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# Adoption of AI-Integrated Social Media Applications: An Application of Diffusion of Innovation Theory

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**Abstract:**
This study explores the adoption of artificial intelligence (AI)-integrated social media applications through the lens of Everett Rogers' Diffusion of Innovation (DOI) theory. Using a quantitative survey of 150 university students in South Punjab, the research investigates perceptions, attitudes, and adoption trends concerning AI features in social media platforms. The findings suggest that AI-driven social media applications are generally viewed positively, with a significant inclination towards adoption driven by perceived benefits such as enhanced engagement, personalization, and future relevance. However, concerns regarding ethical issues and misuse persist. The study highlights the importance of strategic diffuse ion and responsible governance in shaping the future landscape of AI in social media.

**Keywords:** AI, Social media, Diffusion of innovation, Digital content, Human Intelligence

## Introduction

The capacity of a digital computer or computer-controlled robot to carry out actions typically performed by intelligent individuals is known as artificial intelligence (AI). There are two types of AI: narrow AI for specific tasks and general AI for any cognitive task. The term "AI" was coined in 1956 when John McCarthy, the father of AI, coined the term. The evolution of AI was by stages; remarkable progress was obtained in the 1970s, including that of expert systems. We've made lots of progress with certain tasks, like image and speech recognition, with advances in machine learning, particularly deep learning. Also in 1997, IBM's Deep Blue defeated chess champion Garry Kasparov, while in 2016, Google's AlphaGo defeated Go champion Lee Sedol, highlighting AI systems' ability to surpass expert human intelligence in complex games (O'Neil, 2016). The advent of big data and improved computational power has further accelerated AI development, with AI rooted in various applications such as autonomous vehicles, healthcare diagnostics, financial modeling, and natural language processing. AI has implications for the economic, ethical, and social. It could increase productivity, help economic growth, and reduce employment worries. However, the path to responsible and ethical AI deployment involves crucial questions of accountability, transparency, and reduction of bias, for which careful governance is necessary for answerable deployment and development of AI (Russell & Norvig, 2016). Increasingly, social media platforms use Artificial Intelligence for the purpose to improve

user engagement, satisfaction, and safety. At the forefront of the usage of AI in driving user engagement and content curation, AI is changing how users engage and consume information online. Content recommendation is one of the most prominent applications of AI in social media. Thus, Facebook, Instagram, and Twitter, for example, use algorithms that evaluate user interactions and preferences to personalize the feeds. The personalization of this enhances user retention and satisfaction, meaning users tend to spend longer on the platform. Furthermore, AI-driven algorithms can reduce content that might not feel relevant to a given user, improving UX and increasing ad value (Zuboff, 2019). Content moderation by social media platforms gets complicated, and this is where AI comes into play. Natural language processing (NLP) and image recognition technologies allow AI-driven moderation systems to automate this process spotting hate speech, obscene content, and fake news. It however has drawbacks of the misclassification of the streams and the possibility of censorship. The other most important implementation of AI in social media are chatbots, which provide real time interaction with users. AI-driven tools powered by these create an AI that can answer questions, provide customer support and even hold conversations with users almost indistinguishable from human interactions (Fuertes, 2024). With chatbots, users are able to have a quicker time engagement and satisfaction without human intervention. When social media applications utilize AI, it results in highly personalized user experience and resulting higher relevancy of information available to the user. Processes like content moderation and customer interaction are automated so as to add to the overall efficiency social media operations, minimizing need for massive human resource. Thanks to AI, social media platforms can analyze massive amounts of data they collect to give users insights of their behavior and preferences, which drive user engagement and sales (Saha, 2023). However, several challenges must be addressed. The risks associated with algorithmic bias, concealment concerns, and the spread of misinformation necessitate a balanced approach to AI governance in social media. Policymakers, technologists, and the social order must work collaboratively to ensure responsible AI development and deployment that promotes equity and ethical practices. As AI endures to advance, its implications for social media and society will require ongoing reflection and dialogue to ensure that the technology serves the greater good. Everett Rogers created the diffusion of innovations hypothesis, which describes how novel concepts and technological advancements proliferate within a community. When applied to artificial intelligence (AI) in social media, this framework helps understand how AI technologies are adopted, adapted, and integrated into various platforms and user behaviors. Early adopters, early adopters, early majority, late majority, and laggards determine factors affecting the diffusion of AI in social media (Kerner, 2024). Innovators are tech-savvy companies and developers who experiment with new technologies, while early adopters are influential users or organizations willing to take risks on new technologies. Early majority adopts innovations once they see proven benefits, while late majority is skeptical and adopts innovations only after the majority of people have adopted them. Laggards are traditionally resistant to change and may only adopt new technologies when necessary.

Factors swaying the diffusion of AI in social media include comparative advantage, compatibility, complexity, trainability, and observability. Users are more likely to adopt AI if they perceive clear benefits, such as improved engagement, enhanced user experience, and better analytics. AI algorithms curate feeds based on user preferences and engagement patterns, and businesses use AI to improve customer service and engagement on platforms like Messenger and WhatsApp. By analyzing this phenomenon through Rogers' framework, stakeholders can better strategize in introducing and promoting AI tools in the ever-evolving landscape of social media (Choudhury, 2014).

**Objectives of the Study**

1. To investigate the impact of the adoption of AI-integrated social media applications
2. To explore the role of diffusion of innovation in the adoption of AI-integrated social media applications

In this digital age, data is the new oil; Artificial Intelligence (AI) is the new electricity. These are needed technologies for a variety of OM functions including supply chain, production, product development, and services. With Grover and AK Dwivedi mining the collective intelligence of the experts on academic and literature Twitter, the study looks at AI viability in an organization by studying six factors. We model job fit, complexity, long-term penalties, effect towards use, social factors, and facilitating conditions for different OM elements. Finally, we describe the limitations of the study and suggest some possible directions for further research. In addition, it provides a reference for managers in adopting AI in other OM components (Grover, 2022). Since businesses are using social media (SM) more and more, it is still difficult for them to communicate effectively in the digital age. This paper offers an empirically proven model and examines the many SM interactions that organizations have with regard to artificial intelligence (AI). Semi-structured interviews with the CEO, director, chief entrepreneur, and/or related senior management of AI-using companies were done as part of a qualitative study design. The study suggests the "micro-foundation of social media routine framework," which comprises three processes and four stages, based on an examination of these interviews. This practice incorporates AI to control user participation on businesses' social media accounts. This practice offers the chance to build trusting connections with clients (Ghouri, 2022).

Nizar Zorba, Muhamed Aboualola and Khalid Abualsaud have found out in their study that with technologies such as edge sensing, IoT (Internet of things), social media analytics, big data, and so forth along with edge computing, artificial intelligence and the like, we can start creating emergency aware systems. These save disaster management tasks like visualizing, analyzing, or predicting a disaster. Based on this, this paper reviews recent emergency and disaster management literature concentrating on the purview of multiple edge technologies. In particular, artificial intelligence and social media analytics are critical due to the role played by emergencies. On the one hand, artificial intelligence deals with the enormous amount of data that smart devices produce; on the other hand, social media is full of data. Through providing a broad overview of recent literature, the survey organizes papers into four phases and discusses open issues and research trends for emergency and disaster management systems (Aboualola et al. in 2024). The study by Ankish Milan and Rakesh Sahu looks into the applications and their integration of artificial intelligence (AI) into social media marketing. Much of AI’s effects on marketing have come in the form of analyzing large chunks of data and making predictions that help companies better target their advertising and content. With this, businesses are able to understand the consumer through his perspectives, feelings, and responses towards a brand or product, bringing more people into the loop. AI uses adopted by companies have improved their efficiency, logistical networks, reduced costs, and brought up revenues by 10%. AI also helps secure user data privacy and makes businesses using social media marketing with AI profitable (Ankush Milan, 2023). Another place where AI has a big effect is personalizing. The study conducted by Dave Lewis is focused on the trustworthy approach of AI in social media. The study shows that AI is being used more and more by social media companies to examine user behavior and mental health. It is challenging to forecast the harm that this AI-generated material and virtual agents will do, though, because they pose new concerns. It is essential to effectively

regulate AI components in order to guarantee reliable social media. In order to uncover possible over-reliance on individual rights and to suggest a communal approach to AI data governance. This paper analyses many methods to AI governance and Big Data processing. The authors examine the advantages and disadvantages of using AI in two use scenarios using the Institutional Analysis and Development methodology (Dave Lewis, 2020). In order to preserve confidence in the use of AI, they suggest governance through shared data ownership.

This study aims to investigate the usage of artificial intelligence (AI) in social media marketing by focusing on the benefits, drawbacks, and moral factors affecting such a practice. The ability for artificial intelligence to quickly and efficiently analyze data is just one of the many benefits that this brings. Because of this, they see more and more marketers about consumer behavior, preferences, and interactions. Therefore, customers will be able to create customized marketing, increasing customer engagement rate and conversion rate. Additionally, AI-driven solutions are also utilized for 24×7 monitoring as well as timely acts and reactions, which keep the businesses on top of the trends and, besides, make them revise their approach constantly (Dr. Satyender Yadav, 2024). To extract location-oriented public attitudes on worldwide crisis scenarios, a new, completely automated system based on artificial intelligence and natural language processing (NLP) has been created. The program analyses social media feeds on catastrophes in 110 languages using anomaly detection, sentiment analysis, and entity recognition (NER), regression, and Getis Ord Gi algorithms, which are based on AI and NLP. From September to October 2021, the system was evaluated on real-time Twitter feeds, handling 67,515 items in 39 different languages. The system used catastrophe intelligence to present the locations of potential disasters and retrieved 9727 location entities with a confidence level of above 70%. As the first to report location intelligence using sentiment analysis, NER, anomaly detection, and regression, on social media connected to catastrophes, the fully automated disaster monitoring solution showed 97 percent accuracy (Sufi & Khalil, 2023).

**Theoretical Framework**

The Diffusion of Innovations (DOI) theory, which is introduced by Everett Rogers (2003) and serves as a paradigm for understanding how new technologies, including AI-integrated social applications, are adopted and spread, forms the foundation of this study. According to the DOI theory, how innovations are taken up over time in social systems and what five attributes of an innovation impact its adoption in relative fields are described. The Diffusion of Innovations (DOI) theory, worked out by Everett Rogers, explains in general why and how new ideas and technology spread, especially in relation to social media. Lastly, it divides users into five segments. Early adopters, early majority, late majority, innovators, and laggards. The effective communication channels are social media platforms, peer referrals, and digital marketing channels, which ensure a successful diffusion process. Adoption rates increase with relative advantage, compatibility, complexity, trialability, and observability. By targeting user groups, one can employ content marketing to influence innovators and early adopters, with enough case studies and testimonials from early adopters as well as demonstration videos and tutorials to give the late majority and laggard's peace of mind. Incorporating the DOI framework into the study of AI-integrated social media applications provides critical insights into user behavior and adoption dynamics. By understanding the distinct needs and characteristics of user groups, developers and marketers can design more effective strategies for successful innovation diffusion.

**Research Questions**

**RQ1.** What is the impact of adopting AI-integrated social media applications?

**RQ2.** What is the role of diffusion of innovation in the adopting AI-integrated social media applications?

This study adopts a quantitative survey approach, targeting 150 university students across South Punjab. A structured questionnaire, based on the constructs of DOI theory, was used to gauge perceptions, attitudes, and behavioral intentions regarding AI in social media. The questionnaire included closed-ended Likert scale questions, focusing on AI's benefits, ease of use, adoption likelihood, ethical concerns, and future relevance. Participants were selected via simple random sampling to ensure demographic diversity. Data were analyzed using SPSS, employing t-tests and ANOVA to examine differences based on gender, age, and educational level.

**Survey Methodology**

In order to explore the adoption of AI-integrated social applications by university students in South Punjab, assisted by the Diffusion of Innovations (DOI) theory, the researcher has used a quantitative survey methodology. This theory tells us about how over time, people adopt or spread new technologies, such as AI. The researcher takes a quantitative approach, which involves gathering numerical data from which one can measure and analyze statistically. For example, this method is good in an attempt to understand the patterns and trends of how students adopt AI-integrated social applications, since it gives answers that are simple and objective.

**Participant Demographics**

- **Gender:** 72% female, 28% male
- **Age:** 72% (18-24 years), 16.7% (25-34 years)
- **Education:** 46% Master's, 26.7% undergraduate, 18.7% M.Phil, 8.7% Ph.D

**Applying Test for Results**

**T-test for Gender**

| | Independent Samples Test | | | | | |
|---|---|---|---|---|---|---|
| | **You're Gender?** | **N** | **Mean** | **Std. Deviation** | **t** | **Sig. value** |
| Total | Male | 42 | 50.0238 | 11.94191 | -.777 | .438 |
| | Female | 109 | 51.5596 | 10.44689 | | |

This table indicates the results of an **independent samples t-test** comparing both genders including male and female participants. There is **no statistically significant difference** between both genders i.e. male and female. It consists of significance value **(0.438) > 0.05,** indicating that the difference between the means (males vs. females). So, result is **not statistically significant**.

**ONEWAY ANOVA for Level of Education**

**ANOVA**

| | **Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
|---|---|---|---|---|---|
| Between Groups | 49.604 | 3 | 16.535 | .138 | .937 |
| Within Groups | 17655.747 | 147 | 120.107 | | |
| **Total** | 17705.351 | 150 | | | |

The ANOVA table indicates the results of **comparing** for the level of education. It consists of significance (Sig.) value as **(0.937) > 0.05**. So, the result **is not statistically significant**. There is no statistically significant difference between the level of education groups based on this ANOVA test.

**ONEWAY ANOVA for Your Age Difference**

**ANOVA**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1160.044 | 4 | 290.011 | 2.559 | .041 |
| Within Groups | 16545.307 | 146 | 113.324 | | |
| **Total** | 17705.351 | 150 | | | |

The ANOVA table indicates the results of **the** comparing for the level **Your Age Difference.** It consists of **Significance (Sig.) value as 0.041 < 0.05. So,** the result is **significant**. There is a statistically significant difference (age difference) between the groups based on Anova test.

**Results:**

This section obtained the results through Random Sampling and SPSS Statistical tool.

**Key Findings**

- A majority (82.7%) express positive attitudes toward AI-integrated social media applications.
- Over 74% believe these applications improve user experience and information sharing.
- Around 70% recognize AI's role in fostering engagement and community building.
- Ethical concerns, including potential misuse and privacy issues, are acknowledged by over 60% of respondents.
- Diffusion phase analysis indicates increasingly favorable perceptions, with many users willing to adopt new AI-driven platforms.

**Statistical Analysis**

- No significant gender differences were found in perceptions ($p > 0.05$).
- No significant education differences were found in perceptions ($p > 0.05$).
- Age significantly influences perceptions, with older students more cautious about ethical concerns ($p < 0.05$).
- The data suggest a transition from early adopters to early majority within the cohort, aligning with DOI's social diffusion pattern.

**Discussion**

The study explores the perception, feelings, and actions of South Punjab university students towards AI-integrated social media platforms using Everett Rogers' Diffusion of Innovation theory. The findings reveal that most respondents are aware of the advantages of AI and are eager to use AI-enabled features, suggesting a favorable attitude towards technological advancement. Early adopters, such as students who regularly use social media for one to four hours daily, are aware of the benefits of integrating AI, such as improved user engagement and tailored experiences. Over 70% of respondents agree or strongly agree that AI capabilities enhance social media engagement and provide consumers a better understanding of their usage habits. The study also emphasizes the ease of use of AI-enabled services, with over 80% of respondents finding AI features straightforward to use. This simplicity reduces complexity and encourages

experimentation with AI-driven social media tools. However, the results show differing opinions on the dangers and moral dilemmas associated with AI usage, including possible abuse, harm to creativity, and privacy concerns. More than 60% of respondents express worry about possible abuse, emphasizing the need for ethical AI deployment. Diffusion phases indicate that AI integration is currently at the early-to-early majority phase among university students. Many want to adopt or continue using AI apps in the future, and they are aware of and receptive to AI characteristics. AI will continue to be crucial to the development of social media, as seen by the high response rate to queries concerning its future significance. Focused tactics in driving AI adoption include leveraging ethical protections, user-friendly design, and educational benefit around all adoption decisions. Future studies could examine the effect of specific AI features on different demographic groups in different social and cultural settings and long-term effects.

**Conclusion**

The research emphasizes the importance of understanding how innovations like artificial intelligence (AI) become part of social media ecosystems. The diffusion of innovation theory by Everett Rogers provides a framework for understanding this process, explaining five key characteristics that impact adoption rates: relative advantage, compatibility, complexity, trialability, and observability. The study focuses on how AI articulation of social media platforms contributes to community formation, user engagement, and content relevance but also creates ethical, privacy, and misinformation issues. The research shows that early adopters and influencers are important in spreading AI technologies, as they are buoyed by perceived utility and usability. AI's ability to customize material and permit real-time interaction accelerates dispersion between user groups, particularly among tech-savvy young people. However, abuse-related ethical issues and potential detrimental side effects still impede wider adoption. The diffusion theory demonstrates how user views, demographics, and technological features impact AI adoption behavior, which is particularly relevant for explaining AI dynamics in social media. Responsible governance and user education are seen as essential to reduce dangers and increase confidence in AI-driven systems. As AI becomes a reality, media content creation, delivery, and personalization have all been changed. Conventional media gatekeepers' functions are moving to AI functions, algorithmic driven recommendations, targeted advertisement, automated news making, and content regulation. However, these technologies also pose problems in terms of disinformation, data privacy, and moral limits of machine-driven decision making. Effective regulatory frameworks are needed to ensure that mass media serves the public interest while protecting user rights and freedom of speech. The future of mass communication will be shaped by a convergence of technology innovation, human creativity, and informed public policy. Inclusive, moral, and sustainable media systems must be developed to address the diversity and vibrancy of modern society, and the promise of AI must be embraced with understanding how innovation diffuses.

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