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# Digital Social Media Influencers' Impact on Beauty and Personal Care Purchases in South Africa

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**Abstract:** The South African beauty and personal care industry has been significantly impacted by digital technologies, with social media influencers (SMIs) playing a pivotal role in shaping consumer behaviour. Despite the significant role of SMIs, there is a notable research gap in optimising their influence to boost customer engagement and drive sales. This study addresses this gap by introducing a comprehensive digital framework integrating artificial intelligence (AI) and digitalisation to enhance influencer marketing (IM) strategies in South Africa's beauty and personal care industry. The primary objective is to present a novel approach that digitally overlays traditional SMI marketing processes, enhancing engagement and effectiveness. A mixed-method approach was employed, integrating quantitative data from web scraping and sentiment analysis (SA) of Instagram posts with qualitative insights from the existing literature. This approach facilitated data-driven decision-making and optimised IM efficacy through technology-driven feedback analysis. The empirical findings confirmed that incorporating AI into influencer marketing (IM) campaigns significantly improves data collection and sentiment analysis, enhancing consumer engagement and purchase intent. This study underscores the transformative impact of digitalisation on marketing practices and the potential of digital tools to optimise SMI strategies in the beauty and personal care sector. This research also provides a valuable framework for marketers aiming to enhance IM campaigns, emphasising the strategic advantage of an automated response workflow based on feedback analysis. This study contributes to developing more impactful digital marketing strategies, maximising the effect of SMIs, and ensuring market competitiveness.

**Keywords:** artificial intelligence; automation; customer engagement; digitalisation; influencer marketing; social media influencers; sentiment analysis



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## 1. Introduction

The growth of digital platforms like social media (SM), the internet, and mobile applications forms the foundation of today's consumer lifestyle [1]. This era is depicted by a society that has become more dependent on digital technology. A study by Zhou [2] supports this notion by suggesting that because of their expertise in the field of electronic word-of-mouth (eWOM), social media influencers (SMIs) have become increasingly prominent on digital platforms. Companies, seeking to stay ahead of the ever-changing preferences of consumers, have strategically included SMIs as part of their digital marketing plans, changing the way they interact with their audience [3]. In accordance with Sánchez-Fernández and Jiménez-Castillo [4], SMIs are especially important in the beauty industry because they create content that appeals to certain groups, and their influence goes beyond the limitations of traditional marketing strategies [5]. According to a study by Wang [6], businesses are recalibrating their financial key performance indicators (KPIs) to include metrics linked to consumer engagement and word-of-mouth in addition to traditional financial indicators, considering the growing influence of SMIs. Although there has been a rapid expansion in influencer marketing (IM), there is still a research gap concerning its use in the beauty industry [7], particularly in South Africa.

The field of marketing has undergone a revolution attributed to digital technologies. As a result, a new era of digital marketing has arisen, necessitating companies to modify their communication strategies to remain competitive [8]. Because of the need to improve customer experiences and promote company growth, there has been a shift in social interactions and information consumption involving digital platforms [9]. A study by Lu [10] highlights that SM platforms have become essential for communication and information sharing, significantly influencing consumer behaviour and interactions. For example, a case study by Paintsil and Kim [11] displays Glossier, a beauty brand, as a leading example of utilising SM to improve customer experiences and engagement in the beauty industry. This shift highlights the significance of digital marketing [12]. Businesses looking to increase customer engagement and brand loyalty must embrace digital technologies, particularly SM platforms [13]. The beauty industry has been impacted by SM's emergence, creating an important platform for consumers to engage [13–15]. The evolution of the beauty industry is being driven by digital marketing and the strategic use of SMIs to impact customer behaviour [5,16]. Given that 93% of marketers use IM in their plans, it is evident how important it is to comprehend and use IM effectively [3]. Although SMIs have become prominent players in the promotion of beauty and personal care items on SM platforms, effective strategies are required to optimise their influence and boost the degree of interaction with their followers. According to Rutter et al. [17], engagement is regarded as a crucial criterion for evaluating the effectiveness of SM platforms.

The speed at which SM platforms are evolving creates a wide daily exchange of ideas, which benefits digital marketing campaigns. This data boom allows data scientists access to a wealth of unstructured data for the purpose of analysis [18]. Conventional methods of collecting these data are challenging and time-consuming, which can delay reactions and yield a narrow range of insights. In line with the study by Karafillakis et al. [19], manual data collection from SM platforms using browser search tools is ineffective and results in a limited amount of data over time. This reinforces the premise that limited insights are provided by manual data processing, which is also slow. The overall effect of these challenges is suboptimal marketing strategies, which could impact the growth of an organisation. To enable maximum effectiveness of SMIs in the beauty and personal care industry and ensure timely and thorough findings that drive more effective marketing strategies and support company growth, it is fundamental to investigate advanced digital tools and automated data collection methods.

This study aims to close the previously described research gap by highlighting the digital strategies that can enhance the impact of SMIs in this changing environment and address the difficulties experienced by beauty industry stakeholders. This study seeks to use AI-driven analytics applied to the vast amount of data available to improve SMI marketing strategies. The key objective of this study is to provide a thorough understanding of the mutually beneficial link that exists between digital technology, consumer engagement, and SMIs within the context of the personal care and beauty sector. Additionally, this study aims to bridge the gap between theoretical conceptions and their practical application, serving as a valuable resource for scholars and marketing practitioners. This study analyses customer sentiments using a sentiment analysis (SA) platform to provide useful insights and increase marketing efficacy. The following research questions are closely examined considering the outlined problem description:

1. How can digital tools aid SMIs in efficiently obtaining information and making better communication decisions in the beauty and personal care sector?
2. How can automation improve feedback analysis and IM efficacy in the beauty and personal care sector?

## 2. Literature Review

### *2.1. Beauty and Personal Care in the Digital Era*

In the digital era, the integration of digital technology and the importance that society places on personal appearances are the leading causes of a considerable transformation of

the beauty sector [20]. SM platforms and e-commerce have completely changed how consumers interact with brands and how markets function. This has enabled direct customer connections and the rapid adoption of beauty trends [21]. Digital platforms, especially SM, have become vital in determining how consumers behave. SMIs have introduced new patterns of content consumption, like "selfie makeup" and "Instagram makeup" [21]. Furthermore, research shows that SM endorsements and advertisements have a major impact on customer behaviour. This implies that SM platforms influence how consumers discover brands and make decisions [22]. Given the limitless shelf space and increased consumer reach via online platforms, the beauty industry's traditional business model has been transformed by the constructive collaboration between e-commerce and instant messaging [6]. Globally, online transactions have significantly increased, indicating a move towards digital commerce. Despite the current sluggish acceptance of online retail in South Africa, projections indicate significant growth in the online consumer market [23]. The digital revolution in the beauty and personal care sector highlights how crucial it is for organisations to adapt to the ever-evolving digital landscape. Organisations that seek to remain competitive in the digital age and satisfy evolving customer demands must embrace digital technology, leverage SM platforms, and optimise e-commerce.

### *2.2. SMIs and Beauty Marketing*

SM has a pervasive presence in our everyday lives. This is especially true in South Africa, where 42.9% of the population is engaged on these platforms as of January 2023 [24]. This shift in customer behaviour underscores the significance of Social Media Marketing (SMM) in building brand loyalty and improving customer engagement. Individuals who possess established credibility in a certain subject and utilise SM platforms like Instagram to provide information that connects with their audience and ultimately shapes consumer behaviour are referred to as SMIs [3]. For SMIs in the beauty industry, Instagram is a vital platform because of its large user base and strong engagement rate in South Africa. The average interaction rate per post per 1000 followers on Instagram is 29.67, which is higher than Facebook's 16.54 [25]. The promotion and usage of beauty items have undergone a dramatic shift due to the emergence of SMIs. As contemporary role models, SMIs create standards of product or brand attractiveness and develop trends that appeal to their followers [26]. Because of customers' growing reliance on the advice and support of these reliable individuals, this shift has had a marked impact on altering consumer behaviour when it comes to making purchases [27]. The accuracy and efficacy of IM strategies have been optimised with the use of automation [28]. Brands can improve the value proposition of their eWOM strategies by utilising digital technology. This will guarantee a distribution of relevant and interesting content that meets customer expectations and encourages brand loyalty [4].

It is evident that SMIs are now vital in determining the interests and actions of customers in the beauty sector. When strategically applied in conjunction with automation, SMIs can provide a solid foundation that helps brands to successfully traverse the intricacies of digital marketing and realise long-term growth. This study seeks to contribute to the knowledge of the evolving interaction between SMIs and customer buying habits by outlining the substantial impact that SMIs have on beauty marketing and highlighting the possibility for automation to be integrated to enhance the efficacy of IM campaigns.

### *2.3. Digitalisation, Automation, and Influencer Marketing*

Technological advancements and expanding business prospects, particularly on SM platforms like Instagram, have led to the rise in the popularity of IM [27]. eWOM, in which people influence other consumers by disseminating information, viewpoints, and endorsements, is the foundation of IM. It entails identifying powerful people and leveraging them in a calculated manner to advertise products or brands [29]. Businesses and individuals engage with SMIs through platforms like YouTube and Instagram, trusting these reliable individuals to effectively recommend their products or brands [27].

Data science research can benefit from the abundance of unstructured data generated by real-time interactions on SM platforms. Because of time and cost constraints, traditional methods of gathering and analysing consumer behaviour data are usually seen as ineffective, costing companies a great deal of money and time [18]. Furthermore, customers depend more on SM posts and their conversations with other customers to assess the calibre of goods, services, and retailers [30]. Interactive participation is frequently associated with more positive brand views, and it can have a significant impact on consumers' future behaviours [30]. Considering these observations, it is worthwhile to think about how automation may enhance accuracy and engagement in the SMI marketing process. Digital technology-driven automation is vital for improving the efficacy of IM strategies in the beauty and personal care industry [28]. These technologies facilitate quicker customer replies, enhance data collecting, and simplify procedures. In this changing environment, this not only maximises the efficacy of IM campaigns but also tackles the difficulties posed by labour-intensive processes [28]. In addition, the use of AI, particularly NLP, has transformed the way that eWOM data are analysed and has allowed for a deeper understanding of customer attitudes and behaviours [31]. Understanding how SMIs affect consumer attitudes and actions in the beauty and personal care industry, especially in South Africa, depends on this technological breakthrough. Therefore, the possibility of increasing the efficacy of IM campaigns can be created by introducing automation into the SMI marketing process.

### *2.4. Digitalisation in Marketing*

The academic work of Dunayev [32] outlines four primary implications of technical improvements in marketing strategies, demonstrating the extensive disruptive potential of digitalisation within the marketing field. First, digital technologies have improved user experiences by fostering customised connections between businesses and consumers. This has given rise to new forms of data that require the use of sophisticated analytics. This has created opportunities to carry out marketing efforts that are more effective and precisely targeted. Digitalisation has also produced new avenues for customer involvement through marketing innovation. As a final departure from traditional approaches, it has necessitated the creation of atypical strategic marketing frameworks.

The core goals of marketing continue to be achieved despite these revolutionary impacts [32]. The highest standards of marketing management rest on ongoing technology use, which is emphasised by a commitment to customer-centricity. Active participation in online forums is essential to building a strong brand reputation. Automation plays a critical role in building a loyal customer base by soliciting comments and delivering information promptly, both of which help a company become more visible online [28]. According to Dunayev [32], flawless marketing management is defined by the careful and seamless integration of technology, with an emphasis on the viewpoint of the customer. Proactive and prompt community involvement fosters a company's brand identity and reputation in the digital sphere. The combination of an active online presence, quick reaction times, and user-focused content strengthens the connection between brands and consumers, which increases the visibility of the company online [28]. According to a study by Roux [21], innovation in the digital space has driven a notable shift in the beauty sector over the last decade. The entire paradigm of the creation and use of beauty products has been altered by this transformation, including communication tactics. SM has become the reference source for anything related to beauty, with a wealth of resources available to help spread beauty knowledge quickly and widely [21].

### *2.5. Theoretical Grounding: Social Influence Theory and Consumer Behaviour*

Based on Social Influence Theory (SIT), this study investigates how SMIs impact customer behaviour in the personal care and cosmetics sector in South Africa. SIT clarifies how SMIs use mechanisms of compliance, identification, and internalisation to influence customer attitudes and their purchase decisions [33]. According to Atika et al. [34], these

procedures demonstrate the considerable influence that SM has on customer behaviour. They also show the significance that word of mouth (WOM) has in spreading influencers' messages and in impacting consumers' perceptions of brands and intent to purchase. In addition, NLP methods with SA examine how eWOM communications can reveal the complex connections between SMI messages, customer behaviour, and language's power to affect social media [35].

To provide insights into how SMIs might effectively increase consumer engagement and the ensuing buying intent in the beauty and personal care industry, this research attempts to explore the dynamics of compliance, identification, and internalisation within the framework of SMI marketing. The theoretical grounding in SIT provides a comprehensive framework for investigating the impact of SMIs on consumer purchasing behaviour, with a focus on the pivotal role of eWOM and the analytical power of NLP, in the form of SA, in understanding and leveraging social influence within the digital marketing landscape.

### *2.6. Best Practices*

In today's digital environment, the significant increase in online data has changed how we conduct consumer research and analyse their behaviours. Web scraping and other innovative methods are being utilised to gather data about consumer preferences and market dynamics. A collection of best practices developed to support this strategy is displayed in Table 1.

**Table 1.** Best practices and key findings.

| Study Author | Practice | Key Findings |
| --- | --- | --- |
| **Kaulartz and Hippel** [36] | Utilise web scraping for efficient data collection | Web scraping makes data extraction more affordable and time efficient. Products can be customised by businesses to satisfy customer needs. |
| **Boegershausen et al.** [37] | Address technical, legal, and ethical concerns | The veracity of web data depends on meticulous data quality control. Web scraping is becoming more common. |
| **Haddara et al.** [38] | Employ automated tools like NLP | Automated technologies find common themes and patterns in consumer feedback, streamlining the analysing process. |
| **Suganya and Vijayarani** [39] | Implement ML algorithms | ML helps improve customer service and SA. |
| **Vassio et al.** [40] | Analyse data in real time for dynamic insights | The impact of SMI and the rapidly shifting dynamics of SM interactions are captured by instantaneous data analysis. |

This study highlights the value that web scraping and SA, a type of NLP, plays in analysing consumer behaviour. The best practices involve technology-assisted data processing and in-depth examination of web reviews. However, there is a distinctive research gap regarding the impact of instantaneous data gathering on consumer behaviour in the context of SMI marketing, specifically on Instagram, in South Africa's beauty sector. This research intends to evaluate the engagement and interactions of followers with SMI content by way of web scraping and SA. The objective of this study is to introduce a digital framework that enhances the engagement and efficacy of SMIs in the beauty and personal care sector, with the objective of growing revenue.

This study's approach, which emphasises the value of SIT and NLP techniques for SA, is strongly based on marketing theory. SIT provides a fundamental framework for understanding how SMIs impact the decisions of consumers in South Africa's beauty sector. This study uses web scraping to record user interactions from the Instagram platform, in the form of likes and comments, to show how SMI's eWOM affects customer behaviour. In addition, social media postings on beauty products and influencers are analysed using NLP, more specifically, SA, to find important themes, feelings, and subjects that add to the persuasive power of SMIs. The primary aim is to introduce a novel digital framework that enhances the efficacy of conventional SMI marketing, with the goal of improving platform performance and augmenting purchase desire.

## 3. Materials and Methods

### *3.1. Grounded Literature*

This research considers prior research on SA and text mining by Redhu [41], the role of opinion mining in e-commerce by Gosh et al. [42] and Alvares et al. [43], and SA of instantaneous information from news by Kaur [44]. It also considers the works by Nahili and Khaled [18], Lyu and Kim [45], Balli et al. [46], Gangrade [47], and Jones et al. [48] regarding various SA approaches. Building on these prior investigations, this research study offers a novel method for enhancing traditional SMI marketing processes by utilising web scraping and NLP-based SA techniques. To investigate SMI's effect on purchases of cosmetics and personal care products, this study centres around SA and opinion classifications.

### *3.2. Methodology*

The methodology employed in this study effectively combines quantitative and qualitative approaches, creating a cohesive blend of research techniques. Quantitative data are gathered through web scraping and sentiment analysis (SA) of Instagram posts, while qualitative insights are drawn from established best practices in the existing literature. This methodological integration serves as the cornerstone of an extensive research framework created primarily to address a major issue facing the personal care and cosmetics sector. Through the succession of carefully thought-out steps, the comprehensive method advances the research process in its entirety. To accomplish our study objectives, the steps shown in Figure 1 are crucial elements of our comprehensive research framework.

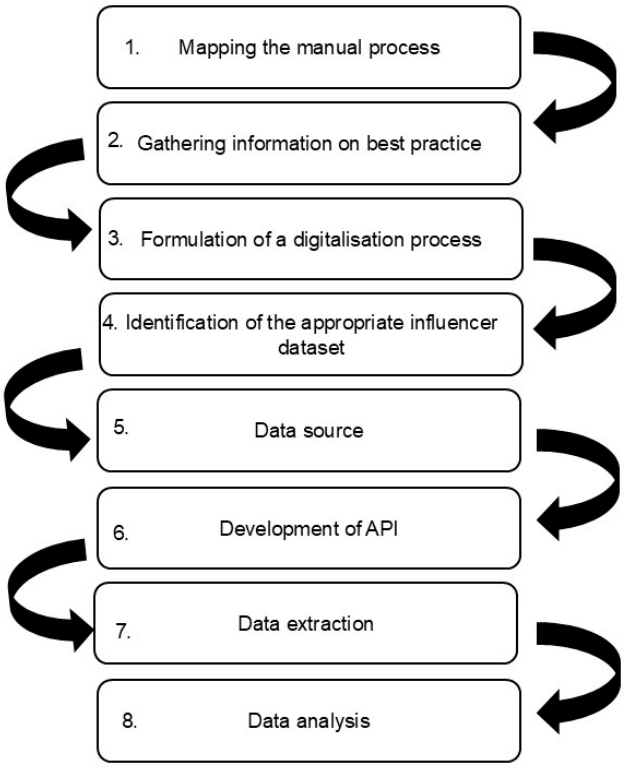


**Figure 1.** Research framework. Source: by the authors.

This study begins by mapping the current manual SMI marketing process to identify areas for automation (Step 1). It then gathers best practices from the existing literature, incorporating techniques like web scraping and NLP-based SA to develop a comprehensive digital framework (Step 2). A theoretical framework for digitalisation is formulated, creating a departure from traditional methods (Step 3). The appropriate influencer dataset is identified based on predetermined criteria (Step 4), and data are sourced from selected SM platforms while adhering to ethical guidelines (Step 5). A custom Application Programming

Interface (API) is developed for efficient data retrieval (Step 6), followed by data extraction using web scraping (Step 7). Finally, machine learning (ML) algorithms are applied for SA to provide valuable business insights (Step 8).

## 4. Results

This section offers a practical demonstration of the framework's effectiveness and capacity to manage the challenging task of gathering, analysing, and responding to feedback in SMI marketing efforts. This study centres on the integration of digitisation and automation to enhance several elements of the IM process within the framework of SMI marketing. The challenges of the conventional manual SMI marketing strategy necessitate this shift. The outcomes are displayed in sequential stages.

### *4.1. Creating the Traditional SMI Marketing Process*

Following the guidelines of our research methodology, we defined the manual SMI marketing process as the first step in our analysis. This strategy and the combined insights derived from our empirical investigation are shown in Figure 2.

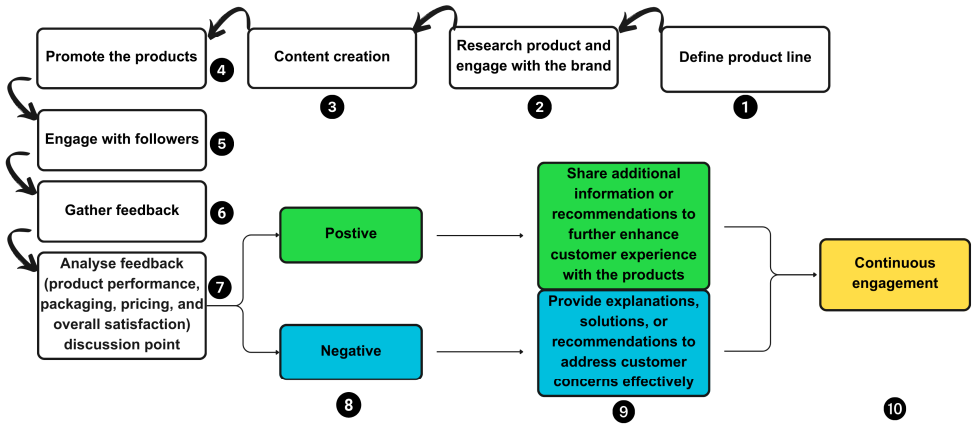


**Figure 2.** Traditional/manual SMI marketing process. Source: by the authors.

To develop this paradigm, we systematically integrated relevant research findings and empirical data. The recognised academic research informed each component of the system. The fundamental stage, "Product Selection and Research", places a strong focus on combining product selection with an influencer's knowledge to maximise campaign effectiveness [25]. The importance of influencer suggestions based on past interests is emphasised by [49]. "Collaboration Establishment" emphasises the critical part that influencer–brand collaboration plays in the success of SMI marketing, utilising data from academic research and industry publications [50,51]. The "Content Creation" stage is guided by empirical evidence that highlights the significance of captivating and creating aesthetically pleasing content in holding followers' attention [48]. Well-researched content that highlights the need to actively engage followers is the foundation of promotion and engagement [33]. Based on this information, the traditional SMI marketing process is developed in a methodical manner.

### *4.2. Collecting Information on Best Practices*

Gathering industry best practices that are supported by scholarly literature and well-established theoretical frameworks is the next stage. These best practices include rule-based automated response creation to increase user engagement, data scraping for efficient data gathering, and SA for accurate assessment of sentiments. Our study aimed to maximise the efficacy of IM campaigns in the digital era by embracing the potential of data-driven methods, going beyond typical manual IM approaches. Table 1 provides factual data to back up each part of this all-encompassing strategy.

### *4.3. Recommended Digital Framework*

The third phase in this study is the introduction of a digitalised framework. A number of essential steps, such as post-identification, data collection, data preparation, SA, polarity calculation, and response generation, are used to methodically create the digitalised framework shown in Figure 3.

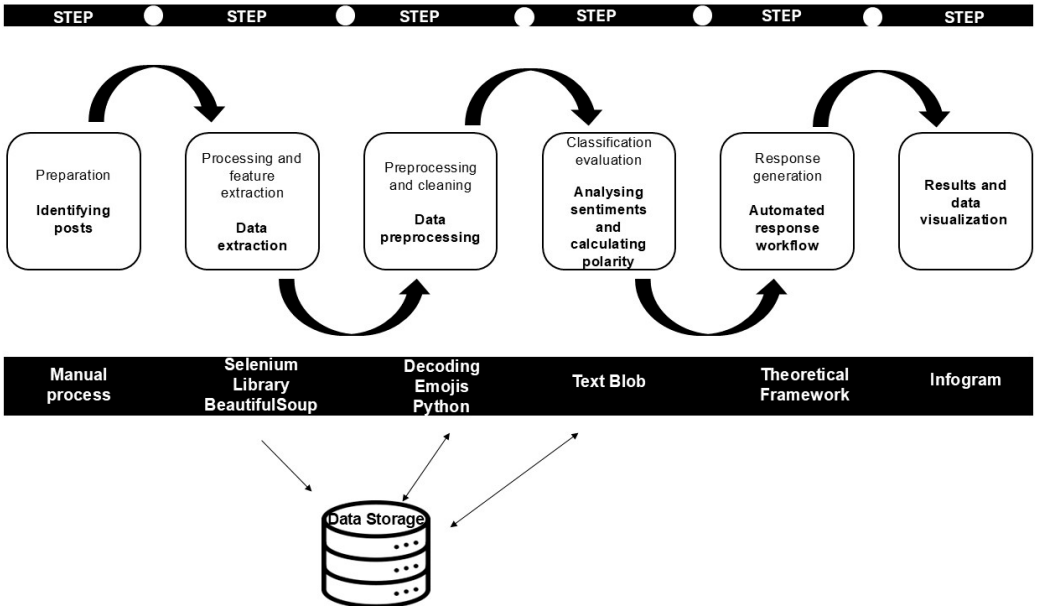


**Figure 3.** The proposed framework that incorporates automation into SMI marketing processes. Source: by the authors.

The goal of this data-driven strategy is to enhance the efficacy and efficiency of the SMI marketing process.

The following describes each of these phases in detail, based on empirical data and an in-depth understanding of the manual SMI marketing process.

#### 4.3.1. Identifying Posts

In accordance with best practices emphasised by Wang, who demonstrated the significance of matching an influencer's attributes with a brand's identity, this research proceeded by identifying postings from a carefully selected, highly active SMI [6]. Following the selection of an SMI, a methodical process was utilised to recognise distinct posts and save their hyperlinks within an organised JSON file. Posts that were published between July 2023 and February 2020 were scraped. A thorough manual check was conducted for this procedure, with an emphasis on retrieving post titles.

#### 4.3.2. Data Acquisition

The fundamental approach that was chosen and supported by both empirical and academic studies was web scraping. To accomplish the procedure, a special Instagram account was created. This account was then used to log in to Instagram, open identified links, and extract comments from posts. BeautifulSoup was used for data extraction, and Selenium was used for web interaction. The results of this research show how effective digital technologies are at aiding SMIs in the beauty and personal care industry in acquiring information more efficiently. With a methodical approach, digital technologies, such as BeautifulSoup and Selenium, were successfully used to collect data from Instagram in an organised manner, providing a wealth of insightful information.

The information repository, which included 25 Instagram posts from the chosen SMI, established the investigative capability of this study. A combination of digital tools was required to organise controlled online interactions and extract content. These tools

significantly increased the productivity of data gathering compared with labour-intensive manual procedures. Subsequent analysis of the acquired data produced a number of noteworthy discoveries. Regularly receiving a lot of likes and comments on their Instagram photos, the SMI demonstrated a large and involved community that values personal care and beauty. Likes and comments for the combined postings are examples of the quantitative measures related to user involvement, represented by the tabulated data in Table 2.

**Table 2.** Total likes and comments of posts in the dataset.

| Number of Posts | Total Comments | Total Likes |
|---|---|---|
| 25 | 4492 | 861,822 |

#### 4.3.3. Data Preprocessing

Data preprocessing was crucial in this framework, guided by best practices and the complexity of raw data. Denny and Spirling [52] emphasise its impact on model efficacy. Using Python 3, we carefully extracted and deconstructed our dataset of 27 posts and 4492 comments, converting emojis to textual descriptions for accurate sentiment analysis. To preserve the integrity of the data, spam and irrelevant comments were eliminated. The integrity and dependability of the dataset were guaranteed by this preprocessing, providing a strong basis for any further study. An example of clean data is shown in Figure 4.

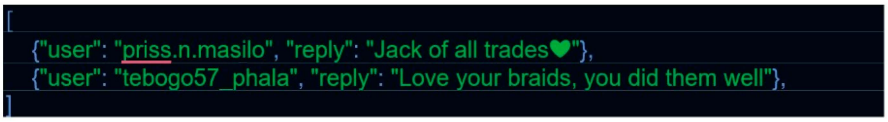


**Figure 4.** An example of clean data.

In the list of dictionaries, "reply" refers to the text that was sentimentally examined, and "user" refers to the person who expressed the feeling. To reply to the user's expressed sentiment directly, we extracted their username.

#### 4.3.4. Analysis of Sentiment and Determination of Polarity

SA was incorporated into this study in a manner that followed accepted best practices. Polarity and subjectivity ratings for comments on Instagram posts were computed using TextBlob, a well-known Python library known for its ability to decipher textual sentiment. With the use of SA, this research provided a convincing example of how digital technologies can improve SMIs' ability to make decisions. Using the TextBlob library, polarity scores for the comments on each of the 25 Instagram posts were carefully computed. The polarity spectrum ranged from $-1$, which represents negative sentiment, to 1, which indicates positive emotion. The TextBlob library employs a straightforward rule-based method for sentiment analysis. It determines a text's sentiment polarity by applying a formula that considers the quantity and frequency of positive and negative words in the text. TextBlob possesses these capabilities since it has been pretrained with positive and negative word data. TextBlob uses the following formula to determine polarity:

$$\text{Polarity} = \frac{\text{Sum of scores of positive words} - \text{Sum of scores of negative words}}{\text{Sum of scores of all words}} \quad (1)$$

where a word's "score" is calculated using lists of positive and negative terms that have already been specified. The total of the positive word scores is determined. The total of the negative word scores is computed. The total of each word's scores is determined. Following these computations, the polarity is calculated by deducting the total negative score from the total positive score and then dividing the result by the total word scores.

The accurate classification of follower attitudes as positive, negative, or neutral was made possible by this quantitative sentiment metric. At the same time, subjectivity scores for the remarks were also calculated, ranging from 0 for objectivity to 1 for subjectivity.

These ratings made it easier to determine how much of the follower comments were based on the author's opinions, beliefs, or feelings. The main conclusions of this study were crucial in clarifying the significant influence of sentiment analysis. Through subjectivity and polarity ratings, SMIs can obtain a complex understanding of their followers' feelings. Subjectivity ratings revealed the level of personalisation and emotional expression in comments, whereas polarity scores revealed the general sentiment within them.

A total of 25 Instagram posts were analysed for sentiments. The sentiment of a post was determined by calculating the average sentiment for each reply under the post. The overall sentiments of the posts are 0.365, which suggests that the SMI's followers expressed positive sentiments regarding the product being marketed. The SA, based on the average sentiment of replies under each post, indicates a generally favourable response from the audience. To gain insights into sentiment classifications, one can examine the polarity scores presented in Figure 5. The table serves as a comprehensive reference, illustrating the sentiment associated with each data point and providing a clear overview of the overall sentiment distribution. This visual representation aids in the interpretation of sentiment patterns, offering a quick and intuitive understanding of the sentiments derived from the polarity scores. By referring to Figure 5, stakeholders can make data informed decisions.

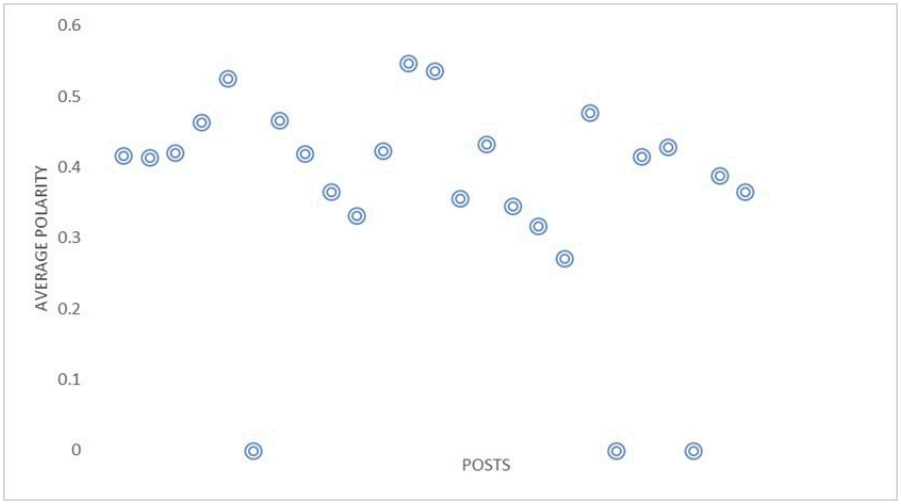


**Figure 5.** Graphical representation of the aggregate sentiment labels per post. Source: by the authors.

Posts that provide exceptionally high emotion ratings, for instance, indicate that followers have a strong affinity for goods or content topics. On the other hand, identifying negative sentiment ratings provide insightful information about areas that need to be improved. SMIs can efficiently utilise this input in order to better align their content plans, respond to issues, and improve their online presence in general. This study emphasises SA's revolutionary potential as a vital tool for SMIs, enabling data-driven decision-making and encouraging more audience participation. The report emphasises SA's revolutionary potential as a vital tool in SMIs' toolset, allowing data-driven decision-making and encouraging more engagement with their audience.

#### 4.3.5. Response Generation

Using knowledge from SA, this study's final phase creates a method for generating responses by classifying them as positive, neutral, or negative attitudes. This innovative method ensures that every message is given an appropriate response. Because of the enormous number of comments, SMIs frequently find it difficult to reply to them all. However, by using SA in this stage, engagement efficiency is increased by prioritising replies according to the emotional tone of the comments. This approach not only guarantees a more thorough engagement with the audience but also handles the challenges that

traditional SMI encounters when managing a large number of responses efficiently. The response-generating method is displayed in Figure 6.

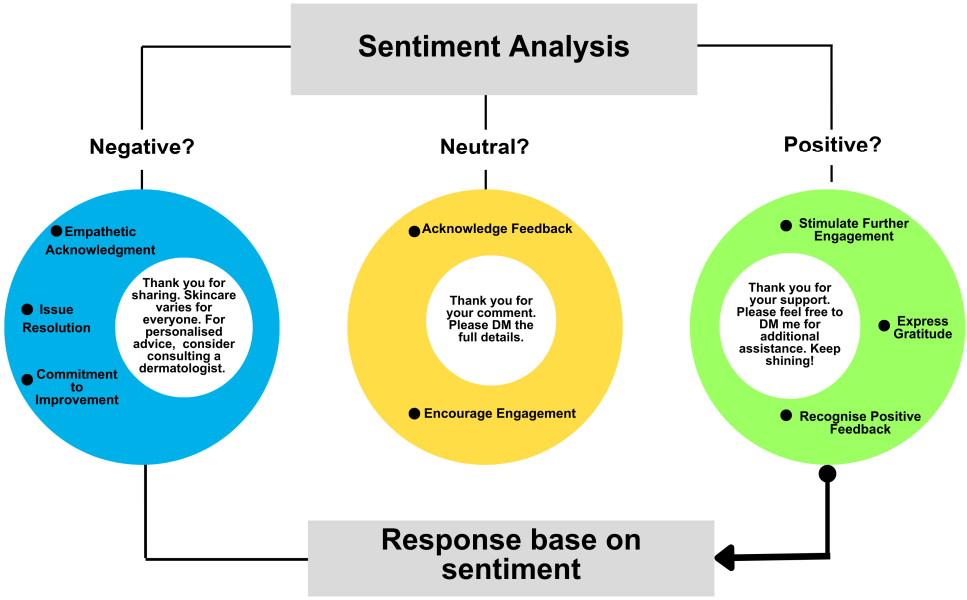


**Figure 6.** Response generation mechanism. Source: by the authors.

The sentiment-based response generation system is designed to provide consistent responses to inputs with the same polarity. In the case of encountering a negative sentiment, the system responds with a considerate message, expressing gratitude for the shared thoughts and acknowledging the diverse nature of skincare preferences. The system encourages seeking personalised advice by suggesting a consultation with a dermatologist, emphasising the importance of individualised skincare experiences. This empathetic approach aims to prioritise the well-being and satisfaction of the user. In instances of neutral sentiment, the system expresses gratitude for the user's support and extends an invitation for further assistance through direct messaging. The message emphasises the user's positive impact and assures them that additional help is readily available. This approach aims to maintain a positive and supportive interaction, fostering a sense of connection and collaboration with the user. Lastly, when comments have positive sentiments, the system reciprocates with gratitude for the positive feedback received. It not only acknowledges the user's support but also expresses a willingness to assist further, inviting questions or additional comments. By building a feeling of community and promoting ongoing interaction, this affirming reaction aims to deepen a positive relationship with the user. Figure 7 shows a representation of a message that generated a positive reaction.


```
[
  {"user": "tebogo57_phala",
  "reply": "Love your braids, you did them well",
  "polarity": 0.5,
  "subjectivity": 0.6,
  "sentiment_label": "positive",
  "Response": "Thank you for your support. Please feel free to DM me for additional assistance. Keep shining!",
  },
]
```


**Figure 7.** A snapshot of a positive generated response for a reply. Source: by author.

## 5. Discussion

In the constantly evolving landscape of digital marketing, using digital technology with automated solutions has become a key strategy for boosting SMI engagement in

the beauty and personal care sector. Our primary research questions are persuasively addressed by this study's major outcomes. We examine these problems and provide data that demonstrate how automation and digitalisation in IM processes can be transformative.

*RQ 1:* How can digital tools aid SMIs to efficiently obtain information and make better communication decisions in the beauty and personal care sector?

This study clearly demonstrates how digital tools, BeautifulSoup and Selenium, in particular, can speed up the process of gathering data for SMIs in the personal care and beauty sector. By leveraging automation and digitalisation, the said digital technologies successfully gathered data from 25 Instagram posts authored by a selected SMI. This shows that it is possible to efficiently scrape significant volumes of real-time data from Instagram.

This study also shows how SMIs' capacity for making decisions may be enhanced by performing sentiment analysis using the TextBlob 0.17.1 library. By calculating polarity ratings, this study uncovers common feelings in comments on Instagram posts, allowing SMIs to make decisions based on a comprehensive grasp of customer attitudes.

When comparing these findings with recent studies, Tyagri et al. [53] underscore the effectiveness of utilising Python and Selenium for automating SM tasks, which validates our results regarding data scraping efficiency. Our findings concerning the speed and effectiveness of these technologies were further supported by Abodayeh et al. [54] who demonstrated that automated data scraping could gather and analyse data from several sources in a space of seconds.

*RQ 2:* In the beauty and personal care sector, how can automation improve feedback analysis and IM efficacy?

This study clearly shows that automation has a major impact on increasing the accuracy of feedback analysis. It does this by carefully converting emoticons into textual explanations and using Python to deconstruct complicated comment strings. This process guarantees that analytical instruments can retrieve the most nuanced emotions conveyed by emojis. Additionally, the addition of TextBlob's sentiment analysis tool improves sentiment evaluation and further increases the analysis's accuracy by assigning subjectivity and polarity ratings to comments. This research successfully answers this topic by using automation, more especially a rule-based response system.

Recent studies by Abdulrahman and Kečo [55] highlight the importance of automated SA tools like TextBlob in augmenting feedback interpretation efficiency, achieving around 80% accuracy in classifying feedback as positive or negative. This validates our results with respect to sentiment analysis's ability to increase the accuracy of feedback analysis.

Improving interaction and engagement between SMIs and their followers is a key focus of this strategic approach, which aims to counteract the falling levels of content marketing engagement. This evidence-based methodology combines automation with personalised responses in a seamless way to cater for the ever-changing needs within the digital marketing landscape. This framework serves as the foundation of a novel IM strategy in the beauty and personal care sector, effectively closing the gap between human and automatically generated answers in a methodical and well-researched way.

## 6. Conclusions

The objective of this study is to introduce a digital framework that enhances SMIs' engagement and efficacy in the beauty and personal care sector with the aim of growing revenue. This study's main findings emphasise the innovative potential of digital technologies and automation in SMI marketing strategies. These technologies effectively collected data from 25 Instagram posts created by a chosen SMI by utilising automation and digitalisation. This shows that it is possible to efficiently scrape significant volumes of real-time data from Instagram. By highlighting the significance of technology-driven feedback analysis, data-driven decision-making, and the integration of automation tools to maximise the efficacy of IM in the South African beauty and personal care sector and enhance user engagement and interaction, these findings are in line with global best practices. For example, Kaur [44] showed how ML algorithms and web scraping can efficiently perform sentiment

analysis on real-time news data. Alvares et al. [43] and Ghosh et al. [42] displayed the importance of employing NLP tools to analyse consumer attitudes in opinion mining and e-commerce. A thorough review of text mining and SA techniques was presented by Redhu [41], who also demonstrated how to apply these techniques to a variety of datasets. Gangrade et al. [47] demonstrated the usefulness of these techniques by achieving a 90.7% accuracy rate in sentiment categorisation on Instagram posts. Balli et al. [46] successfully utilised NLP to analyse sentiment in Turkish language datasets from Twitter, achieving up to 87% classification accuracy.

In a South African setting, this research study adds to the body of knowledge about SMI marketing in the beauty and personal care sector. At the onset, this study provides a thorough mapping of the whole SMI marketing process by fusing real data with previous academic research. To provide the groundwork for digital transformation, this planned process is crucial. Second, this study expands the theoretical conversation on the function of digitalisation in marketing by offering a novel framework that integrates rule-based automated response generation, web scraping, and NLP-based support (in the form of SA) for social media. For example, this study demonstrates how BeautifulSoup and Selenium can be used for data scraping, and TextBlob for sentiment analysis, to enhance decision-making processes. By utilising a platform for sentiment analysis (SA), this research interprets consumer sentiments to offer actionable insights and improve marketing effectiveness.

This research also contributes to the academic body of knowledge on IM by demonstrating the practical use of ML algorithms in the analysis of text-based data from SM sites. SA and polarity computation, which makes use of the TextBlob library, is one use case of rule-based systems for the analysis of massive amounts of unstructured data. The digital framework of this study provides a structured approach to digital SMI marketing by integrating data gathering, preprocessing, and analysis. This framework can serve as a foundation for future theoretical models that analyse the dynamics of IM in the digital age.

Marketing experts in the beauty and personal care industry can utilise the recommended digital framework as a strategic instrument to increase consumer engagement. Managers can use automated data collection and analysis to obtain real-time insights into user sentiment. This information can be used to make well-informed decisions about product marketing and SMI alliances. The key outcomes of the research study draw attention to the dynamic capability of digital technology and automation in IM tactics. These research results emphasise the value of technology-driven feedback analysis, data-driven decision-making, and the integration of automated tools to optimise the efficacy of IM in the South African beauty and personal care sector while improving user engagement and interaction.

## 7. Theoretical and Managerial Implications

By combining automation and digital tools, this study bridges the gap between theoretical concepts and practical applications, making a substantial theoretical contribution to SMI marketing. This study emphasises how AI is revolutionising the beauty industry, particularly in terms of improving customer interaction and empowering businesses to use innovative marketing strategies. AI technologies, such as ML and SA, are pivotal in personalising consumer experiences, optimising product offerings, and improving brand trust, ultimately influencing purchasing decisions. AI is significantly transforming how companies manage customer feedback and engage with consumers, particularly in the beauty sector. Businesses can automate feedback systems that handle a substantial number of customer interactions by employing SA and ML. This allows for real-time responses and tailored marketing campaigns. Client satisfaction and engagement are improved by this connection, which ultimately increases brand loyalty.

AI and SA play a crucial role in modern feedback systems, allowing companies to manage and respond to customer feedback more efficiently and effectively. AI-driven personalisation is a vital aspect of this transformation. For instance, AI tools analyse customer sentiments from a wide range of sources like SM and reviews, allowing businesses

to respond promptly to customer needs [56]. This aligns with this study's findings that incorporating AI into IM campaigns can significantly improve data collection and SA, leading to enhanced consumer engagement and increased purchase intent. According to this study, SMIs can interact with their audience more successfully by using AI-powered SA to categorise comments according to their emotional tone. In addition to improving client satisfaction, this real-time feedback system enables prompt modifications to marketing plans in response to customer sentiment.

ML algorithms identify trends and potential issues, enabling organisations to proactively adjust their products and services [57]. This proactive approach is essential for maintaining competitiveness in the beauty sector, as highlighted in this research. For example, by analysing SA, companies can identify emerging consumer preferences and potential dissatisfaction early, enabling them to adapt their product offerings and marketing messages accordingly. Given how quickly trends can shift in the fast-paced beauty industry, this expertise is very beneficial. This study's introduction of a response generation mechanism that classifies comments based on their emotional tone exemplifies this application, allowing SMIs to engage more effectively with their audience. In addition to strengthening connections with customers, this personalised interaction increases trust and brand loyalty.

This study offers marketing professionals a useful digital platform to enhance SMI–customer interaction and make data-driven decisions from a managerial standpoint. Managers can use SA and automated data collecting to gain real-time insights into customer behaviour. This makes it possible to create SMI partnerships and more effective digital marketing initiatives. For instance, managers may determine which influencers are most successful at fostering positive engagement and modify their collaboration tactics appropriately by regularly analysing sentiment data.

Additionally, the development of novel marketing strategies to attract new customers is crucial. AI-driven marketing campaigns can target specific consumer segments with tailored messages, improving the effectiveness of marketing efforts. For instance, AI can help identify potential new customer segments that have not been previously targeted, allowing companies to expand their reach and grow their customer reach. In addition to improving client reach, this strategic application of AI makes sure that marketing initiatives are in line with the wants and needs of customers. The results of this study highlight how crucial it is for businesses to use AI to evaluate customer data from SM sites like Instagram to create audience-relevant, tailored marketing messages. By integrating AI into their marketing strategies, companies in the beauty sector can engage more effectively with consumers, drive higher conversion rates, and foster long-term customer loyalty.

The integration of AI in SMI marketing offers numerous opportunities for enhancing consumer engagement and optimising marketing strategies. This study's applications show how AI can be used to enhance feedback mechanisms, target advertising, and increase consumer loyalty. Businesses can better serve their customers' requirements and maintain their competitiveness in the ever-changing digital marketplace by consistently upgrading and improving AI-driven marketing frameworks.

## 8. Limitations and Future Research

### *8.1. Limitations*

This study offers a thorough examination of its limits, considering several variables that affected the research method as well as the breadth of its conclusions. First, because this study was conducted in the South African beauty and personal care industry, care must be taken when extrapolating the results and suggested frameworks to other industries or geographical areas. It is important to use caution when applying these findings to other regions because of the distinct market dynamics and consumer behaviour in South Africa. Furthermore, this study's dependence on particular digital tools, namely, TextBlob for SA, raises concerns regarding its long-term accuracy and feasibility because of shifting APIs and technological developments. More sophisticated and flexible SA technologies should be used in future studies to guarantee accuracy and relevance. Furthermore,

because Instagram was the primary focus of this study, it might have overlooked important information from other social media sites like Facebook, X, YouTube, and other blogs. This narrow focus limits the comprehensiveness of the findings, as consumer engagement and sentiment can vary significantly across different platforms. Future research should include a broader range of SM platforms to provide a more holistic view of consumer behaviour and sentiment. Issues with representativeness may also arise from this study's sample size. The amount of Instagram posts and comments examined is substantial, but it might not adequately represent the range of user interactions and opinions seen in the larger beauty and personal care sector. Investigating the impact of AI and SMI marketing with multiple beauty brands would provide a more comprehensive understanding of the effectiveness and challenges of these strategies. The resources needed to implement the suggested automated systems and tools represent another important constraint. These specifications cover ongoing maintenance, technological infrastructure, and software development. Adopting these automation tactics may prove difficult for small businesses or independent SMI with minimal funding, which could limit their capacity to improve their SMI marketing initiatives. Finally, the suggested digital framework for using AI in SMI marketing is still in its infancy. This framework must be put into practice and tested in the real world to confirm its efficacy and identify any possible problems or areas for improvement.

### *8.2. Future Research*

The present investigation lays a solid foundation for future research and development projects aimed at advancing the field of SMI marketing campaigns. According to the findings, several areas warrant further exploration. First, beyond data collection, SA, and response generation, future studies should investigate automating further steps in the IM process. SMI strategies can be improved by researching and implementing automation solutions in several areas of the marketing process. This covers the production of content, promotional efforts, and the tracking and assessment of campaign effectiveness.

Additionally, by modifying the suggested frameworks and automation technologies for use in industries other than beauty and personal care, there is the possibility of cross-industry applicability. A thorough grasp of the adaptability and significance of automation in IM will be possible by expanding the research to different industries and geographical areas. It is critical to keep up with SM trends and technological advancements. Continuously evaluating and modifying automated procedures to conform to changing platform specifications and dynamic user behaviours is crucial for long-term success. Furthermore, to improve the precision and efficacy of SA and personalisation, future research should consider integrating advanced AI methods like deep learning and natural language processing. Examples from the real world, such as the implementation of AI in personalised suggestions and virtual try-ons, show how these technologies may be used practically to increase consumer satisfaction and engagement. For example, customers can virtually try on items using AI tools like augmented reality (AR), which improves their shopping experience and boosts confidence when making a purchase [58,59].

Businesses can better serve their customers' needs and maintain their competitiveness in the ever-changing digital marketplace by consistently improving and refining AI-driven marketing strategies.

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