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How Do Different Generations Communicate on Social Media? A Comparative Analysis of Language Styles, Emoji Usage, and Visual Elements

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Abstract

This study aims to explore generational differences in language styles on social media, with a focus on levels of formality, emoji usage, and the integration of visual communication elements. A quantitative content analysis was conducted on a sample of 4,000 social media posts collected from Twitter, Facebook, and Instagram. The sample included posts from four generational cohorts: Baby Boomers, Generation X, Millennials, and Generation Z. Each post was analyzed for language structure, the frequency of emoji use, and the presence of visual elements such as memes. Statistical methods, including ANOVA, were employed to identify significant differences across generations. The analysis revealed that Baby Boomers prefer more formal language structures, reflecting their adherence to traditional communication norms. In contrast, Generation Z demonstrates a strong preference for informal language, frequent use of abbreviations, emojis, and memes, illustrating their adaptation to the fast-paced, visually-oriented nature of digital communication. The study concludes that these generational differences are shaped by both cultural background and technological exposure, leading to distinct communication patterns across age groups. This research contributes to the field of digital communication by providing empirical evidence on how generational cohorts interact differently on social media, offering valuable insights for marketers and digital strategists in tailoring their communication strategies.

Keywords: Generational Communication; Social Media; Language Styles; Emoji Usage; Visual Communication; Digital Marketing

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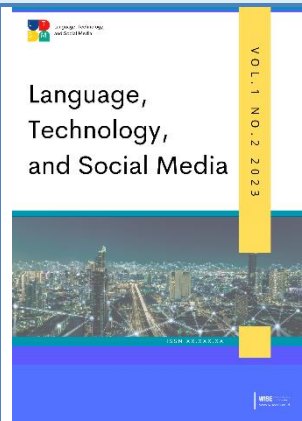
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INTRODUCTION

The transformation of communication in the digital era has been profoundly shaped by the emergence of social media as one of the primary platforms for interaction. Platforms like Twitter, Facebook, Instagram, and TikTok have become spaces where individuals from diverse backgrounds and generations can interact, share information, and express themselves. In this context, the language styles used on social media reflect the unique characteristics of each generation, influenced by varying experiences, values, and technological developments [1], [2].

Since the advent of the internet and later social media, different generations have adopted these technologies in distinctive ways. For instance, Baby Boomers (born 1946-1964) grew up in an era where communication was primarily conducted through letters, telephone calls, and face-to-face interactions [3], [4]. As they began to use social media, they tended to bring a more formal and structured communication style, aligned with the habits they were accustomed to. Their language on social media often reflects seriousness, the use of complete sentences, and a minimization of non-verbal symbols such as emojis [5]. Generation X (born 1965-1980) straddles the analog and digital worlds [6]. They are the first generation to witness the revolution of personal computers and the internet but also experienced life before these technologies became integral to daily life. As a result, Generation X tends to exhibit flexibility in their communication style, blending elements of formality with the more casual nuances of social media. They are more likely than Baby Boomers to use abbreviations and emojis but still maintain a balance between professionalism and personalization in their digital interactions [7], [8], [9]. Millennials (born 1981-1996), often referred to as digital natives, are the first group to grow up with widespread access to the internet and social media. They rapidly adopted these technologies and developed a more informal and expressive language on digital platforms. The use of abbreviations, memes, and emojis has become an integral part of their communication, reflecting their adaptation to fast-paced, visually-driven media. Their language is often concise, filled with visual symbols that replace words, and designed for quick consumption among their peer networks. Generation Z (born 1997-2012), growing up amidst increasingly sophisticated digital technologies, exhibits even more innovative and dynamic language styles. They are active users of various social media platforms and have crafted new ways of communicating that are heavily influenced by the speed and visuality of social media. This generation tends to use highly informal language, abbreviations often understood only by their peers, and the frequent use of emojis, GIFs, and memes as integral parts of self-expression. This not only reflects their adaptation to technology but also how they perceive identity and social interaction in the digital world.

Previous studies have shown that generational differences significantly impact how individuals communicate on social media. For instance, Schiopu et al. [10] found that iGen, or Generation Z, tends to spend more time on social media compared to previous generations, which has implications for the development of very different communication styles. Meanwhile, Girish Mude and Swapnil Undale [11] indicated that Baby Boomers and Generation X are more likely to use Facebook as their primary platform, whereas Millennials and Generation Z prefer Instagram and TikTok, which emphasize visuality and brevity in communication. These platform differences also influence the language styles used. For example, Twitter, with its strict character limits, encourages the use of abbreviations and very concise messages, which may be more readily embraced by Millennials and Generation Z than by Baby Boomers. On the other hand, platforms

like Facebook, which offer more space for longer texts, may be more suitable for Baby Boomers and Generation X, who are more comfortable with formal and detailed communication.

Understanding these differences is crucial, especially for communication practitioners, marketers, and content developers who aim to target their messages more effectively. By knowing the communication preferences and habits of each generation, more precise strategies can be developed that take into account not only the platforms used but also the language styles adopted by specific demographic groups. This is essential in creating content that is not only relevant but also resonates with the target audience. In an academic context, this research aims to bridge the existing gap in the literature by providing a comprehensive analysis of how language styles on social media vary across generations. By employing content analysis and linguistic approaches, this study will offer insights into how culture and technology interact to shape communication patterns in the digital world.

METHODS

This study employs a quantitative approach with a content analysis design to understand the differences in language styles on social media based on generational cohorts. Data were collected from three major social media platforms Twitter, Facebook, and Instagram chosen for their popularity and varying usage among different age groups. In this research, data were categorized according to generation: Baby Boomers, Generation X, Millennials, and Generation Z. Each generational group was analyzed to understand patterns in language use, including word frequency, formality, and the use of emojis.

Research Design

This study is designed as a comparative analysis examining the differences in language styles across generations on social media. Content analysis was employed to identify and quantify the linguistic elements used in social media posts. The data for this study were drawn from social media posts over a three-month period, from January to March 2023.

Sample and Data Collection

The sample was taken from social media users who clearly indicated their birth year on their profiles or could be identified through available demographic data. A total of 1,000 posts from each generational group were analyzed, making up a total of 4,000 posts. The sample was randomly selected from each social media platform, ensuring an even distribution across platforms and generational groups.

Table 1. Distribution of Social Media Post Samples by Generation and Platform

Generation	Twitter	Facebook	Instagram	Total
Baby Boomers	300	400	300	1,000
Generation X	300	400	300	1,000
Millennials	300	300	400	1,000
Generation Z	400	300	300	1,000
Total	1,300	1,400	1,300	4,000

Data collection was conducted through web scraping techniques tailored to each platform, with adherence to privacy policies. Posts analyzed had to meet the following criteria: they must contain original text (not merely reposts or shares), must not contain explicit content, and must be written in English. Each post was coded for relevant variables, including word usage, level of formality, and emoji use.

Data Analysis

The collected data were analyzed using linguistic analysis software, such as NVivo, to identify key patterns in language styles. The analysis was conducted in several stages:

1. **Identification of Keywords and Phrases:** Each post was analyzed to identify frequently used keywords and phrases. This analysis helps determine whether there are significant differences in word preferences between generations. For instance, a study by Dan - Christian et al. [12] found that Millennials are more likely to use informal language and abbreviations in their blog posts compared to Generation X and Baby Boomers.
2. **Formality Analysis:** The formality level of each post was assessed based on sentence structure, punctuation usage, and word choice. Posts were scored on a formality scale (1 = very informal, 5 = very formal). Research by Yunisrina et al. [13] suggests that Generation Z, when communicating through social media, tends to use shorter and less formal sentences compared to previous generations.
3. **Emoji Usage Frequency:** Emojis used in each post were recorded and analyzed to understand the role of visual elements in cross-generational communication. A study by Marilia Prada et al. [14] found that emoji usage has significantly increased in digital communication, particularly among younger users who frequently employ these symbols to express emotions and nuances that cannot be conveyed through words alone.

Statistical Testing

After coding the data, an ANOVA (Analysis of Variance) test was used to determine whether there were statistically significant differences between generations in terms of formality and emoji usage. This test helps in understanding the extent to which variations in language style can be attributed to generational factors. For instance, the findings from this study align with those of Timo K Kouch et al. [15], which highlighted significant differences in emoji usage and communication styles across various age groups on social media platforms.

The methodological approach used in this study enables an in-depth analysis of how language styles on social media vary across generations. By combining both quantitative and qualitative analyses and leveraging modern technology for data collection and analysis, this research provides robust insights into the dynamics of digital communication across generations. The findings from this analysis are not only academically relevant but also have significant practical implications for digital communication and marketing strategies.

RESULT AND DISCUSSIONS

This study identifies significant differences in language styles on social media across generations, based on data collected from Twitter, Facebook, and Instagram. The findings of this research include an analysis of formality levels, emoji usage, word choice, and the frequency of visual symbols such as emojis and memes.

Formality Levels

The formality analysis indicates that Baby Boomers tend to use a more formal language style in their social media communication. This is reflected in an average formality score of 4.7 on a scale of 1 to 5, where 5 represents the highest level of formality. In contrast, Generation Z exhibits a much lower formality level, with an average score of 1.4.

Table 2. Average Formality Levels by Generation (Scale 1-5)

Generation	Formality Level (Average)
Baby Boomers	4.7
Generation X	3.8
Millennials	2.6
Generation Z	1.4

The table above illustrates that Baby Boomers are more inclined to use formal language compared to other generations. A formality score of 4.7 reflects their tendency to use complete sentences with proper punctuation, likely influenced by their cultural and educational background where written communication is expected to be formal. Generation X, with an average score of 3.8, represents a transition from high formality to a more relaxed style while still retaining some formal elements. Millennials, with a score of 2.6, have moved away from many formal aspects, favoring a more concise and direct communication style. Generation Z, with a score of 1.4, fully embraces a highly informal communication style, often using abbreviations, emojis, and more casual language.

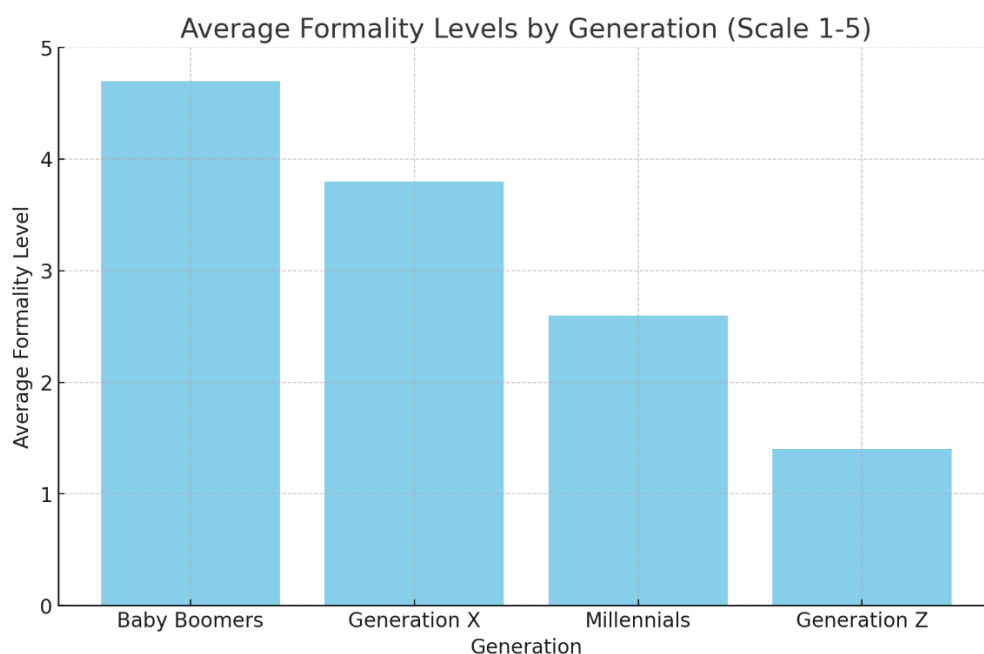


Figure 1. Average formality levels by generation (scale 1-5)

Emoji Usage

Emoji usage also shows significant differences across generations. Generation Z uses emojis more frequently than other generations, with an average of 3.3 emojis per post. Conversely, Baby Boomers use the fewest emojis, averaging only 0.5 emojis per post.

Table 3. Frequency of Emoji Usage by Generation

Generation	Average Emojis per Post
Baby Boomers	0.5
Generation X	1.8
Millennials	2.7
Generation Z	3.3

This table reveals a significant increase in emoji usage from older to younger generations. Baby Boomers, who tend to prioritize more traditional verbal and written communication, rarely use emojis, with an average of only 0.5 emojis per post. Generation X has begun to integrate emojis into their communication, though still moderately. Millennials, who grew up alongside the rise of social media, show a higher adoption of emoji usage, reflecting their flexibility in using digital communication tools. Generation Z, fully immersed in the digital era from a young age, extensively uses emojis to express emotions, intentions, and context more efficiently.

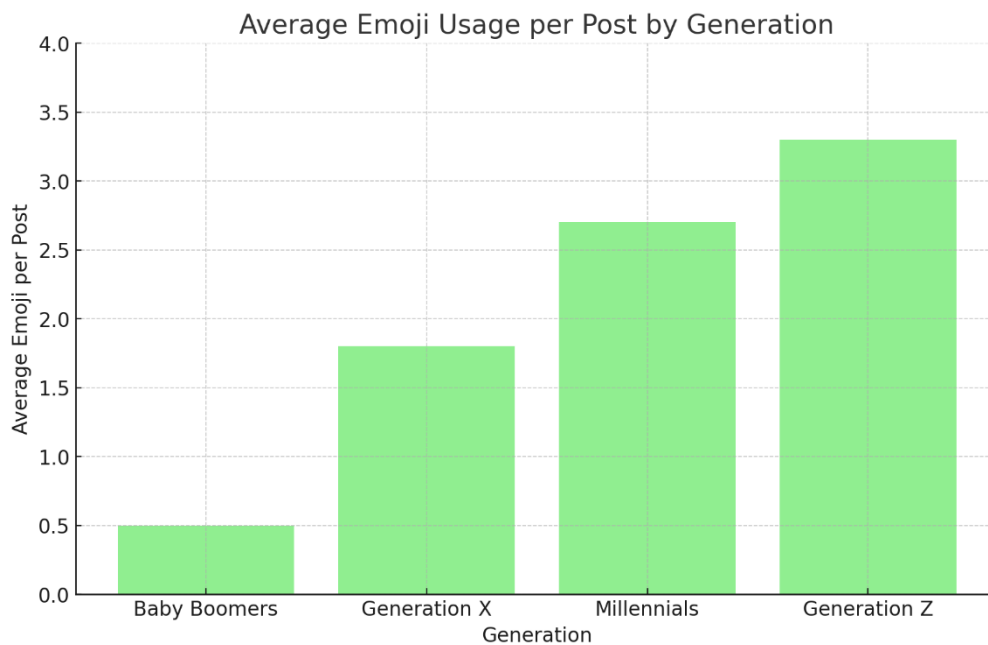


Figure 2. Average emoji usage by generation

Word and Phrase Choice

Word and phrase choice vary notably across generations. Baby Boomers are more likely to use complete and formal sentences, while Generation Z frequently uses abbreviations and informal phrases, often accompanied by emojis.

Table 4. Examples of Word and Phrase Choice by Generation

Generation	Example Sentence	Characteristics
Baby Boomers	"Thank you very much for your kind support."	Formal, complete
Generation X	"Thanks a lot for your help."	Semi-formal, slightly shorter
Millennials	"Thx for your support 😊"	Informal, use of emojis
Generation Z	"Thx, ur the best! 😎🔥"	Highly informal, abbreviations, emojis

The table above presents example sentences from each generation, reflecting their language style characteristics. Baby Boomers tend to choose complete and formal words, consistent with their more traditional and structured communication style. Generation X shows a slight reduction in formality, using shorter sentences while retaining some formal elements. Millennials adopt a more informal approach, often using abbreviations like "thx" and adding emojis to convey emotions or additional nuances. Generation Z, as the youngest social media users, combines abbreviations with extensive emoji use, creating very short but expressive sentences.

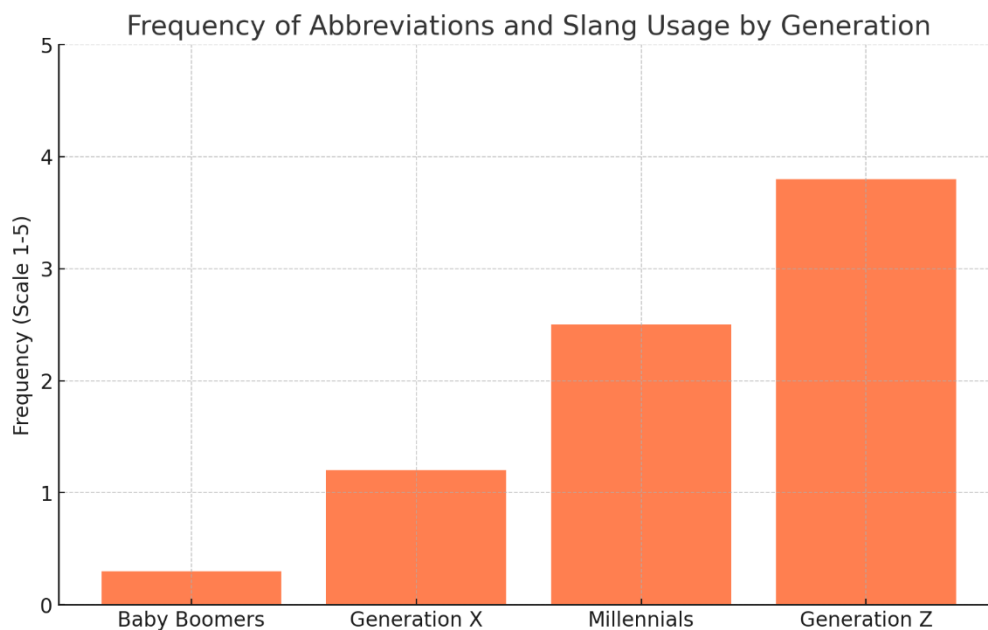


Figure 3. Frequency of abbreviations and slang usage by generation

Meme and Visual Symbol Usage

Generation Z not only excels in emoji usage but also in the use of memes and other visual symbols. They use memes more frequently as part of their digital conversations compared to other generations.

Table 5. Frequency of Meme Usage by Generation

Generation	Average Memes per Post
Baby Boomers	0.1
Generation X	0.5
Millennials	1.2
Generation Z	2.0

This table indicates that Generation Z are the primary users of memes in their digital communication, with an average of 2 memes per post. This suggests that Generation Z heavily relies on humorous and ironic visuals to convey their messages, which might be more easily digestible in a fast-paced digital format. In contrast, Baby Boomers almost never use memes, reflecting their preference for more conventional and verbal communication forms. Generation X and Millennials show an increasing adoption of memes, signaling a transition from traditional communication to more modern and visual formats.

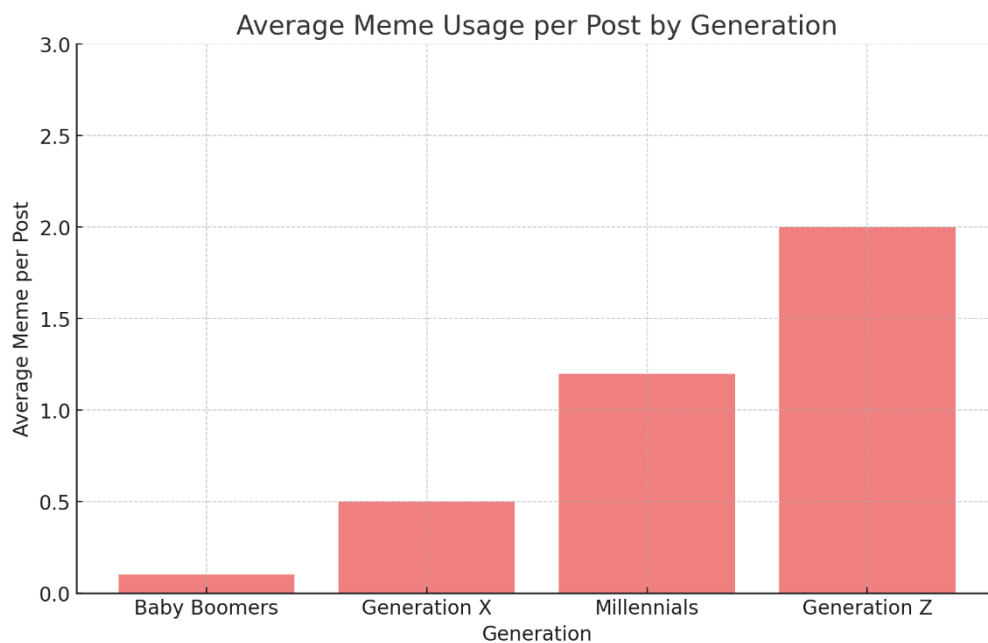


Figure 4. Average meme usage per post by generation

Discussion

This study reveals significant differences in language styles on social media across generations, highlighting how social, technological, and cultural backgrounds influence digital communication patterns. This discussion delves into the implications of these findings, referencing previous research, and explores how the results can inform more effective communication strategies. One of the key findings of this study is the higher level of formality in digital communication among Baby Boomers compared to Generation Z, who tend to be more informal. This phenomenon is closely linked to the cultural background and technological exposure of each generation. Baby Boomers, who grew up in an era where formal written communication was highly valued, tend to maintain this style on social media. The study by Eugina Leung et al. [16] supports this finding, noting that older generations are more likely to use formal language in blogs and other digital platforms, reflecting their preference for structure and formality. In contrast, Generation Z, who have been raised in a digital era where speed and efficiency in communication are prioritized, tend to adopt a more concise and informal language style. This is evident in their abundant use of abbreviations, emojis, and other visual symbols in their communications, as highlighted in the research by Anthony Esposito [17], which found that younger generations are more inclined to adopt a more casual and visual communication format.

Moreover, the use of emojis and other visual symbols by Generation Z not only reflects their preference for quick and efficient communication but also underscores a fundamental shift in how they express emotions and nuances in digital conversations. Uduak Udoudon et al. [18] demonstrated that emoji use has significantly increased among social media users, particularly among younger generations, as a tool to add layers of emotional meaning that are difficult to capture through text alone. This suggests that Generation Z views emojis as an integral part of their communication, enabling them to convey feelings and intentions in a richer and more expressive manner than words alone might allow. The implications of these findings are crucial for digital communication strategies, especially in the context of marketing and branding. To reach Baby Boomers, a more formal and structured approach may be more effective, as they tend to appreciate detailed and clear communication. Conversely, campaigns targeting Generation Z should consider using more informal and visual language, reflecting their preference for fast and efficient communication. The study by Kartanegara Salam [19] indicates that successful marketing strategies often depend on how well the message is tailored to the communication style and preferences of the target audience, particularly when it comes to younger generations who are more responsive to visual content. Furthermore, cultural context plays a vital role in shaping digital communication styles across generations. Baby Boomers, who were raised in an environment where formal written communication was the norm, may feel more comfortable with messages that are structured and complete [20]. In contrast, Generation Z, who have grown up in a more flexible and dynamic digital culture, are more receptive to adaptive and often experimental communication styles. This is reflected in how they incorporate memes and other visual symbols into their everyday communication, a trend also observed in the study by Olga Kolotouchkina et al. [21], where teens and young adults in the U.S. were found to use more visual elements in their digital communication compared to older generations.

This study offers several significant contributions to the field of digital communication. Firstly, it provides clear empirical evidence regarding how each generation has distinct preferences in terms of formality, emoji usage, and visual symbols in social media communication. This adds to our understanding of how technology and culture shape communication styles, an area that has been underexplored in previous literature. Secondly, the study not only compares language styles across generations but also demonstrates how technological changes directly influence the evolution of digital communication. The contribution of this study lies in the practical application of these findings in the field of digital marketing and branding. By understanding the different communication preferences across generations, companies and marketers can more effectively craft communication strategies tailored to their target audiences. Additionally, this research paves the way for further exploration of the impact of specific platforms and social contexts on digital communication styles, which could become an important area of study in the future.

CONCLUSION

This study has revealed significant generational differences in language styles and communication practices on social media. Baby Boomers were found to prefer more formal, structured language, whereas Generation Z exhibited a tendency toward informal, concise communication characterized by extensive use of emojis, abbreviations, and visual elements. These findings align with previous studies on digital communication, further emphasizing the influence of cultural and technological

factors on language evolution. The implications of these results are multifaceted. For marketers and communication strategists, understanding these generational preferences can lead to more effective, targeted digital communication strategies. By tailoring content to match the communication styles of specific age cohorts, organizations can enhance engagement and message impact across diverse demographic groups. Additionally, this research contributes to the growing body of literature on digital communication by offering a comprehensive, data-driven analysis of how generational cohorts adapt to and utilize new technologies in communication. Future research should explore other variables such as platform-specific communication patterns and how socioeconomic factors might further shape language use across generations. Moreover, a deeper analysis of the role of visual symbols, such as memes and GIFs, in modern digital interactions could provide a richer understanding of the evolving landscape of social media communication.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- [1] Y. Han, "The Impact of Digital Media on Language Styles and Communication Methods Based on Text, Image, and Video Forms," *Lect. Notes Educ. Psychol. Public Media*, vol. 40, no. 1, pp. 211-219, Mar. 2024. <https://doi.org/10.54254/2753-7048/40/20240754>
- [2] T. Dembe, "The Impact of Social Media on Language Evolution," *Eur. J. Linguist.*, vol. 3, no. 3, pp. 1-14, Jul. 2024. <https://doi.org/10.47941/ejl.2049>
- [3] E. Venter, "Bridging the communication gap between Generation Y and the Baby Boomer generation," *Int. J. Adolesc. Youth*, vol. 22, no. 4, pp. 497-507, Oct. 2017. <https://doi.org/10.1080/02673843.2016.1267022>

- [4] H. Downs, "Bridging the Gap: How the Generations Communicate," *Concordia J. Commun. Res.*, vol. 6, no. 6, 2019. <https://doi.org/10.54416/SEZY7453>
- [5] S. H. Daulay and H. Berutu, "Exploring Text Messages by Using Emojis on Indonesian Whatsapp," *JALL (Journal Appl. Linguist. Literacy)*, vol. 7, no. 2, p. 213, Sep. 2023. <https://doi.org/10.25157/jall.v7i2.10197>
- [6] A. N. Çoklar and A. Tatli, "Examining the Digital Nativity Levels of Digital Generations: From Generation X to Generation Z," *Shanlax Int. J. Educ.*, vol. 9, no. 4, pp. 433-434, 2021. <https://doi.org/10.34293/education.v9i4.4224>
- [7] Y. K. Dwivedi et al., "Setting the future of digital and social media marketing research: Perspectives and research propositions," *Int. J. Inf. Manage.*, vol. 59, p. 102168, Aug. 2021. <https://doi.org/10.1016/j.ijinfomgt.2020.102168>
- [8] G. Prawitasari, "The Influence of Generations on Career Choice (Social Cognitive Career Theory Perspective)," *Konselor*, vol. 7, no. 1, pp. 15-20, 2018. <https://doi.org/10.24036/02018718464-0-00>
- [9] M. Heitmayer and R. Schimmelpfennig, "Netiquette as Digital Social Norms," *Int. J. Human-Computer Interact.*, vol. 40, no. 13, pp. 3334-3354, Jul. 2024. <https://doi.org/10.1080/10447318.2023.2188534>
- [10] A. F. Şchiopu, A.-M. Nica, A. M. Pădurean, and M.-L. Ţală, "Generation Z vs. Generation Y: Different From or Similar? A Comparison of Centennials And Millennials Regarding The Use of Social Media For Travel Purposes," *CACTUS*, vol. 5, no. 1, Jul. 2023. <https://doi.org/10.24818/CTS/5/2023/1.03>
- [11] G. Mude and S. Undale, "Social Media Usage," *Int. J. E-bus. Res.*, vol. 19, no. 1, pp. 1-20, Feb. 2023. <https://doi.org/10.4018/IJEBR.317889>
- [12] D.-C. Dabija, B. M. Bejan, and N. Tipi, "Generation X versus Millennials communication behaviour on social media when purchasing food versus tourist services," *E+M Ekon. a Manag.*, vol. 21, no. 1, pp. 191-205, Apr. 2018. <https://doi.org/10.15240/tul/001/2018-1-013>
- [13] Y. Q. Yusuf, I. A. Fata, and R. Aini, "'GOTCHUU!': THE USE OF SLANG IN SOCIAL MEDIA BY GENERATION Z," *Ling. J. Ilmu Bhs. dan Sastra*, vol. 17, no. 2, pp. 167-174, Jan. 2023. <https://doi.org/10.18860/ling.v17i2.17756>
- [14] M. Prada, D. L. Rodrigues, M. V. Garrido, D. Lopes, B. Cavalheiro, and R. Gaspar, "Motives, frequency and attitudes toward emoji and emoticon use," *Telemat. Informatics*, vol. 35, no. 7, pp. 1925-1934, Oct. 2018. <https://doi.org/10.1016/j.tele.2018.06.005>
- [15] T. K. Koch, P. Romero, and C. Stachl, "Age and gender in language, emoji, and emoticon usage in instant messages," *Comput. Human Behav.*, vol. 126, p. 106990, Jan. 2022. <https://doi.org/10.1016/j.chb.2021.106990>
- [16] E. Leung, A. I. Lenoir, S. Puntoni, and S. M. J. van Osselaer, "Consumer preference for formal address and informal address from warm brands and competent brands," *J. Consum. Psychol.*, vol. 33, no. 3, pp. 546-560, Jul. 2023. <https://doi.org/10.1002/jcpy.1322>
- [17] A. Esposito, *Millennials and Gen Z in Media and Popular Culture*, Mar. 2023. <https://sunderland.idm.oclc.org/books/millennials-gen-z-media-popular-culture/docview/2778024021/se-2?accountid=14154>
- [18] U. Udoudom, G. William, A. Igiri, E. Okon, and K. Aruku, "Emojis And Miscommunication in Text-Based Interactions Among Nigerian Youths," *J. Informatics Web Eng.*, vol. 3, no. 1, pp. 226-240, Feb. 2024. <https://doi.org/10.33093/jiwe.2024.3.1.15>

- [19] K. N. Salam, A. W. T. F. Singkeruang, M. F. Husni, B. Baharuddin, and D. P. A.R, "Gen-Z Marketing Strategies: Understanding Consumer Preferences and Building Sustainable Relationships," *Golden Ratio Mapp. Idea Lit. Format*, vol. 4, no. 1, pp. 53-77, Jan. 2024. <https://doi.org/10.52970/grmilf.v4i1.351>
- [20] A. Haddock, N. Ward, R. Yu, and N. O'Dea, "Positive Effects of Digital Technology Use by Adolescents: A Scoping Review of the Literature," *Int. J. Environ. Res. Public Health*, vol. 19, no. 21, p. 14009, Oct. 2022. <https://doi.org/10.3390/ijerph192114009>
- [21] O. Kolotouchkina, C. Rangel, and P. N. Gómez, "Digital Media and Younger Audiences," *Media Commun.*, vol. 11, no. 4, pp. 124-128, Nov. 2023. <https://doi.org/10.17645/mac.v11i4.7647>