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# A Unified AI-powered Social Media Platform for Intelligent Scheduling and Data Driven Analytics Using Multi-Layered Artificial Neural Networks (ANNs)

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## ABSTRACT

The paper presents a new process of data analytics of users of social networks (SN) based on the use of artificial neural networks (ANN). , which allows engaging with consumers in real-time, Data sentiment analysis. Nevertheless, the existing Deep learning models deal with single-task aspects and do not dynamically model user interactions and sentiment changes. In this regard, we put forward an AI combined Unified Hybrid Attention-based

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Personalized Artificial Deep Neural Network (A-DNN), a single deep learning system that incorporates hierarchical attention, hybrid optimization, and personalized brand suggestions. A-DNN is an adaptive, dynamically prioritized engagement signal-based and sentiment signal-based hyper-parameter tuning with Moth-Flame Optimization (MFO) that enhances training efficiency and offers a 95% accuracy to the proposed model on the training set and a 92% accuracy to the proposed model on a testing set. Massive experiments show that A-DNN is more effective in engagement prediction Data with an A-DNN 17.5% minimized MSE, sentiment classification accuracy Data with a 4.1 percentage increase, and prediction performance compared to the existing methods. The trend in the analysis and application of social media currently is the use of pre-determined features, which are dedicated to the subsequent modules of development of the model, to fulfill the final tasks. Representation learning has been a central issue in machine learning and has been generally accepted as a crucial issue in the performance of end tasks. This paper presents evidence that there will be specially learned features that will handle the heterogeneous, collective, and diverse nature of social media data. Hence, we suggest moving the emphasis from model development to latent feature learning and introducing a coherent system of latent feature learning in social media. Popular deep learning is used to overcome the noisy, diverse, heterogeneous, and interconnected properties of social media data because of its outstanding abstract capabilities. More specifically, we operationalize a new relational deep learning model to answer the social media link analysis BY creating a multimodal deep learning model towards the social image retrieval problem. We demonstrate the fact that the resulting latent features result in the improvement of both social media tasks.

## 1. INTRODUCTION

Over the past two decades, the rapid rise of social media has fundamentally reshaped global patterns of communication, collaboration, and knowledge exchange. Unlike traditional communication channels such as television, radio, or print media—where information flow was largely unidirectional—social media platforms offer interactive, participatory, and real-time environments [1]. Users are not only passive recipients of content but also active creators and distributors, generating dynamic conversations that transcend geographical, cultural, and socio-economic boundaries. As a result, social media has evolved from being a platform for personal interactions into a multifaceted ecosystem encompassing business

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promotion, education, political mobilization, entertainment, and global networking [2]. For businesses and digital marketers in particular, platforms such as Facebook, Instagram, Twitter (X), LinkedIn, TikTok, and YouTube provide unprecedented opportunities to connect with diverse audiences, advertise products and services, and foster brand loyalty. With billions of active users worldwide dedicating substantial portions of their daily routines to these platforms, social media has become a central component of digital marketing strategies [3]. Unlike traditional advertising models, which rely on one-way communication, social media facilitates two-way interactions, allowing consumers to engage directly with brands, provide real-time feedback, and influence decision-making processes. This participatory dynamic underscores social media's unique role in shaping consumer perceptions, behaviors, and long-term brand relationships [4, 5]. For a training example with C possible output classes, and m = ½ and *(f (x;) + f (ˆx;θ))* measure can be calculated as follows.

$$\mathcal{L}_u = \sum_{k=1}^{C} -f(x;\theta)_k \log f(x;\theta)_k$$

Eq (1)

Despite these transformative advantages, the fragmented nature of social media poses considerable challenges for practitioners [6]. Each platform possesses its own unique characteristics, audience demographics, and content mechanisms. For example, Instagram thrives on visual storytelling, LinkedIn emphasizes professional networking, Twitter (X) is dominated by real-time microblogging, while YouTube is a hub for long-form video content. Consequently, marketers must design and manage platform-specific strategies, which often become time-consuming, resource-intensive, and difficult to synchronize [7]. This lack of cohesion can lead to inconsistent branding, irregular posting patterns, and inefficiencies in campaign management [8, 9].

$$d_{MSE}(f(x;\theta), f(\hat{x};\theta)) \frac{1}{C} \sum_{k=1}^{C} (f(x;\theta)_k - f(\hat{x};\theta)_k)^2$$

Eq (2)

Additionally, the exponential growth of user-generated content contributes to information

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overload. Every second, millions of posts, comments, likes, and shares are generated, creating a vast pool of raw data. While this data offers immense potential for insights, its unstructured nature makes it difficult for organizations to extract actionable intelligence. Without advanced filtering and analytics, businesses may struggle to interpret consumer sentiment, measure engagement accurately, or evaluate the effectiveness of their campaigns. The inability to transform raw data into meaningful knowledge limits the potential of social media as a strategic marketing tool [10, 11].

$$d_{KL}(f(x;\theta),f(\hat{x};\theta)) = \frac{1}{C}\sum_{k=1}^{C} f(x;\theta)_k \log \frac{f(x;\theta)_k}{f(\hat{x};\theta)_k} \quad \text{Eq (3)}$$

To address these limitations, researchers and practitioners have increasingly focused on the development of unified social media management systems. Such systems integrate multiple platforms into a single dashboard, allowing marketers to design, schedule, and distribute content across networks simultaneously [12, 13]. They also consolidate analytics, enabling a holistic view of engagement, audience growth, and campaign performance. By minimizing manual effort and reducing duplication, unified platforms not only enhance efficiency but also ensure greater brand consistency across multiple channels [14, 15]. The emergence of artificial intelligence (AI), machine learning (ML), and automation has further expanded the capabilities of these systems. AI-driven algorithms can optimize posting schedules, recommend trending keywords and hashtags, generate personalized content, and analyze consumer sentiment at scale. Predictive analytics supports marketers in anticipating customer behavior, while AI-enabled chatbots and virtual assistants improve customer service through instant, automated responses [16, 17].

$$d_{JS}(f(x;\theta),f(\hat{x};\theta)) = \frac{1}{2}d_{KL}(f(x;\theta),m) + \frac{1}{2}d_{KL}(f(\hat{x};\theta),m) \quad \text{Eq (4)}$$

These advancements indicate that unified social media tools are evolving beyond supportive utilities, positioning themselves as strategic assets for competitive advantage in the digital economy [18].

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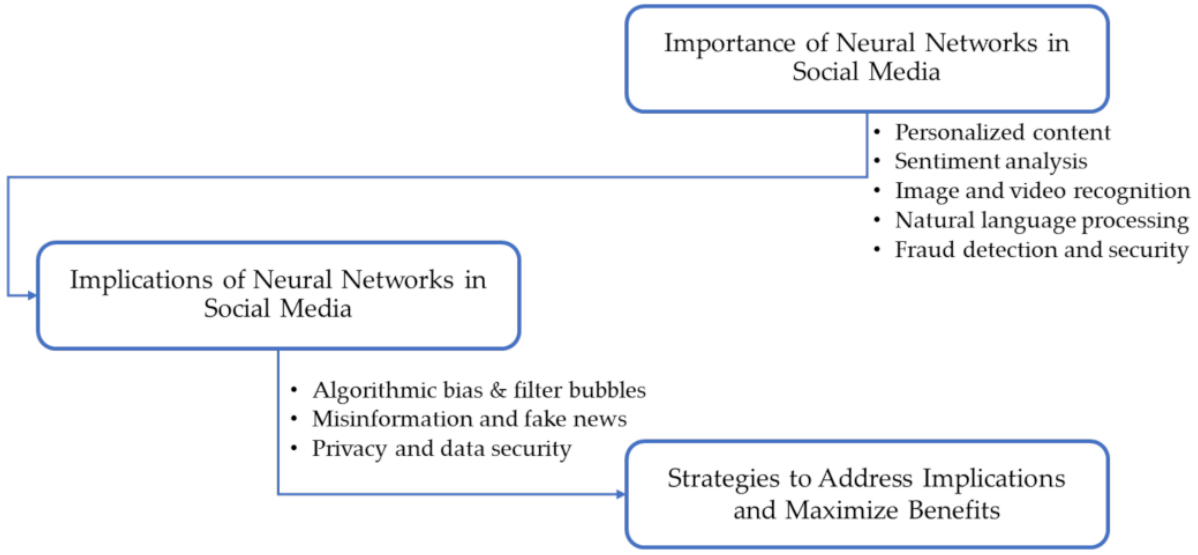



**Figure 1.** Generalize flow Approach based on Neural Network [19]

Against this backdrop, the purpose of this survey paper is to present a comprehensive review of existing research and solutions in the domain of social media integration and management. By offering an in-depth synthesis of existing knowledge, this survey underscores the potential of unified platforms to transform digital marketing practices, reduce operational challenges, and foster innovation [20]. The findings are particularly relevant for marketers, small and medium enterprises (SMEs), and researchers seeking to understand how integrated systems can enhance efficiency, consistency, and engagement in an increasingly competitive digital landscape. Integrated Marketing Communication (IMC) changes very fast. New apps, tools, and rules keep coming again and again. Because of this, a simple or normal review is not enough [21, 22]. A function f (x) is called μ- strongly convex whenever μ> 0 exists where x1, x belong to Rd, f (x1) > f (x2) + (x1 - x2)T∇f (x2) + μ.

$$w_{t+1} = \sum_{k=1}^{K} \frac{n_k}{n} w_{t+1}^k \quad \text{Eq (5)}$$

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$$\mu_i = \frac{1}{n_i}\sum_{j=1}^{n_i} x_j, \quad \sigma_i^2 = \frac{1}{n_i - 1}\sum_{j=1}^{n_i}(x_j - \mu_i)^2$$

Eq (6)

The weight term is W, while X stands for features, which are input examples, and b serves as the bias term.

$$\mu_g = \frac{\sum_{i=1}^{k} n_i \mu_i}{\sum_{i=1}^{k} n_i}, \quad \sigma_g^2 = \frac{\sum_{i=1}^{k}(n_i - 1)\sigma_i^2}{\sum_{i=1}^{k} n_i - k}$$

Eq (7)

A systematic review helps to cover both the wide range of studies and the small details. It shows what most studies agree on, and also shows the differences and gaps. These gaps are important because they guide future researchers about what should be studied next. This method collects studies from many areas together. For example, it not only looks at marketing, but also takes work from communication and information systems. In this way, it gives a full view of the topic. If only one subject is studied, then the picture will not be clear. By joining all related fields, we can understand the topic in a better and wider way. Another strong point is that the process can be repeated by others [23].

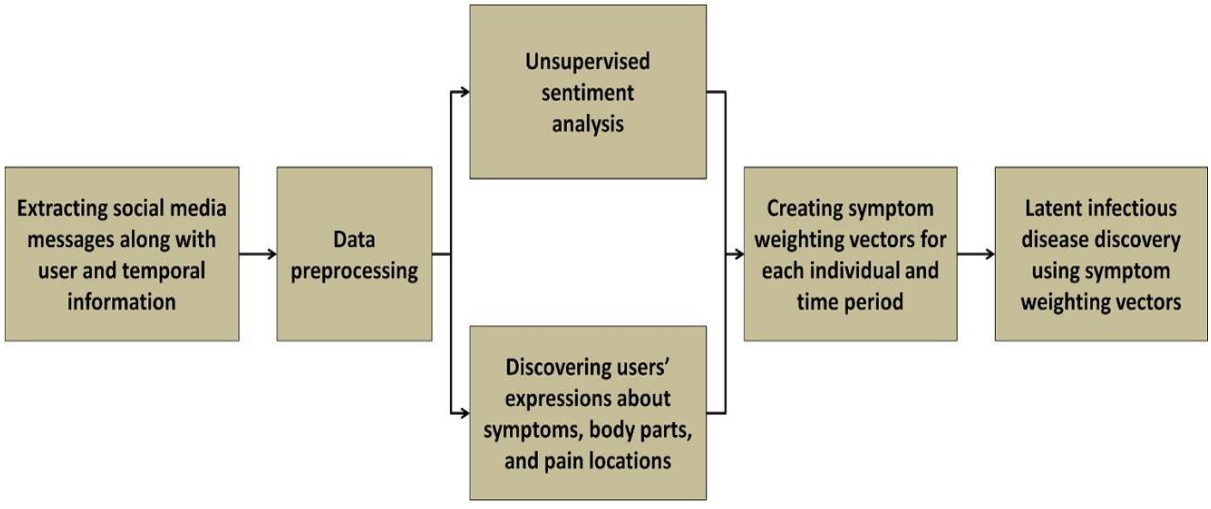



**Figure 2.** Data Extraction flow and Pre-Processing in Neural Network [24]

The steps of this method are clear and open, so any other researcher can follow the same steps and reach almost the same results. This makes the study more trustworthy. It also

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allows future scholars to add new research to the review when more studies are published. So the method is not only useful today, but also for the future. This method is based on real studies, not just opinions [25]. It collects information from many types of work, like theory papers, models, and practical experiments. Because it uses real evidence from different sources, the results become more balanced and stronger. This helps both students and professionals because they can trust the findings more. By using this approach, the study is not limited to small examples or personal ideas [26, 27]. It builds a solid base of knowledge that can guide practice. This is very helpful for digital marketers who need simple and clear advice. It is also useful for small and medium businesses (SMEs). These businesses do not have big budgets or large teams. They need easy steps that are tested and can work in real life. With this kind of help, they can manage social media better and improve their results [28, 29]. The overarching aim of this research is to explore, assess, and illustrate the transformative role of integrating multiple social media platforms into a unified management system tailored for digital marketers. In the current digital economy, social media has moved beyond being a mere channel of communication; it has become a cornerstone of marketing, branding, customer interaction, and competitive differentiation [30, 31].

$$f(x) = w^T a + \quad b \qquad \text{Eq (8)}$$

However, the multiplicity of platforms—each characterized by its own unique algorithms, content formats, and audience expectations—has created unprecedented complexity for marketers. This study, therefore, investigates how the adoption of integrated systems can simplify and optimize key processes such as content creation, scheduling, monitoring, performance analytics, and campaign evaluation across diverse platforms [32, 33]. Beyond operational efficiency, the objectives of this research extend toward strengthening brand identity, improving audience engagement, and enhancing overall campaign effectiveness. The study also emphasizes the rising significance of consumer-generated content (CGM), which increasingly influences consumer trust, brand loyalty, and promotional effectiveness within the modern marketing mix [30, 34].

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**Table 1.** Summary of existing techniques on Social Media Marketing

| Method | Findings | Precision% | Recal% | Ref |
|---|---|---|---|---|
| Social media marketing in Review digital business | Multiplatform Highlights adoption trends unified | 94.8 | 90.2 | [35] |
| IMC effectiveness in Literature digital Synthesis environments | Evaluated synergy between IMC and digital tools | 90.3 | 90.7 | [36, 37] |
| SME challenges in reviewing digital marketing | Barriers for small firms | 90.6 | 89.2 | [38, 39] |
| Consumer-generated media Review Impact | Discussed CGM influence on brand perception | 89.5 | 90.1 | [40] |
| Social media marketing in review of digital business | Multiplatform Highlights adoption trends unified | 92.5 | 89.8 | [41] |

### 1.1 Evolution of Social Media Tools and Technologies and Impact of Consumer-Generated Content (CGM)

This objective seeks to investigate the historical trajectory and transformation of social media management tools over the last two decades. Initially, marketers relied on fragmented, manual methods, handling each platform separately [42]. This approach was resource-intensive and inefficient, particularly as audience sizes grew. With the rise of analytics dashboards, automation systems, content scheduling tools, and AI-powered applications, digital marketing practices have become more data-driven and scalable. This study examines how technological innovations—such as sentiment analysis, predictive analytics, and integrated dashboards—have reshaped digital communication, enabling organizations to conduct large-scale, real-time campaigns with greater efficiency and precision [43, 44]. Despite technological advancements, several challenges persist in managing multiple platforms simultaneously:

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- Operational challenges: Limitations in time, workforce capacity, and budget allocation often constrain marketers from effectively managing multi-platform strategies
- Strategic challenges: The need to maintain consistent messaging and brand identity across platforms with varied audiences poses significant difficulties.
- Technological challenges: Constantly evolving algorithms, frequent policy changes, and platform-specific restrictions complicate campaign execution. This research aims to provide a detailed analysis of how these challenges disrupt brand visibility, consumer trust, campaign reach, and marketing return on investment [45, 46].

$$f(x) = w^n a + \quad b \qquad \text{Eq (9)}$$

Consumer-Generated Content (also known as User-Generated Content, UGC) has emerged as one of the most influential drivers of modern marketing. Reviews, testimonials, social media posts, and user experiences often carry higher credibility than brand-sponsored communication. This study examines how CGM impacts brand perception, purchasing decisions, and customer loyalty, and how unified platforms can systematically incorporate CGM into their content strategies. By amplifying authentic consumer voices, organizations can strengthen promotional activities, enhance trust, and achieve higher levels of engagement while ensuring alignment with brand consistency [47, 48].

$$P(c|x) = \frac{P(X|C).P(C)}{P(X)} \qquad \text{Eq (10)}$$

One of the central objectives is to explore the tangible benefits of unifying multiple social media platforms into a single integrated ecosystem. Such a framework will serve as both a practical guide for practitioners and a theoretical contribution for academic researchers, offering insights into the best practices of unified digital marketing strategies [49, 50].To make the study strong and fair, the literature search was done using many databases. Different databases were used so that more studies from different fields could be included. To collect the right papers, simple keywords were used. These keywords were put in two groups. One group was about IMC and the other was about social media. Words like AND and OR were used in the search. For example, when we join two words with AND, we only get papers that have both. This helped to make the search more useful:

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- IMC cluster: This group had words like "Integrated Marketing Communication," "promotion mix," "marketing communication," and "brand promotion." These words brought studies that talked about promotion and communication in business. Some papers explained how companies use promotion mix, and some explained how IMC is linked with brand promotion [51, 52].

- Social media cluster: This group had words like "social media marketing," "consumer-generated media," "unified social media platform," "cross-platform scheduling tools," and "digital promotion strategies." These words were used to find papers on online platforms. Many of them focused on how people create content, how companies use tools for posting, and how digital strategies are planned [53]. The conceptual papers helped in building a basic understanding. They explained what IMC and social media mean and why they are important. The case studies were more practical. They showed how real companies used social media in their promotion. These were helpful because they connected theory with real life. The review papers joined older studies and showed what has been done already. This helped in finding gaps. The theoretical papers gave models that can be used for research and also for practice [54, 55].

Some papers only talked about one platform, like Facebook or Instagram. These showed in detail how a single app works for marketing. Other papers were wider and explained how social media is used across many platforms and even in different industries like education, health, or business. This mix of narrow and wide studies gave both small details and also bigger strategies [56, 57].

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**Table 2.** Summary of Relevant Techniques

| Field/Method | Application/ Findings | F1% | Recall% | Ref |
|---|---|---|---|---|
| Social Media Analysis | Sentiment analysis<br>Trend identification<br>Fake news detection | 91.8 | 90.2 | [58] |
| Recommendation Systems | Personalized content suggestions based on user behavior | 92.3 | 90.7 | [59, 60] |
| NLP | Sentiment analysis<br>Topic modeling<br>Text classification | 80.6 | 89.2 | [61] |
| Social Good and Humanitarianism | Disaster response<br>Public health initiatives<br>Resource allocation for humanitarian aid | 71.5 | 90.1 | [62, 63] |
| Online Advertising | Targeted advertising based on user preferences and behavior | 72.5 | 89.8 | [64] |
| Personalized Education | Adaptive educational content based on individual learning styles | 71.6 | 80.6 | [65, 66] |
| Fraud Detection | Detection of fraudulent activities such as credit card fraud and online scams | 88.1 | 71.5 | [67, 68] |

### 1.3 Machine Learning Data Analysis and Synthesis

AI is a subfield of computer science that incorporates a wide range of computational operations, from algorithmic production to machine learning and deep learning methods [69] Traditional AI problem-solving methods are based on if–then rules, whereas machine learning and deep learning

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seek to iteratively evolve comprehension of a data set without explicitly coding any rules [70, 71] This permits the computing system on which they are implemented to automatically acquire knowledge and develop predictions beginning with a set of input data, adjusting the parameters by optimizing the performance standard defined on the data and decreasing the error rate at every phase of the learning process [72]. To analyze the data, a thematic coding framework was developed. Each article was coded according to thematic relevance, enabling a structured synthesis of findings. This process revealed both consensus and contradictions in prior work. For example, while most studies agreed that unified systems enhance efficiency, fewer addressed their limitations for SMEs or ethical concerns around AI-driven personalization [73, 74]. In terms of validity, the study employed construct validity (capturing the right phenomena through carefully designed keywords) and external validity (ensuring applicability across industries). Ethical considerations were minimal, as this research relied solely on secondary data. However, transparency in reporting and acknowledgment of limitations were prioritized to ensure academic integrity [75, 76]. Social media has become one of the most transformative forces in modern marketing, reshaping how organizations communicate, engage, and position their brands. Unlike traditional advertising—characterized by one-way, mass broadcasting—digital platforms such as Facebook, Instagram, Twitter (X), LinkedIn, TikTok, and YouTube foster a participatory culture built on interactive, two-way communication. In these environments, consumers no longer act as passive recipients of brand messages but actively engage in dialogue, critique, and co-creation of content, thereby influencing brand narratives in real time [77, 78]. The literature consistently highlights that social media provides several strategic advantages: it enhances brand visibility, builds consumer trust through authentic interactions, and nurtures long-term loyalty via continuous engagement [79]. Beyond relational benefits, the digital environment generates vast consumer datasets that enable firms to implement micro-targeting, behavioral segmentation, predictive analytics, and real-time optimization of campaigns. Consequently, social media has shifted from being a supplementary channel to an indispensable pillar of consumer-centric Integrated Marketing Communication (IMC) strategies [80].

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**Table 3.** Summary of Relevant Techniques

| Field/Method | Application/ Findings | F1% | Recall% | Ref |
|---|---|---|---|---|
| Cybersecurity | Network traffic analysis for detecting anomalies and identifying cyber threats | 70.6 | 72.5 | [81] |
| Mental Health Analysis | Identification of individuals at risk of mental health issues through social media analysis | 81.5 | 91.5 | [82] |
| Good and Humanitarianism | Disaster response Public health initiatives Resource allocation for humanitarian aid | 90.6 | 88.5 | [83] |

### 1.4 Consumer-Generated Media (CGM) and Brand Engagement

Consumer-Generated Media (CGM) has emerged as one of the most influential and disruptive components of the social media ecosystem. CGM includes reviews, testimonials, memes, unboxing videos, reaction posts, and viral challenges, all of which shape brand perception in ways that firm-generated messages alone cannot. Research suggests that CGM is often regarded as more authentic and trustworthy than corporate advertising, due to its perceived independence from commercial motives. Positive CGM—such as enthusiastic YouTube reviews or viral TikTok campaigns— can substantially enhance brand equity, foster emotional connections, and accelerate purchase decisions. Conversely, negative CGM poses significant reputational risks; for example, a dissatisfied customer's viral complaint on Twitter can damage brand credibility within hours [84, 85]. Scholars emphasize the importance of active engagement with CGM. Brands that acknowledge consumer contributions, respond transparently to criticism, and collaborate with users in co-creation are more successful in building advocacy and long-term loyalty [86, 87]. Moreover, CGM amplifies electronic word-of-mouth (eWOM), widely recognized as one of the most powerful

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forms of marketing persuasion. Integrating CGM into IMC not only improves campaign credibility but also sustains consumer-brand relationships over time. Integrated Marketing Communication (IMC) provides a conceptual framework for aligning brand messaging across diverse channels. Classic IMC literature emphasizes the importance of consistency, synergy, and reinforcement in delivering a seamless consumer experience in the digital era. IMC has evolved into a two-way interactive model, with social media at its core [88, 89]. Social platforms allow brands to personalize communication through algorithm-driven advertising, AI chatbots, and real-time consumer interactions. Studies show that organizations integrating social media into IMC achieve higher brand recall, improved efficiency, and stronger engagement outcomes compared to fragmented communication efforts [90]. The traditional 4Ps of marketing (Product, Price, Place, Promotion) have undergone substantial transformation due to social media. The most radical shift has occurred in this domain. Mass campaigns are being replaced by segmented, personalized, and interactive strategies— including influencer partnerships, real-time brand storytelling, and interactive content. For example, Nike's "Just Do It" campaigns on Instagram combine storytelling with consumer participation, while Coca-Cola's "Share a Coke" initiative leveraged user hashtags to enhance personalization. Social media enables the co-creation of products and services by integrating customer feedback into design processes [91, 92].

### 1.5 Emerging Trends in Social Media Marketing

Recent scholarship identifies several disruptive trends that redefine digital marketing practices:

- Influencer Marketing: Social media influencers act as intermediaries between brands and audiences, enhancing authenticity and reach. However, concerns about influencer fatigue, fake followers, and over-commercialization present new challenges [93].

- Immersive Technologies: Augmented reality (AR) filters, virtual reality (VR) shopping experiences, and AI-driven personalization are transforming customer journeys into interactive, memorable experiences [94].

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- Social Commerce: Platforms like Instagram and TikTok are increasingly integrating in-app shopping functionalities, merging communication with commerce [95].

- AI and Automation: Predictive analytics, chatbots, and automated scheduling tools allow marketers to deliver precision campaigns at scale, while also raising questions about personalization and consumer trust [96].

Together, these trends point toward a highly interactive, personalized, and transaction-oriented ecosystem, where technology and consumer behavior continuously reshape each other. Despite the significant progress, the literature identifies notable challenges and gaps: Much research prioritizes engagement metrics (likes, shares, clicks) while overlooking long-term outcomes such as customer lifetime value and brand equity [97, 98]. Emerging spaces like TikTok, Instagram Reels, and Threads lack robust empirical and theoretical studies. Absence of unified performance metrics complicates cross-platform comparisons. Studies often focus on large corporations, with limited attention to how SMEs can adopt affordable and effective social media strategies [99]. These limitations highlight the need for comprehensive, comparative, and longitudinal research to address knowledge gaps.

## 2. Literature Review

Case studies from Nike, Starbucks, and Coca-Cola demonstrate that successful campaigns rely on cross-platform storytelling, influencer collaborations, and consumer participation. Importantly, SMEs also stand to benefit, as unified systems lower entry barriers by reducing complexity [100]. Despite extensive exploration, further research is needed in the following areas: The integration of social media within Integrated Marketing Communication (IMC) has emerged as a transformative force in modern marketing research and practice. Evidence from prior studies consistently demonstrates that social media is not merely an additional promotional channel but a strategic foundation of consumer–brand interaction, reshaping how organizations engage with audiences, manage brand equity, and sustain competitiveness [101]. The literature portrays social media as a double-edged sword: while it empowers consumers and drives innovation, it also introduces risks such as

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misinformation, reputational crises, and fragmented messaging. Unified management systems emerge as a practical solution, providing: Centralized dashboards for cross-platform control [102].

$$\sum_{i=\{1.,.,.n\}/k}^{n} \frac{c_i}{\tau_i} + \frac{c_k + \alpha_k}{\tau_k} \qquad \text{Eq (11)}$$

One of the most significant contributions of social media is its ability to facilitate two-way communication between brands and consumers. Unlike traditional advertising, which is predominantly one-directional, social media enables real-time feedback, dialogue, and co-creation of value. This shift has transformed consumers from passive receivers into active participants. A central component of this engagement is Consumer-Generated Media (CGM) [103]. Testimonials, user-generated posts, and viral campaigns are perceived as more credible and authentic compared to firm-driven messages. Positive CGM not only enhances emotional connections and loyalty but also generates powerful word-of-mouth promotion. Conversely, negative content can spread rapidly, amplifying reputational risks. Research emphasizes that firms that actively respond to CGM, address criticism transparently, and encourage participation achieve stronger levels of trust and advocacy [104, 105].

$$\sum_{i=\{1.,.,.n\}/(k,j)}^{n} \frac{c_i}{\tau_i} + \frac{c_k + \alpha_k}{\tau_k} + \frac{c_j + \alpha_j}{\tau_j} = 1 \qquad \text{Eq (12)}$$

Another strength lies in the synergy between IMC and social media tools. When integrated into IMC strategies, social platforms enable personalization, demographic targeting, and analytics-driven optimization. Case evidence from global brands such as Nike, Coca-Cola, and Starbucks illustrates how integrated campaigns—built around storytelling, participation, and cross-platform messaging—deliver superior engagement, visibility, and brand equity. Despite these strengths, the literature also highlights significant operational, strategic, and technological challenges [106, 107]. Operational challenges include the demand for time, expertise, and financial resources to manage multiple accounts simultaneously. Strategic challenges arise from the need to maintain consistent messaging across diverse platforms with varying audience expectations. Technological challenges relate to the constant

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evolution of algorithms, platform-specific features, and privacy regulations that marketers must adapt to. A further limitation is the lack of standardized performance metrics [108].

$$\sum_{i=\{1.,.,.n\}/(k,j)}^{n} \frac{c_0}{\tau_0} + \frac{c_0 + \alpha_0}{\tau_0} + \frac{c_0 + \alpha_0}{\tau_0} \quad \text{Eq (13)}$$

$$\sum_{i=\{1.,.,.n\}/(k,j)}^{n} \frac{c_1}{\tau_1} + \frac{c_1 + \alpha_1}{\tau_1} + \frac{c_1 + \alpha_1}{\tau_1} \quad \text{Eq (14)}$$

While marketers often rely on short-term indicators such as likes, shares, or comments, these do not adequately capture long-term outcomes such as customer lifetime value or sustained brand equity. For SMEs, the problem is magnified due to budgetary constraints and limited technical expertise. Emerging platforms such as TikTok, Instagram Reels, and Threads remain underexplored in scholarly research, leaving practitioners without tested frameworks or models to guide effective adoption [109].

$$\sum_{i=\{1.,.,.n\}/(k,j)}^{n} \frac{c_3}{\tau_3} + \frac{c_3 + \alpha_3}{\tau_3} + \frac{c_3 + \alpha_3}{\tau_3} \quad \text{Eq (15)}$$

$$\sum_{i=\{1.,.,.n\}/(k,j)}^{n} \frac{c_n}{\tau_n} + \frac{c_n + \alpha_n}{\tau_n} + \frac{c_n + \alpha_n}{\tau_n} \quad \text{Eq (16)}$$

### 2.1 Role of AI Opportunities and Integration Benefits

The studies collectively underline the importance of unified social media management systems as a practical solution to fragmentation. These platforms offer centralized dashboards for scheduling, monitoring, and performance analysis across multiple channels. By reducing duplication of effort, they enhance efficiency, ensure brand consistency, and provide holistic analytics. For SMEs in particular, such tools lower entry barriers by simplifying workflows and enabling scalability. Another major opportunity lies in the integration of advanced technologies.

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**Table 4.** Summary of Relevant Techniques Based on AI

| Model | Layer | Output Shape | Image Size | Parameters | Ref |
|---|---|---|---|---|---|
| RNN | Conv2D (3 × 3)@32 | $(n, n,32)$ | (48, 48, 32) | ((3 × 3 × 3) + 1) × 32= 896 | [110,111] |
| DT | Batch Norm | $(n, n,32)$ | (48, 48, 32) | 4 × 32 = 128 | [112, 113] |
| NBB | Activation ReLU | $(n, n,32)$ | (48, 48, 32) | 0 | [114] |
| RF | Maxpool2D (2 × 2) | $(n1,n1,32)$ $n1$ = n/2 | (24, 24, 32) | 0 | [115, 116] |
| CNN | Dropout | $(n$ 1,$n1,32)$ | (24, 24, 32) | 0 | [117, 118] |
| ANN | Conv2D (3 × 3)@64 | $(n$ 1,$n1,64)$ | (24, 24, 64) | ((3 × 3 × 32) + 1) × 64 = 18,496 | [119, 120] |
| LSTM | Activation ReLU | $(n, n,32)$ | (48, 48, 32) | 0 | [121] |
| KNN | Maxpool2D (2 × 2) | $(n1,n1,32)$ $n1$ = n/2 | (24, 24, 32) | ((3 × 3 × 32) + 1) × 64 | [122] |
| P-CNN | Dropout | $(n$ 1,$n1,32)$ | (24, 24, 32) | ((3 × 3 × 32) + 1) × 64 | [123, 124] |
| P-ANN | Conv2D (3 × 3)@64 | $n1,n1,32)$ $n1$ = n/2 | (24, 24, 64) | ((3 × 3 × 32) + 1) × 64 = 18,496 | [125, 126] |

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Artificial Intelligence (AI) and machine learning (ML) can provide predictive insights, optimize content delivery, and enhance personalization. Automation tools streamline scheduling and reporting, allowing marketers to focus on strategy rather than repetitive tasks. Immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR) are redefining consumer engagement by offering interactive and memorable brand experiences [127, 128].

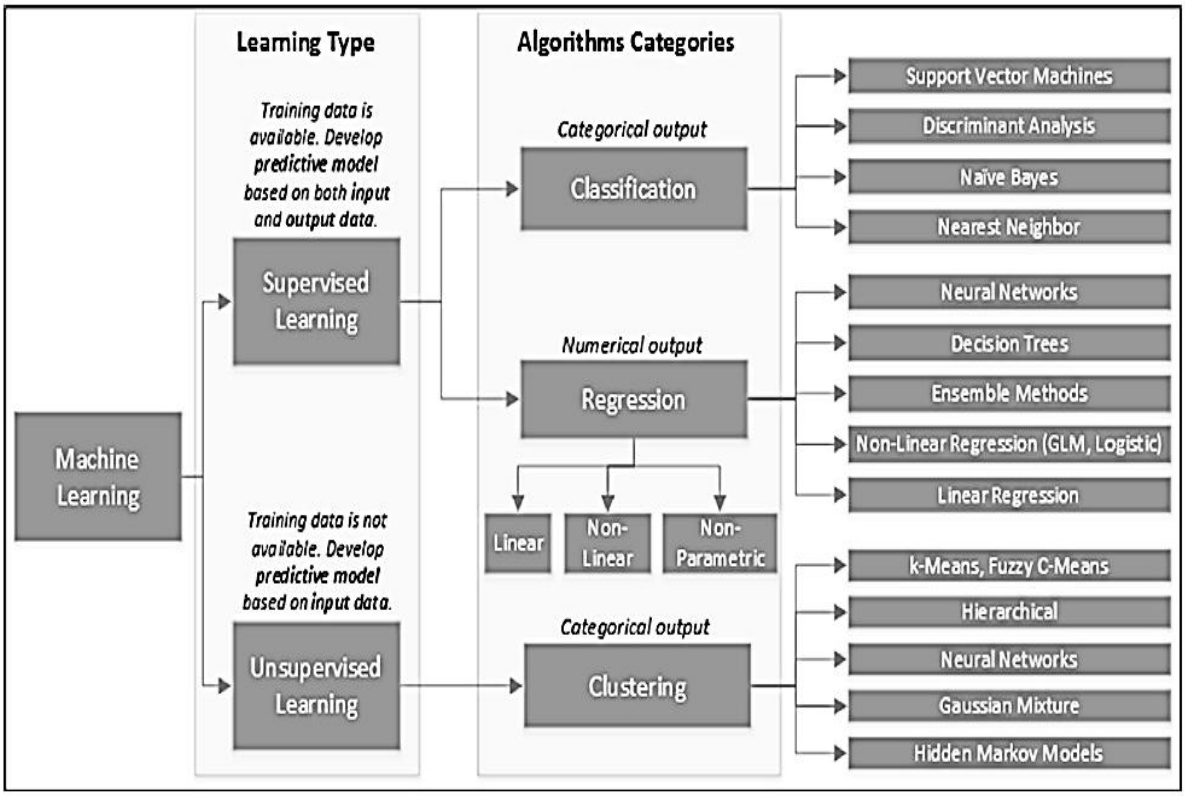



**Figure 3.** Generalize Architectures based on Machine Learning [129]

Social commerce, where transactions take place directly within social platforms, further expands possibilities by merging communication, engagement, and sales into a seamless consumer journey. The merged analysis confirms that the integration of social media within IMC offers both unprecedented opportunities and substantial challenges [130]. It empowers businesses to achieve higher engagement, personalization, and efficiency, while simultaneously requiring them to remain adaptive, resource-conscious, and ethically responsible. As social media continues to evolve, unified management systems, AI-driven

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tools, and consumer-centered strategies are likely to define the future of digital marketing [132].

**Table 5.** Performance metrics of AI and Machine Learning based Social Media Model

| Model | Latency (ms) | AAE (%) | Duration | RT (ms) | Ref |
|---|---|---|---|---|---|
| Deep Learning | 10 | 2.1 | 50 | 15 | [133] |
| Reinforcement Learning | 12 | 2.5 | 60 | 18 | [134] |
| Federated Learning | 15 | 2.8 | 45 | 20 | [135] |
| Rule-Based Methods | 25 | 5.0 | 30 | 25 | [136] |
| Deep Learning | 10 | 2.1 | 50 | 15 | [137] |
| CNN-LSTM | 14 | 2.5 | 5.0 | 30 | [138] |
| ANN | 17 | 2.8 | 2.1 | 50 | [139] |

## 3. Method and Materials

This article confirms that social media has evolved far beyond its initial function as a personal communication medium and has now become a transformative driver of marketing, organizational practices, and consumer culture. Its influence extends across industries, enabling businesses to foster deeper engagement, achieve broader visibility, and integrate consumers into the value-creation process. At the same time, the dual nature of social media remains a defining characteristic: while it provides unparalleled opportunities for collaboration, innovation, and growth, it also presents significant challenges, including misinformation, privacy concerns, reputational risks, and fragmented campaign management. From a marketing standpoint, integrating social media into Integrated Marketing Communication (IMC) is no longer optional; it has become a strategic necessity. The review

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emphasizes that Consumer-Generated Media (CGM), such as user reviews, testimonials, and viral content, has overtaken traditional advertising in terms of credibility and influence. To maintain competitiveness, marketers must therefore prioritize message consistency, adopt data-driven insights, and actively engage across multiple platforms to strengthen consumer trust, loyalty, and brand equity. A central insight derived from this review is the effectiveness of unified management systems. By consolidating content scheduling, monitoring, and analytics into a single platform, these systems address the inefficiencies and inconsistencies of fragmented strategies. They improve workflow management, ensure brand coherence, and align organizational goals with consumer expectations, thereby creating a foundation for sustainable and scalable digital marketing practices.

### 3. 1 Data Preprocessing in Social Media Management

Data preprocessing in social media management is the crucial process of cleaning, transforming, and organizing raw, unstructured social media data into a high-quality, structured format suitable for analysis and decision-making. This ensures the accuracy and reliability of insights used for tasks like sentiment analysis, trend detection, and campaign optimization. First of all, the company should look at all the social media platforms they are using. They can make a small list of platforms like Facebook, Instagram, or Twitter, and note how many posts are done and what people reply. This step is simple but important because it shows which platform is working good and which is almost dead. For example, sometimes Instagram gives a lot of likes, but Twitter gives almost nothing. After checking platforms, the next step is to pick one tool that can handle them in one place. Small businesses mostly want something cheap and easy, so they do not waste money. Big companies need more options like reports and AI features because they have bigger teams. The point is to choose a tool that fits your size and work, not just pick the most famous one. It is not a good idea to move everything to the new system at once. It can create confusion. The company should start small, maybe with only Facebook and Instagram. After a few weeks, when the team feels comfortable, slowly add more platforms like LinkedIn or TikTok. This step-by-step process makes learning easier and avoids mistakes. AI can make posting easier. It tells the best time to share, suggests hashtags, and can even read comments to see if people are happy or angry. This helps save time. But still, humans should check everything before posting. AI cannot fully understand culture or emotions, so the final control must be with

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people. The company should not just post and forget. They must check results regularly. They can see likes, shares, comments, and even if sales are coming from social media. If Instagram gives good results, then give more focus there. If Twitter is not helping, spend less time there. This checking helps to adjust the plan and improve. The people who will use the tool must know how to handle it. A little training can help them learn posting, scheduling, and checking reports. If the team is not trained, many features of the tool will be wasted. Training also makes the whole team work in the same way and reduces mistakes. While significant advancements have been made, continued research is required to address unresolved gaps: In the proposed system, AI plays an even bigger role in social media work. Right now, AI mostly helps in scheduling posts or suggesting hashtags. But in the future, AI can also learn from people's behavior and suggest full content ideas. For example, if most users like short videos, AI can guide the company to make more of them. Research should study how this can be done safely and how companies can still control the quality of content.

$$\ln fl_{it}^{+} = \sum_{j=0}^{t} \Delta \ln w^{T} x + b_{it}^{+} = \sum_{j=0}^{t} \max(\Delta w^{T}{}_{ij,0}) + \epsilon_{it} \quad \text{Eq (17)}$$

When many platforms are joined together, data privacy becomes a big issue. People will not like it if they think their personal data is not safe. In the future, there should be more focus on building systems that protect user data properly. Research can also look at how to make users trust these tools more. For example, tools can give clear messages about what data is being collected and how it will be used. A lot of small businesses cannot buy expensive tools like Hootsuite or Sprout Social.

$$\ln fl_{it}^{+} = \sum_{j=1}^{t} \Delta \ln w^{T} x + b_{it}^{+} = \sum_{j=1}^{t} \max(\Delta w^{T}{}_{ij,1}) + \epsilon_{it} \quad \text{Eq (18)}$$

They need cheaper and easier options in the future, researchers can try to find out how unified systems can be made simple and low-cost. If this happens, then even small shops, startups, or local companies can use them to promote their products. This will help them compete with bigger companies. Social media is never the same. New apps come quickly, like TikTok, and old platforms like Facebook or Instagram change their rules again and again. Future studies should focus on how one tool can quickly adapt to these changes. If a tool is flexible, it will not become outdated quickly. For example, if a new app becomes popular, the tool should add

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support for it without much delay. Even though AI is very helpful, it cannot replace people fully.

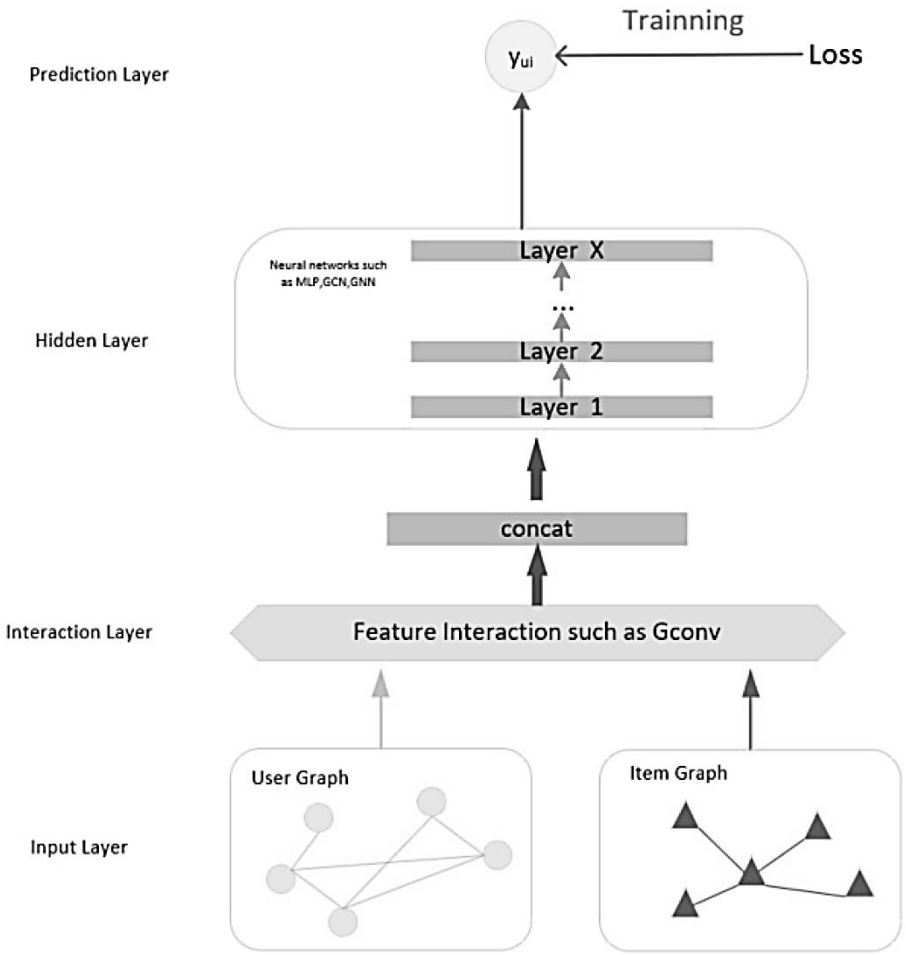



**Figure 4.** Proposed Social Recommendation Process Based on Multi-Layered Machine Learning Technique

$$\ln fl_{it}^{+} = \sum_{j=2}^{t} \Delta \ln W^{T} x + \quad b_{it}^{+} = \sum_{j=2}^{t} \max(\Delta W^{T}{}_{ij,2}) + \epsilon_{it} \qquad \text{Eq (19)}$$

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AI can do the fast work, like setting post times or checking reactions. But only humans can understand culture, emotions, and how words will affect people. Future work should look at how both can work together. A good balance means AI does the routine work and humans take the creative and sensitive decisions. Today, most research only looks at likes, shares, and comments, which are short-term. But in the future, studies should also focus on long-term effects. For example, how do unified platforms affect customer trust, brand reputation, or sales growth over many months or years? This type of research will show the real value of these tools, not just quick results.

$$\ln fl_{it}^{+} = \sum_{j=n}^{t} \Delta \ln W^{T} x + \quad b_{it}^{+} = \sum_{j=n}^{t} \max(\Delta W^{T}{}_{ij,n}) + \epsilon_{it} \qquad \text{Eq (20)}$$

**Table 6.** Comparative Analysis of Various Themes for Virtual Social Media Analysis

`

| Field | Variable | Social Media User | Mean (M) | Standard deviation (SD) | Accuracy | TH2 |
|---|---|---|---|---|---|---|
| Social Media Analysis | Social influencers' threat to human identities | S.M User | 3.198 | 2.581 | 3.581 | 3.916 |
| Recommendation Systems | | Non- S.M User | 2.118 | 3.1 | 3.198 | 1.5 |
| NLP | | S.M User | 3.4 | 2.581 | 1.41 | 1.1 |
| Social Good and Humanitarianism | | Non- S.M User | 3.198 | 3.5 | 3.198 | 1.51 |
| Online Advertising | | S.M User | 1.41 | 5.1 | 2.1 | 3.1 |
| Personalized Education | | Non- S.M User | 1.51 | 1.21 | 3.1 | 2.51 |

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**Table 7.** Comparative Analysis of Various Themes for Virtual Social Media Analysis

| Field | Variable | Social Media User | Mean (M) | Standard deviation (SD) | Accuracy | TH2 |
|---|---|---|---|---|---|---|
| Social Media Analysis | AI awareness (AIA) in Social Managers | S.M User | 2.41 | 5.1 | 3.581 | 3.916 |
| Recommendation Systems | | Non- S.M User | 1.118 | 3.1 | 3.198 | 5.5 |
| NLP | | S.M User | 5.4 | 2.581 | 1.41 | 5.1 |
| Social Good and Humanitarianism | | Non- S.M User | 4.198 | 1.41 | 4.1 | 1.51 |
| Online Advertising | | S.M User | 6.1 | 5.1 | 3.1 | 3.1 |
| Personalized Education | | Non- S.M User | 7.2 | 1.21 | 2.1 | 1.51 |

**Table 8.** Comparative Analysis of Various Themes for Virtual Social Media Analysis

| Field | Variable | Social Media User | Mean (M) | Standard deviation (SD) | Accuracy | TH2 |
|---|---|---|---|---|---|---|
| Social Media Analysis | | S.M User | 6.33 | 2.41 | 5.1 | 7.11 |
| Recommendation | | Non- S.M User | 4.222 | 1.118 | 3.1 | 3.8 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Systems | Intention to use Social Media | | | | | |
| NLP | | S.M User | 6.111 | 5.4 | 2.581 | 4.1 |
| Social Good and Humanitarianism | | S.M User | 2.428 | 4.198 | 1.41 | 4.128 |
| Online Advertising | | Non- S.M User | 1.22 | 6.1 | 5.1 | 8.1 |
| Personalized Education | | S.M User | 6.55 | 4.21 | 4.3 | 2.51 |

**Table 9.** Comparative Analysis of Various Themes for Virtual Social Media Analysis

| Field | Variable | Social Media User | Mean (M) | Standard deviation (SD) | Accuracy | TH2 |
|---|---|---|---|---|---|---|
| Social Media Analysis | Social influencers' personalization benefits | Non- S.M User | 7.11 | 5.1 | 3.581 | 1.916 |
| Recommendation Systems | | S.M User | 3.8 | 3.198 | 2.581 | 4.581 |
| NLP | | Non- S.M User | 4.1 | 2.118 | 3.1 | 7.198 |
| Social Good and Humanitarianism | | S.M User | 4.128 | 3.4 | 2.581 | 6.41 |
| Online Advertising | | Non- S.M User | 5.7 | 5.1 | 3.1 | 8.1 |
| Personalized Education | | S.M User | 1.2 | 1.21 | 2.1 | 2.51 |

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## 4. Conclusion and Future Directions

In the end, this article tells us one clear thing that Social media is not just something extra for marketing anymore. It has become the main part every brand, big or small, is now depending on it to talk with people and show their products. Without social media, marketing feels incomplete today. For digital marketers the problem is not only to save time. The bigger problem is to make posts that look real and honest. People do not like fake or copied content. So the work is to be fast with the help of tools, but also keep the trust of the audience. Both things must stay together. Technology, like AI, is very helpful. It can tell when to post, give hashtags, and even read what people are saying. This makes the job simple. But trust is more important than speed. If people think their data is not safe or the brand is hiding something, then they will leave. That is why companies must be open and clear in their work. Social-media gives many chances. It helps in sharing new ideas, reaching more people, and building a strong brand. But it also brings problems because platforms keep changing and there is always strong competition. So, companies must keep learning and adjusting again and again. This study collected information from many sources and also pointed out where research is still missing. It also shared some useful advice for companies. So, it is not only for students or theory, but also for real business use. It can guide organizations to plan better, earn trust, and grow in this fast digital world. From this survey, it is clear that social media has become a very powerful tool for both small and large organizations. It is not only about posting but also about building connections, trust, and brand value. By studying different tools and methods, we can see how unified systems can make this process easier and more effective. AI is very useful in social media management, but it cannot replace humans fully. It can suggest times, hashtags, or even check reactions, but the final creativity and message should always come from people. This balance is important because users connect more with authentic content, not with machine-generated words only. The study also shows that unified platforms can save time and reduce workload. For businesses, this means they can spend less time on repeated posting and more time on planning good strategies. Small businesses especially benefit because they often do not have large teams to manage different accounts. Even with many advantages, there are still problems that must be solved. Privacy, cost, and fast changes in platforms are some challenges. If these are not handled, many organizations may hesitate to use such

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systems. This reflection reminds us that technology should always be updated and flexible. Looking at the future, social media management will continue to grow. With new platforms and more AI features, there will be more opportunities as well as new risks. The reflection is that organizations must be ready to adapt and learn again and again. This way they can get the maximum benefit while staying safe and trustworthy for their users.

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