The solution is to separate training and assessment program should be designed for development of employees.
- HR planning should be job-related. Job description should be given to the employees. Bring them into the line of organization's goals with the job objectives so that every employee's work lead to the organizational goal.
- Since the goal of HR planning system is to achieve the organizational goal. Hence there is immense need to coach the employee before and after appointment regularly. Provide the resources required by them to get to the management's expectations.
- Provide training and development for new and experienced employees that enhances critical competencies and behaviors.
- Create career development systems that identify, prepare, and promote employees whose experience and skills match the demands of higher-level positions.
- Design the system which is free from biasness and favoritism because it discourages the employee when it comes to appointment of employees in a long run case.
- Review the systems that support the on-going relationship with the employee. This includes looking at the performance management system, assessing the state of your compensation structures, training and development, plus looking how you handle employee grievances or complaints.
- Determine the gap between where your organization wants to be in the future and where you are now. The gap analysis includes identifying the number of staff and the skills and abilities required in the future in comparison to the current situation.
- HR Planning and audit objectives can be achieved successfully when there is a link or alignment between organizational and unit objectives so to avoid the conflict between team and organization's objectives.

References

1] Anderson, M.W. and Pynes (2004). "The metrics of Workforce Planning", Public Personnel Management, Vol. 33: Pp. 363-378.

2] Bamberger, P. and Meshoulam, I. (2000). "Human Resource Strategy: Formulation,

Implementation, and Its Impact", Thousand Oaks: Sage Publications, Vol. 7: Pp 45-67.

3] Bowey, A. M. (1977). "Corporate Manpower Planning". Management Decisions, Vol. 15: Pp 411-469.

4] Budhwar, P. S., and Khatri, N. (2001). "A comparative study of human resource practices in Britain and India", International Journal of Human Resource Management; Vol 12 : Pp. 803-829.

5] Bulla and Scoh (1994). "Willing Slaves? British workers under Human Resource Management", C.U.P 9th Ed., New Delhi, India, Tata McGraw-Hill. Pp 140-167.

6] Cascio, W. F. (1998). "Managing Human Resources – Productivity, Quality of Work Life, Profits", Boston: McGraw Hill. Pp 57-143.

7] Cascio, W.F. (2006). "Managing Human Resources – Productivity, Quality of Work Life, Profits", 7th Ed., New Delhi, India, Tata McGraw-Hill. Pp 58-167.

8] Chakrabarty, K. C. (2012). "Human Resource Management in Banks- Need for a New Perspective", Inaugural Address by Deputy Governor, Reserve Bank of India at the HR Conference of Public Sector Banks at Mumbai, RBI Monthly Bulletin, July 2012, 1275-1298.

9] Ferris, G. R., Hochwarter, W. A., Buckley, M. R., Harrell-Cook, G. and Frink, D.D. (1999). "Human Resources Management: Some New Directions", Journal of Management, Vol. 25: Pp. 385-415.

10] Joo, B. and Mclean, G. N. (2006). "Best Employer Studies: A Conceptual Model from a Literature Review and a Case Study". Human Resource Development Review, Vol. 5: Pp. 207-228.

11] Milkovich, T.G., and Boudreau, J.W. (1993). "Human resource management". Praha: Grada Publishing, Pp. 190-191.

12] Perry, J.L. (1993). "Strategic Human Resource Management", Review of Public Personnel Administration, Vol 13; Pp. 59-71.

13] Pfeffer, J. (1998). "The human equation: Building profits by putting people first". Boston: Harvard Business School Press. Pp 134-145.

14] Rothwell, S. (1995). "Human Resource Planning." In J Storey (ed.): Human Resource Management – A Critical Text. London. Routledge. Pp 196.

15] Schermerhorn, J.R. (2001). "Management Updated", New York: John Wiley and Sons. Inc. Pp 156-167.

16] Schuler, R. S. and Jackson, S.E. (1987). "Organizational Strategy and Organization Level as Determinants of Human Resource Management Practices", Human Resource Planning, Vol. 10, No.3: Pp.127-144.

17] Schuler, R.S. and Jackson, S.E. (2005). "A Quarter-Century Review of Human Resource Management in the U.S.: The Growth in Human Resource Planning in the International Perspective", Management Review, Vol. 16: Pp. 4-25.

18] Tichy, N.M., Fombrun, C.J., and Devanna, M.A. (1982). "Strategic Human Resource Management", Sloan Management Review, Vol. 23: Pp. 49- 64.

19] Vetter, E. W. (1967). "Manpower Planning for High Talent Personnel". Bureau of Industrial Relations, University of Michigan, Ann Arbor. Pp 56-147.

Internet accessed many times

Book Review

Book Review on *India @100: Envisioning Tomorrow's Economic Powerhouse* by Krishnamurthy Subramanian

Abhijit Biswas

Faculty, Globsyn Business School, Kolkata

Book Review: *India @100: Envisioning Tomorrow's Economic Powerhouse* by Krishnamurthy Subramanian In *India @100: Envisioning Tomorrow's Economic Powerhouse,* Krishnamurthy Subramanian (the previous Chief Economic Advisor to the Government of India) articulates a persuasive vision for the economic future of India. This work is not merely a forecast; it functions as a detailed roadmap outlining how India can leverage its strengths and confront its challenges to ascend as a global economic leader by 2047 (the year that marks the centenary of its independence). Subramanian's academic rigor, combined with his extensive experience in policy-making, endows the book with both credibility and depth. This makes it an indispensable read for anyone interested in India's economic trajectory. However, some readers may find particular sections somewhat dense, which could impede accessibility. But overall, the insights provided are truly invaluable.

Visionary Outlook

Subramanian asserts that India (considering its demographic dividend, entrepreneurial spirit and rapidly advancing technological capabilities) is strategically positioned to transform into a $30 trillion economy by 2047. However, this aspiration can only be achieved through meticulous planning and bold reforms. The author argues that actualizing this vision demands a dual focus on economic growth and social advancement. He emphasizes the necessity of addressing structural inefficiencies, fostering innovation and building resilient institutions to sustain high growth rates over the next two decades, although this will entail coordinated efforts and considerable investment.

Analytical Depth

The book is structured around crucial themes that are vital to India's progress (including governance, technology, financial inclusion, education, healthcare and infrastructure). Each chapter delves into these topics through a critical lens, providing not only historical context but also forward-looking insights.

For example, Subramanian investigates how India's economic reforms in the 1990s laid the groundwork for its current growth trajectory; however, he emphasizes the need for a second wave of reforms to tackle challenges like income inequality, regional disparities and climate change. One significant strength of the book is its data-driven methodology. Subramanian supports his claims with empirical evidence, drawing from a wide range of sources (such as government reports, global indices and academic studies).

This analytical rigor not only boosts the book's credibility but also makes its arguments persuasive. For instance, the author uses labor force participation data to highlight

the underutilized potential of women in the workforce and suggests actionable strategies to enhance gender equity in employment.

Reform Agenda

Subramanian's reform agenda is both ambitious and pragmatic. He champions policies that not only facilitate ease of doing business (which is essential) but also promote productivity and stimulate innovation. The book underscores the importance of fiscal prudence, suggesting that India's economic strategies must reconcile growth ambitions with macroeconomic stability. Furthermore, Subramanian underscores the pivotal role of technology in catalyzing economic transformation, particularly through advancements in digital infrastructure, artificial intelligence and blockchain. Education and healthcare emerge as fundamental pillars in Subramanian's vision; however, the author contends that India's demographic dividend could transform into a liability if the population lacks adequate skills and health. He advocates for a comprehensive overhaul of India's education system to emphasize quality and inclusivity, but he also supports universal healthcare initiatives to enhance productivity and mitigate economic disparities. Although these reforms are imperative, they necessitate concerted efforts and significant investment to unlock their full potential.

Global Perspective

Another notable aspect of India @100 is its global perspective. Subramanian (1) assesses India's development in comparison to other emerging economies, particularly China. He identifies areas where India has lagged, such as manufacturing and infrastructure; however, he offers insights on how India might embrace global best practices. This analysis is vital because, concurrently, he highlights India's unique strengths, like its democratic framework and vibrant entrepreneurial climate, which can serve as essential differentiators in the international marketplace.

Challenges and Critiques

Although the book presents an optimistic outlook, it does not shy away from addressing the significant challenges that India faces. Subramanian delves into issues such as bureaucratic inefficiencies, corruption and the sluggish pace of judicial reforms. He also explores the environmental consequences of rapid industrialization and emphasizes the need for sustainable growth models. However, some readers may find the book's ambitious goals daunting. The aspiration to achieve a $30 trillion economy by 2047 presupposes an average annual growth rate exceeding 7%—this requires consistent policy implementation and global economic stability, factors that are not entirely within India's control. Furthermore, while the book provides a comprehensive overview, certain sections (like those that concentrate on social equity and rural development) could have benefited from a more thorough examination.

Writing Style and Accessibility

Subramanian's prose is clear (and engaging), rendering intricate economic concepts accessible to a diverse audience. He adeptly navigates the tension between academic rigor and narrative clarity—this enables the text to resonate with policymakers, scholars and everyday readers alike. Furthermore, the incorporation of anecdotes and case studies introduces a human dimension to the discourse, which makes the material not only relatable but also impactful. However, some might perceive the balance as delicate; although it is well-executed, the simplicity risks oversimplifying complex ideas. Nevertheless, because of the thoughtful approach, readers can connect with the content on various levels.

Conclusion

India @100: Envisioning Tomorrow's Economic Powerhouse embodies an inspiring and insightful endeavor (which merges visionary thinking with practical strategies).

Krishnamurthy Subramanian's expertise and passion for India's development shine through in each chapter; therefore, the book represents a substantial contribution to the discourse surrounding India's economic future. However, although it is ambitious in its goals, the book functions as a wake-up call for policymakers, entrepreneurs and citizens to work together toward realizing India's immense potential. For those who believe in India's promise (and are enthusiastic about contributing to its progress), this book provides both a blueprint and a call to action. As India advances toward its centenary, India @100 will, without a doubt, act as a guidepost for envisioning and achieving a brighter, more prosperous future.

Book Review

Learning to Dance with Failure

Manas Chakravarty

Faculty, Globsyn Business School, Kolkata

Right Kind of Wrong

How the Best Teams Use Failure to Succeed

Amy Edmondson

Penguin Books

FT and Schroders

Business Book of the Year 2023

Learning from failure has been emphasized in various philosophies across cultures but they do not easily lend themselves to creating an actionable blueprint that individuals and institutions may adopt. *Right Kind of Wrong* by Amy Edmondson fills that gap.

The academician that she is, Edmondson sets out with definitions right at the beginning, distinguishing failure from violation and error. Failure is lack of expected success. It could be a failure to win a sports medal or a start-up that goes bankrupt.

It is any outcome that deviates from the desired result. Violations are deliberate deviations from rules or procedures while errors are unintentional. For example, a fire caused by an arsonist is deviant behavior and therefore a violation, but a fire resulting from forgetting to ensure safe storage of combustible material is an error. The author has similarly explained other terminologies as and when they appear in a manner that are academically accurate but easily understood by all.

Beyond the prologue and introduction, the book comprises two parts having four chapters each. In Part One, the "failure landscape" is painted creating a framework for failure typology. Key concepts relating to the science of failure is covered in the first chapter followed by one each devoted to the three types: intelligent failure, basic failure and complex failure. Edmonson calls basic failures as those that are easily understood and most preventable, giving the example of an email sent to a wrong address. Sometimes basic failures may be devastating, nonetheless they remain basic considering that they happen due to one simple cause. On the other hand, complex failures have multiple causes often laced with bad luck. They happen due to inherent uncertainties and interdependence of situations. Complex failures have to be nipped in the bud before they spiral out.

Intelligent failures have been also called the "good failures" which provide learning opportunities. In doing something new, there is always a chance of failure. It is important to learn

from them rather than being in denial or feeling guilty about it and giving up. Intelligent failures have four attributes: they are not due to lack of preparation, they happen in new territory, their size is small enough for the organization to absorb the consequences, and, the context of the failure provide meaningful opportunity to advance towards a desired goal.

Part Two of the book lays out "tactics and habits" that people may deploy to practice the science of failing well, both at work and also in their personal lives with focus on awareness. It contains three chapters devoted to developing the capabilities of self-awareness, situation awareness and system awareness and their interplay with the three types of failures. The theme of the last chapter is thriving with failure and serves as a capstone to the various ideas related to good failure articulated in the previous chapters. Edmondson suggests that for institutions it is important to build a healthy failure culture which, among other things, requires rewarding the "right kind of wrong."

It is interesting that, to emphasize different aspects covered by the book, its subtitle varies from edition to edition: *Science of Failing Well, Why Learning to Fail Can Teach Us to Thrive*, and *How the Best Teams Use Failure to Succeed*. The book does justice to all three. As Edmondson mentions in the introductory chapter, reading the book is a "satisfying journey of learning to dance with failure."

Book Review

Nexus: A Brief History of Information Networks from the Stone Age to AI – Yuval Noah Harari

Tanusree Chakraborty

Faculty, Globsyn Business School, Kolkata

Yuval Noah Harari's "Nexus: A Brief History of Information Networks from the Stone Age to AI" presents a comprehensive examination of how the dissemination of information has influenced human societies (from ancient oral traditions to the contemporary digital era dominated by artificial intelligence). Building on themes established in his previous works, such as "Sapiens" and "Homo Deus," Harari investigates the evolution of information networks and their significant impact on civilization. The book is organized into two primary sections: the first explores historical developments, charting the advancement of information technologies (including storytelling, clay tablets, the printing press and the internet). Harari highlights how every technological leap has shaped societal structures, governance and interpersonal relationships. For example, the invention of the printing press democratized knowledge; however, it also resulted in unintended consequences, such as the proliferation of misinformation and witch hunts. This complex interplay of progress and pitfalls illustrates the dual-edged nature of technological advancement, which continues to resonate today.

In the latter half, Harari (1) shifts his focus to the contemporary era, analyzing the rise of artificial intelligence. He introduces the concept of AI as an "alien intelligence"— fundamentally different from human cognition. This perspective prompts readers to consider AI not merely as a tool; instead, it is an independent agent capable of making decisions that may (2) surpass human understanding. However, one must ask: what implications does this have for society? Although AI offers numerous benefits, it also raises ethical questions. Because of this, understanding its nature is crucial.

A central theme (in "Nexus") is the dual-edged nature of information networks. Although they have facilitated human progress, they have also been harnessed for control and manipulation. Harari warns against the naive belief that increased information naturally leads to more openness and cooperation; however, he argues that, without proper safeguards, information networks can become instruments of surveillance and oppression. This is especially true when combined with advanced AI technologies, because the risks can escalate dramatically.

Harari's narrative is imbued with historical anecdotes and comparisons that illuminate contemporary dilemmas. He (1) draws parallels between the past and present, illustrating how the challenges posed by today's AI revolution resonate with those encountered during previous technological upheavals. This historical perspective encourages readers to contemplate the cyclical nature of human responses to technological change. However, some critics contend that "Nexus" reiterates points from Harari's earlier works, because it fails to offer substantial new insights. The Times describes

the book as "a retread of old ideas without providing significant new insights or practical guidance on future challenges." Although the narrative has merit, its repetitive nature may leave some readers wanting more.

The book has faced critiques for its sweeping generalizations and insufficient depth in certain (particular) areas. However, despite these criticisms, Harari's talent for synthesizing complex ideas into an accessible narrative remains evident. In conclusion: "Nexus" serves as a thought-provoking examination of the evolution of information networks and their profound impact on human societies. Harari's exploration of the interplay between technology, information and power offers valuable insights—especially pertinent in an era where AI's influence is rapidly expanding. Although the book may traverse familiar territory for readers of his previous works, it nonetheless provides a compelling narrative that encourages reflection on the challenges and opportunities presented by our increasingly interconnected world.

Globsyn Management Journal

globsyn
business school
AMBITION OF THE YOUNG

ABOUT GLOBSYN MANAGEMENT JOURNAL

Globsyn Management Journal is an EBSCO listed bi-annual publication of Globsyn Business School, Kolkata, India. Globsyn Management Journal (GMJ) is also available in the Pro Quest database. Its objective is to contribute to a better understanding of organizations and their functioning by presenting conceptually sound and methodologically rigorous articles which provide insights and advanced knowledge on managerial, business and organizational issues.

A typical issue of the journal would carry a mix of research articles, book reviews, perspectives and case studies. ***Research Articles*** would be analytical and/or empirical in nature and focus on the analysis and resolution of managerial issues in organizations. ***Book Reviews*** would present reviews of current books on various domains of management. ***Perspectives*** would aim to identify and highlight emerging issues and paradigms in management ***Case Studies*** would aim at an intensive analysis of a real life decision taken at the individual or the organizational level, which may be functional, operational or strategic in nature.

GUIDELINES FOR AUTHORS

Globsyn Management Journal invites original contributions from both academicians and practitioners on various management, business, and organizational issues. The journal welcomes research-based articles on topics of current concern.

Articles, based on theoretical or empirical research or experience, should illustrate the practical applicability and/or policy implications of the work described. Each article is refereed.

Submissions should indicate relevance and clarity. Empirical articles should have an appropriate methodology and be able to justify the use of the methodology to arrive at the findings besides relating their findings to the existing literature in this body of research. Methodological articles must attempt to show how they inspire further development and research.

The Journal tries to maintain a balance between purely research-oriented articles and those based purely on the experiences of practitioners involved in different areas of management.

A typical research arrticle may have the following headings and sub-headings:

1. Introduction
2. Literature Review
3 Objective of the Study
4. Methodology
   a. Sample Design
   b. Methods of Data Collection
   c. Data Validation
5. Data Analysis or Findings
6. Conclusion
7. Way Forward
8. Bibliograhy

Manuscript

The author/s should send three copies of the manuscript. The text should be typed double-spaced only on one side of A4 size paper in MS Word, Times New Roman, 12 font size with one-inch margins all around. The manuscripts should have a cover page bearing only the title of the article, author/s' names, designations, official addresses, phone/fax numbers, and e-mail IDs. The first page of the article must also provide the title of the article but it should not give the author/s' name and address. The author/s' name should not appear anywhere else on the body of the manuscript to facilitate the blind review process. The articles should be in clear, coherent and concise English. Professionally drawn graphs and diagrams must be provided wherever necessary along with the manuscript.

For all tables, charts, and graphs, the source should be indicated, wherever necessary. Tables should be numbered consecutively in Arabic numerals and should be referred to in the text as Table 1, Table 2 etc. All notes must be serially numbered. These should be given at the bottom of the page as footnotes.

The following should also accompany the manuscripts on separate sheets: (i) An abstract of approximately 150 words with a maximum of five key words, and (ii) A brief biographical sketch (60-80 words) of the author/s describing current designation and affiliation, specialization, number of books and articles in refereed journals and membership on editorial boards and companies, etc.

The author/s can also e-mail the manuscript to GBS Journal Office at **gbsjournal@globsyn.edu.in**

The hard copy and electronic files must match exactly. Author/s should also certify that the article has not been published or submitted for publication elsewhere.

The word limit of the various sections are as follows:

- Research Article - 5000 words approx
- Perspective - 1000 words approx
- Case Study – 5000 words approx
- Book reviews - 500 words approx

Review and Acceptance

The review process followed by *Globsyn Management Journal* is systematic and thorough. Articles submitted to the journal are initially screened by the editor for relevance and quality including presentation of concepts, methodology and findings. Inappropriate or weak submissions are not forwarded for a formal review. Those considered appropriate are put through a double blind review process that may take between three to four months. Author/s may be asked to revise and resubmit a manuscript based on the referees' comments.

Once an article is accepted, a camera-ready copy of it (the final version) must be sent in a CD to the editor. The CD should not contain any other files (i.e., not related to the article being submitted). In case of multiple authors, all correspondence would be done with the first author, unless otherwise stated. For this, the author must provide an easily contactable email address or phone number/fax so that the editorial office can get in touch with the author in case of queries during the copy-editing stage.

All material and editorial correspondence should be addressed to:

The Editor,

Globsyn Management Journal,

Globsyn Business School - Kolkata

Globsyn Knowledge Campus,
Mouza Chandi, P.S. Bishnupur, J.L. No. - 101, District - 24 Parganas (South), Kolkata - 743503.
Tel: +91-33-6600 3600, Fax: +91-33-2480 8032
Website: *www.globsyn.edu.in*

The contributions received will be acknowledged immediately.

Manuscripts not considered or not accepted for publication will not be sent back. Contributors whose contributions are accepted or rejected will be informed by e-mail only.

References

References should be given separately at the end of the article and arranged alphabetically. The list should include *only* work that has been cited. *The following style should be strictly followed*:

For Journals:

Cascio, W F (1993). "Downsizing: What Do We Know? What Have We Learned?" *Academy of Management Executive, 7(1), 95-104.*

For Books:

Drucker, P (1999). *Management Challenges for the 21st Century*, New York, NY: Harper Collins.

For chapters in books:

Srinivas, E S (1994). "Perceived Quality of Working Life (PQWL) and organizational commitment: A study of managers in select organizations" in Gupta, N and Ahmad, A (eds.), *Management Research: Contemporary Issues*, New Delhi: South Asia Publications.

For electronic documents:

Basu, I (2004). "India's thorny FDI rule under scrutiny," *Asia Times*, May 28, http://www.atimes.com/atimes/South_Asia/FE28Df03.html Accessed on April 27, 2004.

In the text, the reference should appear as follows:

Theil (1970) has shown… or Recent studies (Gupta, 1990; Srivastava, 2003; Sen, 1999, 2001; Dasgupta, 2003a, 2003b) indicate...

Page numbers should be given whenever another author/text is quoted:

According to Saini (2000, 35), "The buzz word in people management in India is HRD and not HRM."

Every article must be accompanied by a statement that the article is the author/s' own work and has not already been published or submitted to any other journal for publication.

All authors must sign the 'Transfer of Copyright' Agreement before the article can be published. This transfer agreement enables GBS to protect the copyrighted material for the author/s, but does not relinquish the author/s' proprietary rights. The copyright transfer covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of a similar nature and translations and includes the right to adapt the article for use in conjunction with computer systems and programs, including reproduction or publication in machine-readable systems.

Also, author/s are responsible for obtaining from the copyright holder permission to reproduce any figures for which copyright exists that they use in their contribution.

Note: The views expressed in the articles in Globsyn Management Journal do not necessarily reflect the opinion of the Institute.

Subscription Rates For Globsyn Management Journal (GMJ)

Subscription (2 Issues Per Year)

Rates	Per Copy	1 Year	2 Years	3 Years
Indian				
Corporates	₹500	₹1000	₹1800	₹3500
Academic Institutes	₹400	₹800	₹1500	₹2000
Individuals	₹200	₹400	₹7500	₹1000
Foreign				
Academic Institutes	$25	$45	$80	$115
Individuals	$15	$25	$40	$55

All payments are to be made by drafts drawn in favour of Globsyn Technologies Ltd. payable at Kolkata.

Journal Mailing Address

Name: _____

Organization: _____

Address: _____

Country: _____ **City:** _____ **Pin:** _____

Phone: _____ **Fax:** _____ **Email:** _____

Mail the completed form along with your draft to:

The Editor, Globsyn Management Journal, Globsyn Business School, Mouza Chandi, PS - Bishnupur, J.L. No. - 101, District - 24 Parganas (*South*), Kolkata - 743 503, Phone: +91-33-6600 3600

Email: gbsjournal@globsyn.edu.in, Website: http://www.globsyn.edu.in/globsyn-management-journal

Advertisement Rates For Globsyn Management Journal (GMJ)

Size	B&W	Color
Full Page	₹10,000	₹15,000
2nd Cover	NA	₹25,000
3rd Cover	NA	₹30,000
Back Cover	NA	₹35,000

All payments are to be made by drafts drawn in favour of Globsyn Knowledge Foundation payable at Kolkata.

Order Form

Name : _____

Organization: _____

Address: _____

Country: _____ **City:** _____ **Pin:** _____

Phone: _____ **Fax:** _____ **Email:** _____

Mail the completed form along with your draft to:

The Editor, Globsyn Management Journal, Globsyn Business School, Mouza Chandi, PS - Bishnupur, J.L. No. - 101, District - 24 Parganas (South), Kolkata - 743 503, Phone: +91-33-6600 3600

Email: gbsjournal@globsyn.edu.in, Website: http://www.globsyn.edu.in/globsyn-management-journal

ISSN: 0973 - 9181

Globsyn Knowledge Campus
Mouza Chandi, PS - Bishnupur, J. L. No. - 101, District - 24 Parganas (South)
Kolkata - 743 503 Phone: +91-33-6600-3600

gbsjournal@globsyn.edu.in

www.globsyn.edu.in