Social Media Marketing Mix for SMEs in Indonesia: A Decision Tree Modelling

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Abstract: - SMEs (Small and Medium Enterprises) in Indonesia are increasing. Digital technology development has changed market dynamics and how SMEs interact with consumers. Indonesian SMEs must adopt social media marketing as a promotional or sales instrument. The capabilities of Facebook, WhatsApp, Instagram, and TikTok in social media marketing are both opportunities and challenges for SMEs to take advantage of because of the differences in the suitability of their technological characteristics with the preferences and digital behavior of SME owners. 219 Indonesian SME data were used to create a decision tree model of a social media marketing mix for SMEs with the help of Orange Datamining software. The model testing parameters, especially Area Under Curve/ AUC (0.8070-0.9192) and Classification Accuracy/ CA (0.7231-0.8615) recommend the decision tree model in this study as a reference for SMEs in Indonesia in choosing a combination of social media for promotion and sales. This study also shows that the natural characteristics of Gen X, Y, and Z reflect the preferences and digital technology behavior of each generation in choosing a combination of various social media as a technology in doing business, with the note that the combination does not reflect proportions or priorities, and needs to consider the age of the business. In particular, the impact of new social media, such as TikTok, and its technological developments on generational preferences is an opportunity for future research.

Key-Words: - Social Media Marketing, Decision Tree, Facebook, WhatsApp, Instagram, TikTok, Gen X, Gen Y, Gen Z.

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1 Introduction

Globally, in today's rapidly evolving digital environment, organizations are strategically striving to adapt to technological advancements to succeed. However, research on how technology investments impact the performance of SMEs is still relatively limited, [1]. This condition is understandable because SMEs generally have limited resources and capabilities, including technical skills and efficiency. Their perception that digital technology is an expensive and difficult-to-master business tool makes digitalizing business activities, one of which is marketing, not a top priority, [2], [3], [4]. In the last ten years, there were around 57 million SMEs in Indonesia, and by mid-2023, it had increased to around 65 million, [5]. SMEs play a critical role in the Indonesian economy, contributing more than 60% of the Gross Domestic Product and absorbing more than 97% of the workforce.

Internet users in Indonesia in 2023 were recorded at 212.9 million people. Around 167 million (49.9%) are social media users, [6]. In Indonesia, social media platforms such as Facebook, WhatsApp, Instagram, and TikTok have become valuable tools for SMEs to market their products and services. Although it has recently become increasingly popular in Indonesia, LinkedIn tends to be used functionally as a medium for developing professional networks rather than marketing, [7].

Facebook remains one of the most popular social media platforms in Indonesia. Empirically, Facebook is the most understood social media by Gen X as a digital migrant, [8]. In the SME context, Facebook has many features that are very important

for promotional activities. Features such as Facebook Marketplace and Facebook Groups also provide opportunities for SMEs to sell products directly and join relevant communities. WhatsApp, although better known as a messaging application, has also become an effective tool for marketing and customer service. SMEs use WhatsApp Business to communicate directly with customers, update orders, and answer questions quickly. Features such as WhatsApp Status and product catalogs allow SMEs to promote their products efficiently. Instagram is a social media platform synonymous with Gen Z -the digital natives- and a trendy platform for visual-oriented digital marketing, [9], [10]. Business actors, including SMEs, can use Instagram to share interesting photos and videos, use the Stories and Reels features to interact with audiences, and use Instagram Shopping to sell products directly through the platform. TikTok, which must be classified as one of the newest social media platforms, is a digital media that is very attractive to internet users hungry for creative and viral content, especially among Gen Z. Around 70.8 internet users in Indonesia are TikTok users, [11]. Through creative video content, SMEs can use TikTok to reach a broad audience at a relatively low cost, increase brand visibility, and drive maximum audience engagement, [11].

Overall, SMEs' development of social media use in Indonesia shows the increasingly widespread and creative adoption of digital technology. By utilizing various available features and platforms, SMEs can increase their brand visibility, interact more closely with customers, and optimize their marketing strategies efficiently and effectively, [12], [13]. Every SME can choose various types of social media as a digital marketing tool. The problem is that various factors require SMEs to apply a scale of priorities, and at least two risk-related factors to interesting business characteristics are the business's age and the SME owner's generation, [1], [14], [15].

In Indonesia, it is not easy for SMEs to adapt effectively to the dynamics of digital marketing technology. SME owners' skills and knowledge regarding social media platforms, Search Engine Optimization techniques, and other digital marketing strategies to promote their products vary considerably, [16]. Empirically, this variation has the potential to be influenced by gaps in knowledge and practice due to differences in the values, preferences, and digital technology behaviors of different generations, [8], [17], [18]. Moreover, theoretically, people born, raised, and developed in the same or similar period have the exact nature, [19]. These facts raise the suspicion that the presence of SMEs managed by different generations gives rise to different digital behaviors with different goals and impacts. This study attempts to answer these questions by applying one of the machine learning methods, namely decision trees. This method was chosen as an alternative to conventional statistical approaches because its measurements are very flexible, and the results are much easier to understand by its users, including SME actors.

2 Literature Study

2.1 Social Media Marketing

Various businesses, individuals, and companies have utilized digital marketing systems and technologies to maximize the performance of ethically and sustainably operated businesses, [3], [20], [21], [22]. The increasing investment in this marketing system is due to its impact on increasing sales, improving brand image, improving customer image, and reducing overall marketing costs for companies. However, this phenomenon is not always evident in SMEs, especially in developing and less developed countries, [22], [23]. Theoretically, digital marketing refers to using digital channels, platforms, and technologies to promote products or sales to target consumers, [24], [25]. Active social media users usually double as active content creators. Anyone can participate in creating, commenting on, and revising social media content. Social media platforms quickly gained popularity because they are easy to navigate and do not require exceptional experience or knowledge, [26]. However, the ability to use various social media features does not necessarily enable users, especially business people, to gain economic benefits. The advancement of social media technology and each platform's advantages require more tips, attention, and resources to optimize its performance, [27]. This condition also explains the rise of practical digital marketing training activities, [20].

The advent of smartphones has led to the growth of mobile marketing strategies tailored to mobile users. Social media platforms have become an integral part of digital marketing efforts due to their large user base and targeting capabilities, [21]. Marketers are now focused on delivering personalized experiences based on user preferences and behavioral data. The popularity of video content has soared, leading marketers to incorporate video into their strategies for higher engagement, [28]. AI-powered automation tools have revolutionized digital marketing by enabling personalized

messaging at scale. Overall, digital marketing continues to evolve rapidly as technology advances and consumer trends shift, requiring marketers to adapt to stay competitive in the digital landscape continually. Digital marketing consists of several essential components that support each other to increase business visibility and effectiveness.

Additionally, content marketing focuses on creating and distributing valuable content to attract and retain an audience. Social media marketing generally utilizes platforms like Facebook, Instagram, and TikTok to connect with target audiences and build brand awareness, [13]. In some situations, specific social media users may be more actively involved in brand communities than on other social media, [27]. Digital marketing is vital in helping businesses reach their target audience more effectively by leveraging various online channels. It enables companies to increase brand awareness, generate leads, drive website traffic, increase sales and revenue, build customer relationships, and measure campaign performance.

Social media marketing has become an integral part of the marketing strategies of various businesses worldwide, including SMEs in Indonesia, [12]. Rapid technological developments and changes in people's behavior encourage using various digital platforms, including social media. Instagram, which have over 90 million active users in 2024, offers exciting features such as Stories, IGTV, and Reels, allowing SMEs to share interesting visual and video content. Although its interface is designed to focus on visual content, Instagram's frequently changing algorithm is thought to affect the visibility of organic content. One of the business impacts is that paid advertising strategies have become essential for Instagram users.

On the other hand, TikTok, which has more than 40 million active users, provides creative and interactive short video features, making it an effective social media platform for viral marketing and high engagement among young audiences. However, high creativity is needed to stand out among the many contents. Like Instagram, TikTok's unpredictable algorithm is a challenge for its users who want to use TikTok as a promotional or selling tool, [29]. Facebook still has the most extensive user base, with over 100 million active users, providing features like business pages, groups, and marketplaces that make it easy for SMEs to build communities and advertise directly. Facebook's broad reach and ability to target ads specifically are beneficial, although intense competition in the news feed can reduce content visibility. As part of the Meta ecosystem, WhatsApp allows SMEs to interact directly with customers through messaging, adding a dimension of personalization to marketing. In competition with TikTok, Meta is looking to integrate new features and strengthen the user experience across its platforms, so SMEs must understand the strengths and challenges of each platform to choose the right and effective digital marketing strategy.

2.2 Classification Methods in Machine Learning

Machine learning is the study of algorithms that allow computers to learn from experience. Machine learning teaches computers to perform a specific task, where performance can be improved through experience or not explicitly programmed, [30]. Machine learning classification models are critical supervised learning techniques that allow computers to categorize data into specific classes based on existing features. Classification models are trained using labeled datasets to map inputs to the correct class. Some standard algorithms in this model include logistic regression, decision trees, support vector machines, K-nearest neighbors, and Naive Bayes. Decision trees, in particular, are one of the most intuitive and easy-to-understand methods, using a tree structure to make decisions based on feature values. This model divides the dataset into smaller subsets, creating a series of decisions based on certain conditions, resulting in a transparent and easily interpretable model. The success of a classification model depends heavily on the quality of the training data and the relevance of the features used, [31].

As technology advances, classification models, including marketing and social media analysis, have expanded. In Indonesia, SMEs can use this model to identify consumer behavior patterns, segment customers, predict campaign performance, and customize content that interests the audience. One popular software for implementing this technique is Orange Data Mining, an open-source platform that provides a visual interface for data analysis and machine learning, [32], [33]. With Orange, users can quickly build classification models using decision trees and other algorithms through drag-and-drop without requiring in-depth programming skills. The platform also provides widgets to visualize data, explore patterns, and test models, making the analysis more interactive and intuitive. In this way, classification models help SMEs understand their audiences better and enable more data-driven decision-making, improving marketing effectiveness and contributing to business growth.

3 Research Methods

This study uses a quantitative descriptive approach. Data were obtained through an electronic questionnaire (Gform) distributed through social media and online advertisements during August 2024, targeting SME owners in multi-sector businesses in Indonesia. Screening of 1,210 data obtained resulted in 824 being filled in entirely and verifiable via WhatsApp. According to proportion requirements for Tree-Supervised Machine Learning implementation, the division of SME owners' age groups was arranged based on three generation groups (Gen X, Y, and Z) which ultimately used 219 data.

The data was processed using the Tree-Supervised Machine Learning model approach with the help of Orange Datamining software, [32]. The decision tree-supervised machine learning model was chosen as the analysis tool due to the simplicity of the procedure and its easy-to-understand output, [28]. This model is used to see the relationship between the types of social media SMEs use with business age, owner gen, and social media usage (promotion and transaction). Orange Data mining software should carry out the building process to facilitate the process of sample arrangement, visualization, and model testing (Figure 1, Appendix). Model performance will be tested using the AUC (Area Under Curve), CA (Classification Accuracy), F1, Precision, Recall, and MCC (Matthews Correlation Coefficient) parameters.

4 Discussion

SMEs in Indonesia have unique characteristics. In reality, many SMEs operate as micro and small businesses with less than five employees and limited annual revenue. The age of SMEs also varies, from newly established to those that have been operating for decades. As in other countries, technology adoption among SMEs also varies, [4], [22]. Some SMEs have entirely switched to digital platforms for marketing and sales, while others still rely on traditional methods. In business activities, many SMEs in Indonesia are engaged in the food and beverage, handicraft, and local service sectors. Adopting digital technology is closely related to access to internet infrastructure and business owners' level of digital literacy. After going through the data cleaning process, the study determined 219 SMEs in Indonesia as the basis for creating a decision tree model in supervised machine learning.

Visually, it can be seen that the proportion of SMEs aged between 3-5 years is greater than those aged more than five years. Another prominent visual information point is the small proportion of SMEs that use social media only for sales (Figure 2). It can quickly be concluded that social media has an undeniable promotional or communication function, [34].

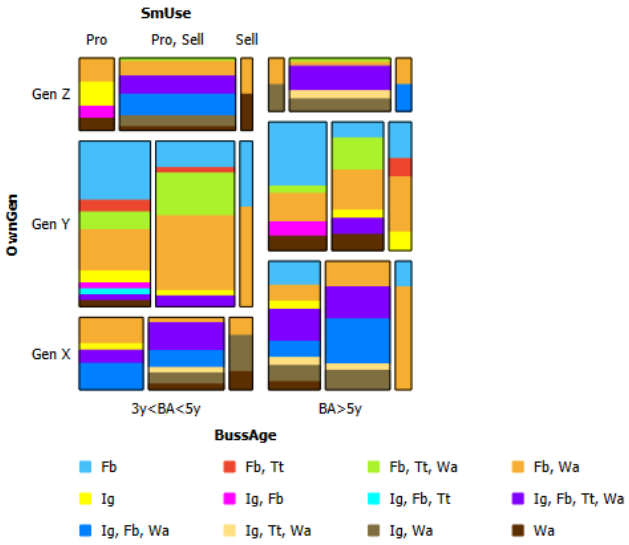

Fig. 1: Mosaic Display

Social media marketing has become one of the main strategies in the modern business world, offering significant benefits to companies of all sizes. Social media expands the reach of promotions and transactions, [22]. Social media allows Indonesian SMEs to interact intensively with a broader audience than traditional marketing methods, [12], [16]. Platforms such as Facebook and Instagram provide advertising services that allow SMEs to target audiences based on demographics, interests, and behaviors so that marketing messages can be tailored more effectively. As a promotional tool, social media provides an opportunity for SMEs and their audiences to interact two-way directly through comments, private messages, reviews, or emoticons. Relationships with subscribers/followers allow SMEs to build closer relationships with customers, get valuable feedback, respond to questions or complaints quickly, and ultimately open up opportunities for ongoing transactions and sustainable business, [23]. With relevant, consistent, engaging, or creative content, SMEs can increase brand awareness and create customer loyalty. Creative campaigns and high-quality content can help brands stand out in a crowded market and build long-term customer relationships.

Regarding cost, social media marketing is much more affordable than traditional marketing channels such as TV or print advertising. These social media platforms offer various advertising options with

flexible budgets, allowing SMEs to advertise at a cost that suits their limited capabilities with free allocation. Social media marketing costs are increasingly effective and efficient because various social media platforms provide analytical tools that allow SMEs to track their digital marketing performance in real-time. This data includes metrics such as reach, engagement, and conversions, which help businesses measure their strategies' effectiveness and make necessary adjustments.

Visualization through Orange Datamining with Facebook (FB) as the target class shows some interesting information (Figure 3(a), Appendix). The root of the tree (note: root is the top node in a tree) starts with the segmentation of Facebook user generations, namely OwnGen, followed by Gen X, Gen Y, and Gen Z. The number in OwnGen (14.9%, 23/154) (Note: the number 23 represents 23 out of 154 SME owners who only use Facebook without distinguishing between generations). This number shows that the characteristics of the owner generation are sufficient to classify Facebook usage in this group. For the Gen X branch (4.4%, 2/45) (, the tree has sub-branches based on Facebook utilization in business (SmUse), especially as a promotional tool (Pro). Information on the branch shows that Gen X as SME owners do not use Facebook as a sales tool. As a promotional tool, this sub-branch is divided again based on the age of the SME (BA), where SMEs aged between three and five years do not use Facebook as a promotional tool, while SMEs aged less than five years are relatively active in using Facebook as a promotional tool. Gen Y (28.0%, 21/75) has more complex conditions. The Gen Y group that uses Facebook as a promotional tool is further divided into two branches; if the age of the SME is less than five years, around 54.5% have the potential to use Facebook as a promotional tool. If the age of the SME is between 3-5 years, around 20.0% of its promotions have the potential to use Facebook. This proportion will change for Gen Y SME owners who use Facebook to sell only (30%) or promote and sell (18.8%). Today (2024), the position and role of Facebook for the three generations are very different. Gen X -the digital migrant- is a casual or necessary Facebook user; Gen Y -the digital native- is a genuine Facebook user, or at least still maintains Facebook as a promotional and sales tool, while Gen Z -the digital mobile- is a group that has left Facebook. Each generation has different preferences or behaviors and has changed towards social media over time, [17], [35].

Orange Datamining tree visualization with target class mix of Facebook and Whatsapp (Fb, Wa) starts with generation segmentation, divided into OwnGen (29.2%, 45/154), Gen X (24.4%, 11/45), Gen Y (36.0%, 27/75), and Gen Z (20.6%, 7/34) (Figure 3(b), Appendix). OwnGen represents the generation of business owners who use a mix of Facebook and WhatsApp without further branching in this segment. In the Gen X branch, the tree branches again based on social media usage. If the SMEs use these two social media platforms as promotional tools, a new sub-branch will appear based on the age of the SME. For SMEs aged 3-5 years, 37.5% use Facebook and WhatsApp. For SMEs under five years, 10.0% tend to combine Facebook and WhatsApp. If used as a promotional and sales tool simultaneously, around 18.2% of SMEs use the Facebook and WhatsApp mix. However, if only for selling, the probability of SMEs using this social media combination of Facebook and WhatsApp increases to 60.0% of SMEs (3/5). In this target class, Gen Y again has more complex branches. As a promotional tool, this branch is divided again based on the age of the SME. If the age of the SME is less than five years, 27.3% of SMEs have the potential to use a mix of Facebook and WhatsApp. For SMEs aged between 3-5 years, 50.0% use Facebook and WhatsApp. As a promotional and sales tool, 40.6% of SMEs use Facebook and WhatsApp. Around 50.0% of SMEs use a mix of Facebook and WhatsApp in the sales branch. This second tree again proves that until 2024, Gen Y -the digital native- will be a loyal technology user [8], [17], in this case, Facebook. This second tree also shows that Gen Y is a selective technology user. WhatsApp (2009) was indeed born before Instagram (2010). However, regarding business mergers, Facebook acquired Instagram (2012) before WhatsApp (2014). The large number of Facebook and WhatsApp combinations by Gen Y in this model shows the suitability of Gen Y digital technology behavior and the need for promotional and sales functions provided by the two social media platforms.

For Gen Z, the tree branches are based on SmUse with the following details: if used as a promotional tool, 20.0% of SMEs use a mix of Facebook and WhatsApp. If, as a promotional and selling tool, a new sub-branch appears based on the age of the SME, in addition, if the age of the SME is less than five years, 25.0% use a mix of Facebook and Whatsapp. If the SME is between 3 and 5 years old, 10.0% use Facebook and WhatsApp. Finally, if the SME only uses it as a sales tool, 33.3% have the potential to use Facebook and WhatsApp. From the discussion above, it can be seen that Gen Y is the most consistent and high user of Facebook and

WhatsApp in all categories, perhaps because of their familiarity with both platforms. Gen X has a considerable variation in usage, with sales focus showing the highest level, perhaps because they value direct communication with others via WhatsApp. Although relatively low compared to other generations, the proportion of Gen Z is still significant for several categories. Perhaps this condition reflects their preference for newer social media platforms, [14]. Furthermore, this tree shows that the age of the SME and the focus of use (promotion, sales, or both) affect the level of adoption of Facebook and WhatsApp across all generations. At the same time, it shows evidence that SMEs adjust their social media strategies as their business develops.

Orange Datamining tree visualization with target class is a combination of Facebook, WhatsApp, and Instagram, and again, uses generation as the main segmentation factor, similar to the previous two trees (Figure 3(c), Appendix). In this tree, the level of simultaneous use of the three social media platforms (9.1%, 14/154) is lower than the use of Facebook alone (14.9%) or a mix of Facebook and WhatsApp (29.2%). This data shows that combining the three social media platforms is less frequently used simultaneously. In terms of comparing user generations, Gen X: 18.6% (8/43), Gen Y: 0.0% (0/83), Gen Z: 21.4% (6/28), and OwnGen: 9.1% (14/154) show that the pattern of use of the mix of these three social media platforms as a marketing tool is very different from the previous tree. SME owners from Gen Z have the highest adoption rate, followed by Gen X. Uniquely, SME owners from Gen Y show no use at all, which is in stark contrast to the previous tree. In more detail, SME owners from Gen X use a mix of these three social media for promotion, around 23.5% (4/17), and for promotion and sales, around 21.1% (4/19).

Meanwhile, SME owners from Gen Z use a mix of these three social media platforms with details, with promotion and sales at around 25.0% and sales at only around 33.3%. The addition of Instagram seems to make the combination of the three platforms more exclusive or complex for SME owners in Indonesia to adopt simultaneously. SME owners from Gen Z show the highest adoption, perhaps because they adopt new platforms quickly, [9], [14], [34]. It could also be triggered by the presence of Instagram, which has various digital communication features and sales that are very much in line with the character of Gen Z, [9]. Gen X shows high adoption, indicating their efforts to stay relevant to the latest trends.

The absence of adoption by Gen Y is surprising and may require further investigation. Adding new social media platforms such as Instagram has resulted in very different usage patterns than using Facebook alone (Figure 3(a), Appendix) or the combination of Facebook and WhatsApp (Figure 3(a), Appendix). Simultaneous adoption of the three platforms is lower overall but shows significant differences between generations. Gen Z emerged as the most vigorous adopter, while Gen Y showed unexpected resistance. Gen X shows good adaptability with relatively high adoption. This pattern may reflect different platform preferences across generations, business strategies, or the difficulty of managing three platforms simultaneously, [36]. In particular, the lack of adoption by Gen Y deserves further investigation, as it is very different from the pattern in the previous tree and may indicate a significant shift in preferences or strategies.

The presence of TikTok in the tree again reveals exciting facts (Figure 3(d), Appendix). The adoption rate of SME owners towards the mix of four social media platforms simultaneously is 14.9% (23/154), higher than three platforms (9.1%) but lower than two platforms (29.2%). This insight shows that adding TikTok increases multi-platform adoption compared to three platforms, but it is still more challenging to adopt four platforms at once than two platforms. In terms of the proportion of generations adopting this mix of four social media, Gen X: 27.9% (12/43), Gen Y: 6.0% (5/83), Gen Z: 21.4% (6/28), and OwnGen: 14.9% (23/154). Gen X shows a significant increase in adoption with the addition of TikTok, Gen Y again shows adoption, in contrast to when the three platforms had 0% adoption, while Gen Z remains consistent with a high adoption rate. In this tree, Gen X is the most vigorous adopter, showing high adaptability to new platforms; Gen Y shows increased adoption compared to the three platforms, although still low, and Gen Z remains consistent as an early adopter of new technologies. In a way, the conditions seem to confirm the issue of business risk disparities based on the generation of SME owners, [15].

Functionally, SME owners remain focused on the promotion function and the promotion-sales combination. The addition of TikTok shows that SMEs are increasingly daring to adopt a more complex multi-platform strategy. When compared to the previous three decision trees, it can be seen that multi-platform adoption is increasing among SMEs. SME owners cannot avoid diversifying their digital marketing strategies. SMEs are increasingly aware of the importance of being present on various social

media platforms. Each generation of SME owners shows different preferences and capacities in adopting multi-platforms. In particular, the presence of social media has the potential to attract the attention of certain generations who want to try using it to reach segments outside their main target in different ways, [29]. In the context of this study, the generations of Gen X and Gen Z are TikTok users who are classified as explorative.

Although, in general, the decision tree above provides various valuable insights, technically, the four decision tree models produced by Orange Datamining software still need to have their performance evaluated.

The following is an analysis of the model's performance on each type of social media that is the target class:

1. Facebook (FB):
   This study's tree model with Facebook target class performs very well in distinguishing positive and negative classes (high AUC) and good classification accuracy (CA) (Table 1, Appendix). The recall is very high, indicating the model's ability to identify most positive cases. However, precision is low, meaning there are many false positives.

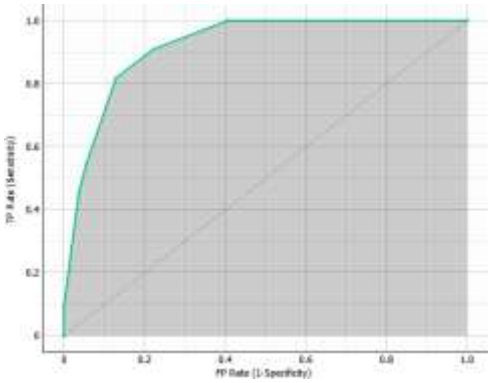

Fig. 2: ROC, FaceBook Class

The ROC (Receiver Operating Characteristic) curve shows good performance. The curve rises rapidly initially, indicating a high true positive rate with low false positives (Figure 4).

2. Facebook and WhatsApp (FB, Wa):
   Compared with the Facebook target class, the performance of this tree model decreases on the Facebook and WhatsApp target classes. AUC and CA are still quite good, but F1, precision, and MCC are lower than previously (Table 1, Appendix). The model evaluation results show a poor balance between precision and recall.

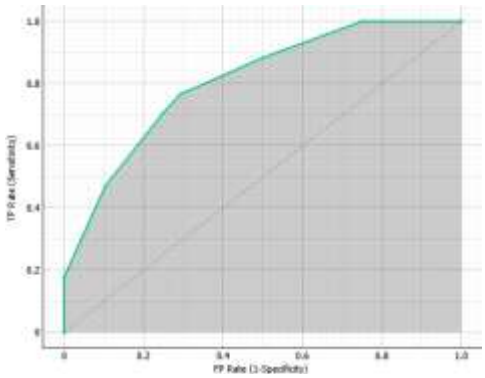

Fig. 3: ROC, FaceBook, and WhatsApp Combination Class

The ROC curve shows a slight decrease in model performance due to the addition of WhatsApp social media (Figure 5).

3. Facebook, WhatsApp, and Instagram (Fb, Wa, Ig):
   The performance of this tree model has significantly increased in AUC and CA on the target classes Facebook, WhatsApp, and Instagram (Table 1, Appendix). This performance composition shows better discriminative ability and accuracy of the tree model on these target classes. However, F1, precision, and recall are lower than the previous classes, indicating a trade-off between overall accuracy and performance on the positive class.

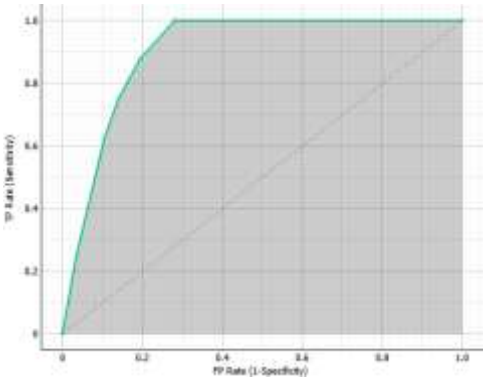

Fig. 4: ROC, FaceBook, WhatsApp, and Instagram Combination Class

The ROC curve shows an improvement in model performance after adding Instagram social media (Figure 6).

4. Facebook, WhatsApp, Instagram, and TikTok (Fb, Wa, Ig, Tt):
   The performance of the tree model on AUC and CA remains good, but there is a significant decrease in F1, precision, recall, and MCC when tested on the target classes Facebook, WhatsApp,

Instagram, and TikTok (Table 1, Appendix). This value indicates that the model has difficulty correctly classifying the positive class when the number of social media platforms increases.

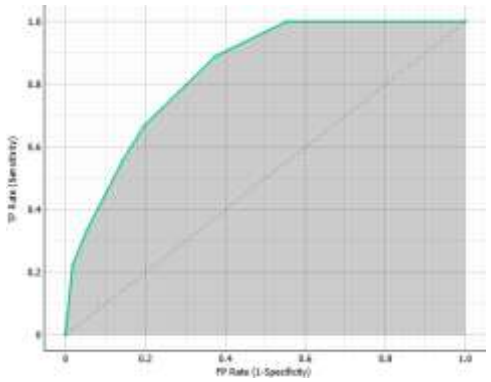

Fig. 5: ROC, FaceBook, WhatsApp, Instagram, and TikTok Combination Class

Adding TikTok media reduces the model's performance after (Figure 7).

Inter-parameter analysis for all target classes:

1. AUC
   The highest value is in the Facebook class (0.9192), while the lowest is in the mixed class of Facebook and Whatsapp (0.8070). This value indicates that the tree model has the best discriminatory ability in the FB class. However, with the lowest AUC value still greater than 0.8, the decision tree model in the study can be categorized as good, mainly when associated with the potential imbalance in the amount of data in each class, and the model requires a single number as a basis for evaluation, [37], [38].
2. CA
   Accuracy Increases from the Facebook class to the mixed class of Facebook, Whatsapp, and Instagram (0.8000 to 0.8615), then decreases slightly to the mixed class of Facebook, Whatsapp, Instagram, and TikTok (0.8462). This value shows that the model's overall accuracy increases with the addition of Instagram but decreases slightly with TikTok.
3. F1 Score
   The F1 score decreases consistently from the Facebook class (0.6061) to the mixed class of Facebook, Whatsapp, Instagram, and TikTok (0.3750). This phenomenon indicates that the balance between precision and recall worsens as the number of social media platforms in the model increases.
4. Precision
   Precision in this tree model is relatively stable and low for all classes (ranging from 0.4286 - 0.4800). Consistency in the false positive rate in the model tends to be high.
5. Recall
   The model's ability to recall decreased significantly from the Facebook class (0.9091) to the mixed class of Facebook, Whatsapp, Instagram, and TikTok (0.3333). This value indicates a decrease in the model's ability to identify positive cases as class complexity increases.
6. MCC
   MCC is one of the parameters to measure the balance of a dataset. MCC is a parameter to measure the balance of a dataset with a value range of -1 to 1. MCC approaching one indicates a better balance of the dataset. The MCC value decreases from the Facebook class (0.5443) to the mixed class of Facebook, Whatsapp, Instagram, and TikTok (0.2918), indicating a decrease in overall classification quality as the number of social media platforms SMEs use increases.

The analysis shows that the results are auspicious when the model only needs to identify Facebook usage. With an AUC of 0.9192, the model shows an extraordinary ability to distinguish between SMEs using Facebook and those not. The CA reaches 80%, indicating that 4 out of 5 model predictions are on target. Even more impressively, the model can identify 90.91% of SMEs that use Facebook (recall), although sometimes it is too enthusiastic and misclassifies some non-users as users (precision is only 0.4545). When the task given to the model becomes more complex by adding WhatsApp to the mix, the model experiences a slight decrease in performance. The AUC drops to 0.8070, and the classification accuracy to 72.31%. These results show that distinguishing SMEs that use a combination of Facebook and WhatsApp from those that only use Facebook is more challenging for the resulting decision tree model.

Interestingly, this decision tree model gets fresh air when Instagram is included as the third social media platform. The AUC jumped back to 0.9035, almost as high as when only classifying Facebook. The classification accuracy even peaked at 86.15%. However, despite the improvements in AUC and CA, the model struggled to correctly identify users of these three platforms, with recall dropping to 62.50%. The addition of TikTok as the fourth social media platform seems to be the point where the complexity of reality begins to overwhelm the

model. While CA remained high (84.62%), the tree model's ability to correctly identify user categories for these four social media platforms dropped dramatically. Recall dropped drastically to 33.33%, meaning that the model could only identify a third of the SMEs that use all four platforms.

This pattern seems to reflect the reality of the mix of social media usage among Indonesian SMEs. Facebook usage seems to have obvious and easily identifiable characteristics. Although common, the combination of Facebook and WhatsApp appears to have a more diverse pattern. In the development of the popularity of social media and its supporting technologies, the addition of Instagram to this combination seems to create a usage profile that is again easily recognizable. Previous studies have shown that Facebook and Instagram have different daily timings as promotional tools, [27].

Moreover, Instagram is considered successful in boosting sales, especially by Gen Z SME owners, [9]. The reason could be the synergy between these three platforms in the SME marketing strategy. However, when TikTok is included, the model faces significant challenges. This phenomenon could reflect the still limited or diverse adoption of TikTok among Indonesian SMEs, or it may indicate that TikTok usage is not always in line with the usage patterns of the other three platforms.

5 Conclusion

Significant changes are seen in the way SMEs in Indonesia interact with consumers. Social media platforms such as Facebook, Whatsapp, Instagram, and TikTok have enabled SMEs to promote at a relatively low cost but with a broader reach. In addition, with all its features, social media has made it easier for SMEs to sell their products online, reduce dependence on physical stores, and increase operational efficiency.

This study shows that the best-performing decision tree model is obtained to classify SME owners in Indonesia who use Facebook, followed by a combination of Facebook, WhatsApp, and Instagram. As the number of social media marketing platforms in the target class increases, there is a trade-off between overall accuracy and the model's ability to correctly classify positive cases (indicated by a decrease in F1, recall, and MCC). However, using each decision tree model in this study by various parties, for example, SME owners who want to choose a combination of social media as a digital marketing tool, is still recommended because the AUC value in each class is relatively good.

Although the capabilities and functions of social media are very numerous, in reality, the perceptions of Gen X, Y, and Z towards the functions of each social media are different. Further research shows that the natural characteristics of Gen X, Y, and Z reflect the preferences and behavior of digital technology of each generation in choosing a mix of various social media as a technology in business, with the note that the combination does not reflect proportion or priority.

6 Implications

This study provides valuable insights into how Indonesian SMEs adopt and use various social media platforms. While the model demonstrates strength in identifying a single platform or a combination of three platforms, the challenge of classifying the use of four platforms at once demonstrates the complexity of the social media landscape among Indonesian SMEs.

7 Limitation

The decision tree output that is relatively easy to understand by SMEs and other parties using the results of this study is also a limitation of this study itself. For comparison, other classification models, such as Random Forest or Gradient Boosting, are recommended for further research while considering the simplicity of classes and predictors. The significant change in the performance of the decision tree model when Tiktok was added theoretically shows the impact of new social media, which is difficult to predict. It also shows the weakness of one of the models in this study. Research opportunities by adding specific data related to TikTok usage are recommended. We also recommend a conventional statistical approach as a comparative study. Contextually, further details on how decision tree models may vary across other cultural contexts could be an opportunity for future research to gain a broader perspective.

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Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the authors used Grammarly, an English writing assistant software tool, in order to improve readibility and the language of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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Conflict of Interest

The authors have no conflicts of interest to declare.

APPENDIX

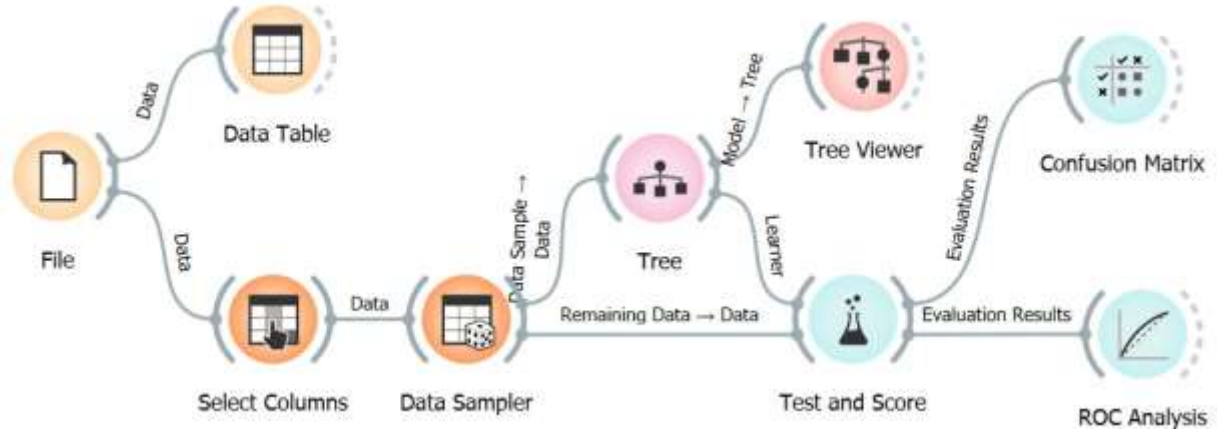
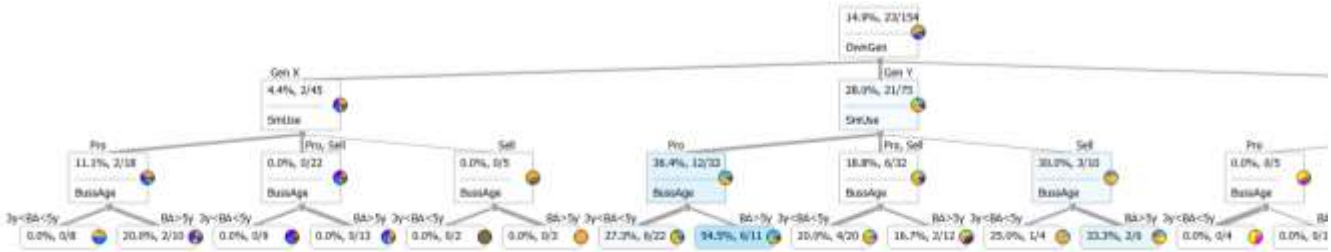
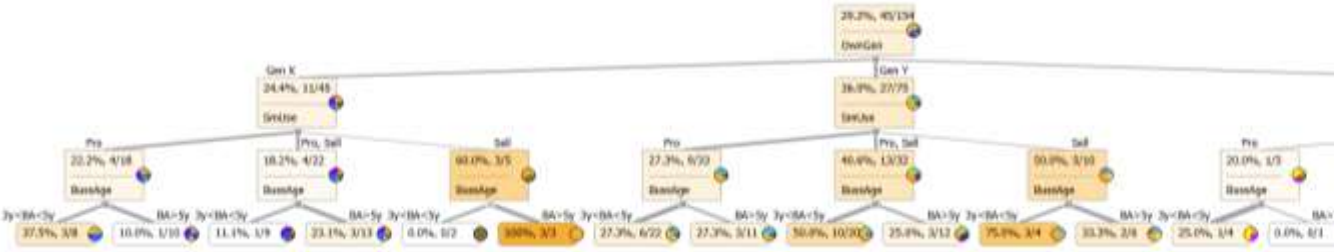


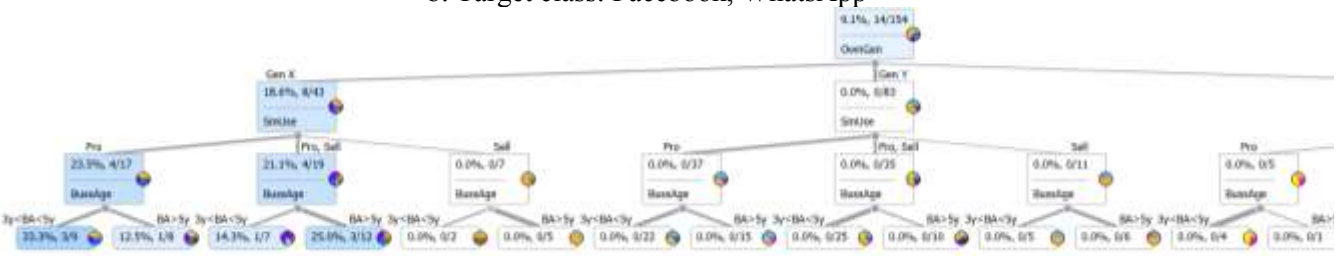
Fig. 6: Workflow in Orange Datamining



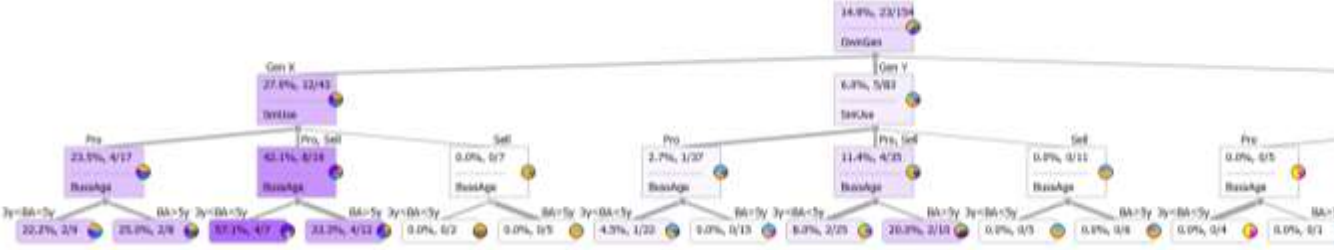
a. Target class: Facebook



b. Target class: Facebook, WhatsApp



c. Target classes: Facebook, WhatsApp, Instagram



d. Target classes: Facebook, Whatsapp, Instagram, TikTok

Fig. 7: Decision Tree model (visualization)

Table 1. Results of Decision Tree Model Performance Evaluation

Target	AUC	CA	F1	Price	Recall	MCC
Facebook	0.9192	0.8000	0.6061	0.4545	0.9091	0.5443
Facebook, WhatsApp	0.8070	0.7231	0.5714	0.4800	0.7059	0.3930
Facebook, WhatsApp, Instagram	0.9035	0.8615	0.5263	0.4545	0.6250	0.4554
Facebook, WhatsApp, Instagram, TikTok	0.8383	0.8462	0.3750	0.4286	0.3333	0.2918