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The Role of AI in E-commerce Brand Recognition: A Malaysian Perspective

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Abstract: *Artificial Intelligence (AI) has transformed retail strategy and operations, introduced branding strategies, and improved consumer shopping experience. E-commerce growth in Malaysia requires established and emerging companies to compete in order to maintain their fitness. Brands need to be more systematic in their strategies to maintain brand recognition across multiple e-commerce platforms using AI and other advanced technologies. This study explores the drivers of brand acceptance among Malaysian e-commerce users, with a focus on AI techniques such as big data analytics, machine learning, AI platforms, and more. The results show that machine learning and AI platforms meaningfully influence brand recognition, while big data analytics may not have a significant impact. The study proves to be a foundational reference point for future research and provides useful implications for brands looking for effective strategies to build brand recognition among e-commerce consumers in Malaysia.*

Keywords: brand recognition, artificial intelligence (AI), big data analytics, machine learning, AI platforms, e-commerce.

JEL Codes: C42, M1, N35, O33.

1. Introduction

Brand plays an important role in influencing consumer choice in the market (Karthik & Vijayalakshmi, 2024). Materials have enduring value as assets over the long term. When used properly, the brand has long-lasting power, extending decades or even centuries, as exemplified by respected institutions like Harvard University, founded in 1636, PepsiCo, founded in 1898, and Yen Yen & Walia (2017); the aforementioned brands maintain their vibrant value at the moment. Brand recognition refers to the strategic implementation of the marketing strategy by firms, which is considered successful when individuals can quickly and effortlessly recognize, distinguish, or recall the brand through cues associated with the said brand (Rahman, new, 2020). Logo, the tagline in these cues, slogan, or packaging materials. Companies conduct a lot of market research to evaluate the effectiveness of their brand awareness program. Marketing strategies have numerous essentials, such as logos, advertisements, slogans, unique colour schemes, and text options. They comprise direct mail advertising, reminders to encourage customers to buy products, customer registration on websites, discount promotions, promotional campaigns and new products. Consumers find brands, share opinions about them on special forums, recommend or criticize products or services from fellow consumers or competitors, or acquire knowledge to be developed (Morokhova et al., 2023). Establishing a brand reputation is significant for companies because it permits consumers to stand out for their uniqueness or distinctiveness compared to their competitors (Shaily & Emma, 2021). Artificial intelligence (AI) refers to a collection of theories and algorithms that empower computers to carry out tasks that usually necessitate

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human intelligence, such as visual perception, voice recognition, or the interpretation of text while considering its context (AL-Araj et al., 2022). The advancement and progression of artificial intelligence (AI) have revolutionized the efficiency of commercial enterprises on a global scale. Nevertheless, the implementation of AI-based comprehensive solutions in organizations is limited due to a lack of expertise regarding the technology. The technology can aid the organization in comprehending the clients and enable it to more effectively target customers and customize advertising and marketing strategies and messaging (Arumugam et al., 2024). In certain instances, AI can even enhance these capabilities. Machine learning is a branch of artificial intelligence (AI) that has gained significant popularity in recent times. The COVID-19 pandemic expedited the acceptance of AI, altered the approach of global businesses towards emerging technologies, and significantly contributed to the growth of the AI solutions industry. In the future, businesses will increasingly require advanced solutions that seamlessly incorporate artificial intelligence with other digital technologies, such as the Internet of Things, next-generation communication, and distributed ledger systems. In the foreseeable future, this will facilitate the shift from disjointed to methodical advancement of AI technologies across the whole value chain. In the future, the use of AI solutions in cloud infrastructure will become more common, indicating that corporations consider deploying intelligent technology in the cloud to be a more effective and adaptable approach (Kraus et al., 2022). According to Lin et al. (2022), consumers perceive AI marketing communication as having little efficacy in influencing their brand evaluations and affecting their consumption behaviors. Prominent multinational corporations such as Google, Microsoft, Apple, Amazon.com, and Alibaba have strategically prioritized artificial intelligence (AI) research within their own business frameworks. In the present era, artificial intelligence (AI) has not only brought about transformations in company models and operations, but it has also exerted an impact on brand management strategies and customer behavior (Davenport et al., 2019). In the context of the electronic commerce (e-commerce) business, Alibaba's Fashion AI, in collaboration with Taobao's TECH department, has implemented a smart mirror system (Thakur et al., 2024) This system aims to enhance the promotion and recommendation of items by analyzing the items that customers bring into the fitting room. A significant obstacle to the widespread implementation of artificial intelligence (AI) is the constrained financial resources available for the continued advancement of cutting-edge technologies. Despite the numerous advantages offered by the digital market, organizations allocate substantial resources and time to ensure the efficacy of their brand recognition strategies (Shaily & Emma, 2021). The lack of research on the reasons for organizations' failure to incorporate artificial intelligence (AI) into their marketing strategies is disproportionate to the immense potential value that AI features can offer. However, it should be noted that there are contradictions present in the findings. Eriksson et al. (2020) additionally demonstrated that the machine exhibits a notably sluggish pace, and the subsequent cohorts display a lack of inclination towards embracing change due to perceived time constraints. There exists a prevailing dearth of empirical research that specifically concentrates on emerging countries like Malaysia. The majority of studies have been carried out in affluent nations such as the United States and several European countries. However, it is important to acknowledge that there are certain limitations within the existing body of research (Mulili, & Wong, 2011). In order to enhance the inclusivity of research samples, it is imperative to expand the scope of the study to encompass a wider range of countries and cultural regions (Chen et al., 2021). Malaysia's foray into e-commerce commenced in 2004 with the introduction of eBay Malaysia. In 2023, it is estimated that Malaysia's eCommerce industry will reach a value of US$ 10.19 billion and is expected to grow to $16.98 billion by 2027, with a compound annual growth rate (CAGR) of 13.6%. The country is presently trying to integrate its e-commerce strategy, counting features such as availability, payment, and distribution, as well as regulatory requirements, with a well-established online shopping market (Kashyap, 2023). Deficiency of research on the use of artificial intelligence (AI) in marketing In his 2017 review, Anthony Mullen highlights

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the need for technology and product marketing to have a broader knowledge of how artificial intelligence (AI) can be used has played a role in their application in the Malaysian context. The Norzelan et al. (2024) study examines AI acceptance among finance and accounting department leaders in the shared service industry. Results show performance expectancy, attitude, skill, and technical capability significantly influence AI acceptability. However, there is no correlation between AI acceptance and effort expectancy, social influence, or facilitating conditions. The findings provide insights for prioritizing AI adoption in finance and accounting. Nevertheless, businesses continue to face difficulties in obtaining the essential IT literacy skills and resources, despite the existence of skill development initiatives led by industry organizations like the National ICT Association of Malaysia, commonly referred to as PIKOM. Furthermore, there is a limited presence of AI integration within local e-commerce brands in Malaysia. Insufficient scholarly investigation exists regarding the factors contributing to China's ascension as the foremost force in the digital industry, as well as the mechanisms by which Alibaba, a digital commerce enterprise, has achieved a monopolistic position inside the domestic market (Zhang et al., 2020). According to Chung (2022), in the Malaysia Retail Report 2022, a significant majority of Malaysian consumers, specifically 87%, exhibit a higher inclination towards shopping with retailers who employ technology to augment the overall customer experience. This percentage surpasses the corresponding figures of 55% internationally, 64% in the Asia-Pacific region, and 74% in Singapore. The study, commissioned by global financial technology firm Adyen and sponsored by KPMG, showed that Malaysian businesses are among the top performers in the region when it comes to using data for decision-making and customer engagement. Malaysian businesses have been identified as high performers in optimizing data for decision-making and customer engagement, according to a survey conducted by global financial technology firm Adyen and sponsored by KPMG. The worldwide survey was conducted between late 2021 and early 2022, covering a sample size of 40,000 consumers from 26 markets and 11,500 companies from 23 countries. The poll in Malaysia included a total of 1,000 consumers and 500 businesses. Considering the objectives and gaps identified previously, the research questions for this study are: What is the impact of big data analytics, machine learning, and AI platforms on brand recognition in e-commerce? In addition, this study aims to enhance brand recognition by utilizing three key AI components and cognitive dissonance theory principles. It aims to improve understanding of AI components and marketing tactics, promoting AI adoption for brand recognition.

The study offers valued insights for entrepreneurs, marketers and politicians in the Malaysian e-commerce sector. It helps make informed decisions about AI strategy, optimizes resource allocation and creates a competitive advantage. The findings can be replicated for marketing communications, highlighting the impact of AI on brand recognition. The study provides a valuable resource for policymakers and regulatory agencies, guiding the development of legislation that encourages innovation and consumer protection. The study also serves as a benchmark for future scholarly research, enabling it to be generally applicable to e-commerce contexts worldwide. It can also be beneficial for smaller, growing companies, helping them develop more effective brand awareness. The findings could increase consumer awareness and trust, as brands can mention about their usage of AI technology.

2. Literature Review

2.1 Brand Recognition

The branding and advertising industry offers important potential for growth. By strategically selecting and executing branding and advertising campaigns, leveraging technology, hiring experts, and targeting specific market segments, companies can address weaknesses and mitigate risks. Internal factors play a critical role in determining success in this field. External influences likewise impact the industry, but by adopting

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proactive and responsive strategies, businesses can adapt to external challenges. In a study by Taguimdje and colleagues (2020), brand identity and reputation were identified as significant intangible assets within companies. The use of artificial intelligence (AI) technologies to recognize brand logos on social media provides new ways to understand what users are interested in. Photos shared on social media platforms provide valuable visual insights into users' behavior, desires, and needs, which marketers often overlook (Capatina et al., 2020). Research by Jarek and Mazurek (2019) suggests that AI can boost brand value by producing personalized experiences that foster intimacy, assist with purchases, and reduce post-purchase uncertainty. Chung et al.'s (2020) study found that luxury brands can use AI mechanisms to deliver individualized care for their customers beyond traditional human-to-human interactions (Lin et al., 2022). AI has revealed unexpected contradictions in strategy, with user experiences influencing their perceptions of AI in branding. Using AI for marketing presents challenges in brand management and shaping consumer buying habits. According to Kumar et al. (2019), artificial intelligence (AI) has likely to advance personalized marketing in both the short-term and long-term. This is realized through the creation of brand trust and the delivery of improved brand experiences. Capatina et al. (2020) assert that artificial intelligence (AI) technologies have confirmed to be valuable in the realm of personalized content delivery, exactly in the context of audience analysis. Additionally, these technologies have established their efficacy in enabling astute marketers to identify and differentiate brand logos presented in social media material using picture analysis.

2.2 Big Data Analytics

For businesses to improve the use of e-commerce platforms, they must comprise web analytics tools such as Big Data. These tools permit data collection, measurement, analysis and reporting on-site visitation, thus giving businesses a holistic understanding of their online operations and improving their performance. In predicting and preventing possible image crises, the use of big data from social networks is of considerable importance. This is done through emotional sentiment analysis involving social mentions, as highlighted by Capatina et al. (2020). Scholars are advised to persevere in using cloud computing for big data to create instruments that will improve the decision-making capacity of practitioners in B2C. This can be achieved by implementing artificial intelligence (AI) applications and advancements along with integrating blockchain technology. Mainly these innovations stand to be useful in domains like e-commerce order management processes and forecasting regarding online shopping behavior. The effectiveness of value chains in e-commerce is determined by transparency and usage of data across information systems (IT) systems (Reinartz et al.,2019). In a recent study (Chen et al., 2021), the rise of big data on the internet has led to a vast growth in the amount of data available. This big data gathered through data mining online varies from traditional customer surveys. The study acknowledged five main characteristics of big data: volume, accuracy, speed, diversity, and significance. For example, e-commerce sites like Amazon.com have a large number of online reviews, but not all of them are equally significant. Customers are often stimulated to share their experiences with products they have purchased. Consumer behavior and preferences can be monitored and analyzed not only through online shopping platforms but also on several social media platforms, review websites, and news portals (Micu et al., 2020).

2.3 Machine Learning

Eriksson et al. (2020) highlight the benefits of artificial intelligence (AI) for organizations. It permits the automated processing of large amounts of data, replacing manual efforts. AI utilizes probabilistic machine learning (ML) models to extract meaningful insights from data, enabling organizations to make informed

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decisions. The use of artificial intelligence (AI) and machine learning (ML), a subset of AI, is revolutionizing how businesses operate. AI and ML are changing processes and improving efficiency in companies (Taguimdje et al., 2020). The use of technology enhances the intelligence of organizations. Machine learning allows computers to learn from data on their own, boosting their capabilities (Chen et al., 2021; Jarek & Mazurek, 2019). To make AI systems more effective, the way algorithms typically used in them is being changed. As stated by Nair & Gupta (2020), machine learning algorithms can look at past data to figure out which ads are shown the most often and what stages of the buying process those ads correspond to. Machine learning is a computer-based technique that uses algorithms to study and understand data. It allows computers to learn from the data, making independent decisions without human intervention. Jarek & Mazurek (2019) believe machine learning (ML) exceeds traditional digital marketing methods. ML allows businesses to gather more data to improve content and engage customers effectively. Machine learning (ML) lets companies uncover insights and make general statements from data that's been analyzed. ML comprises a wide range of techniques, such as finding patterns, modeling statistics, exploring data, discovering knowledge, making predictions, analyzing data, creating adaptive systems, and building self-organizing systems (Khoei et al.,2024). Machine learning models can understand the context of images on social media. They can use techniques like image recognition to predict how people behave on social media based on the images they share (Capatina et al. 2020). Machine learning algorithms empower B2C marketing operations to harness data-driven insights for diverse tasks, such as: Identifying potential and prospective customers, strengthening customer relationships, personalizing interactions and communications, understanding customer requirements, tailoring content, Generating and monetizing insights, creating new offerings, automating responses to common issues, Performing customer analytics (Mikalef et al., 2021). Nair and Gupta (2020) indicate that machine learning algorithms improve the implementation of flexible pricing strategies, making the process more efficient. ML streamlines the distribution of targeted promotions by identifying customers who are both likely to make purchases following a special offer, and those who will make purchases irrespective of such an offer. By adopting a flexible pricing approach, companies can increase their sales and maximize profits.

2.4 AI Platforms

Many popular platforms practice artificial intelligence (AI) for diverse tasks: Personal assistance: Alexa, Siri, Cortana, Music streaming: Pandora, Travel planning: Mezi, Financial planning: Olivia, Credit scoring: Lenddo, Language translation: Liv, Legal help: Legal Robot, Task automation: Amazon MTurk, Facial recognition: Haystack, Home automation: Nest, Pre-built AI solutions: Fluid AI (Hagan et al., 2021; Chan-Olmsted & Wolter, 2018). These platforms are designed for both personal and professional use. AI solutions have become widely used in different sectors, such as online shopping and internet marketing, as demonstrated by the popularity of Sentient (Hagan et al., 2021). In the realm of marketing, a prevalent approach is the use of technologies to gain a deeper comprehension of the most effective AI platforms for advertising purposes, as well as the extent to which they enhance the performance of a specific product. This tool has the capability to gather data pertaining to client involvement as well as metrics like clicks and impressions. According to Micu et al. (2020), the application of artificial intelligence (AI) in marketing involves the utilization of AI algorithms to automate specific marketing operations, with the primary objective of discerning consumer satisfaction. IT experts assert that artificial intelligence technologies guarantee the precision of decision-making, enhance the effectiveness of internal and external organizational operations, and enhance the customer experience. However, the benefits of utilizing artificial intelligence extend beyond those mentioned. In fact, artificial intelligence enables a substantial acceleration of processes,

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which is currently the primary competitive edge for the majority of corporate organizations (Kraus et al., 2022). One prominent example of this is the implementation of a consumer relationship management (CRM) program. The responsibility of management teams inside e-commerce enterprises entails the implementation of automation strategies and the optimization of data transmission through predictive analytical platforms utilizing AI algorithms. One example of an AI platform in real-world applications is IBM's Watson, which possesses the capability to analyze vast quantities of data and engage in communication through natural language processing (Eriksson et al., 2020). Another instance is Albert AI, an algorithm-driven marketing platform utilized by Red Balloon to identify and target new customers (Sutton, 2018).

2.5 Hypothesis Development

Cognitive dissonance theory (Festinger, 1957) is central to this study, focusing on how brand recognition influences consumer behavior. This theory explains that psychological tension arises when actions contradict beliefs, leading individuals to adjust their attitudes for internal consistency. Castelo et al. (2019) identify two key factors affecting technology perceptions: its effectiveness and user discomfort. Technological effectiveness impacts cognitive assessments, while discomfort relates to emotional responses. Discomfort, indicating psychological unease, often prompts avoidance of the technology (Albarracin & Shavitt, 2018). The literature shows that attitudes toward technology are shaped by both cognitive and affective factors (Lin et al., 2022; Ajzen & Fishbein, 1980). Discomfort with AI elements, in particular, can lead to negative attitudes and reduced usage (Li et al., 2021). As per Festinger (1957), such discomfort drives attitude changes to resolve dissonance (Fazio & Cooper, 1983). This study uses cognitive dissonance theory to examine how brand recognition and technology perceptions impact consumer behavior.

Big Data Analytics offers valuable company intelligence that can drive beneficial transformations, such as enhancing current products or augmenting revenue per customer. Brand awareness is an additional avenue via which the utilization of big data can exert a substantial influence on marketing strategies (Hagan et al., 2021). By using large amounts of data, marketers can create customized content for each customer. This helps make the brand more well-known both online and in stores. Using big data enables businesses to match the effectiveness of large, established brands despite having limited marketing resources. Big Data Analytics empowers businesses by permitting them to examine and extract meaningful information from vast amounts of data gathered from various sources. This analysis provides valuable insights into customer patterns and preferences. These valuable insights gained from customer feedback can be used to guide business strategies and improve the quality of customer service, leading to increased customer satisfaction and loyalty (Chandra & Verma, 2023). By tracking a customer's online purchases, companies can determine what products or services they might want in the future. This information helps businesses provide targeted discounts and promotions based on each customer's interests and needs. If customers are satisfied with a positive transaction, they are more likely to remember and recommend the brand. This leads to improved brand recognition, which benefits both the business and the customer. Customers become more satisfied and strongly attached to the brand as a result of this situation.

H_1: Big Data Analytics has a significant relationship with brand recognition.

Machine Learning

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By using machine learning techniques, businesses can enhance brand awareness by identifying potential customers who are more likely to remember the brand for future purchases, as suggested by Ooi et al. (2023). Machine learning can assist in understanding the exceptional traits and behaviours that differentiate potential long-term customers from those who only make isolated purchases. Machine learning permits marketers to use a brand's own data to uncover and predict patterns in customer behavior that drive beyond the most noticeable ones. Machine learning often helps marketers in identifying potential clients who are more likely to be drawn to and interested in a brand. Machine-learning algorithms employ contemporary client data in order to comprehend the specific promotions to which they are likely to respond. This involves determining the appropriate messaging, timing, and channels through which to engage with them. Collectively, these factors simplify the perpetual reinforcement of brand awareness and instantaneously empower personalized marketing possibilities. It is imperative for brands to keep in mind that their client base is heterogeneous and, hence, lacks uniformity. Every individual exhibits a distinct shopping pattern that brands must comprehensively comprehend in order to maintain their loyalty as clients (Trang., 2022). Machine learning is considered to be a very effective and optimal technology for marketers to segment and target potential consumers in order to enhance brand recognition. This is mostly due to its ability to recognize intricate patterns on a far larger scale than what can be achieved by humans. Customers can exhibit unpredictable behavior; nevertheless, through the utilization of machine learning, brands can now recognize strategies to effectively retain their attention (Zhou, 2022).

H_2: Machine Learning has a significant relationship with brand recognition.

AI Platforms

The utilization of AI platforms has the potential to provide advantages for small firms through the optimization of critical functionalities on their corporate websites, resulting in the efficient allocation of resources such as time and finances (Chowdhury et al., 2023). AI platforms have the potential to collaborate with sales teams, thereby enhancing e-commerce income by assuming the role of the customer's primary point of contact. The utilization of AI platforms, such as chatbots, to engage with visitors and potential prospects on websites has the potential to enhance brand recognition. This is due to the fact that individuals are more likely to retain a stronger memory of a brand when they have a distinctive and personalized interaction with it. This phenomenon facilitates businesses in enhancing their brand recall value, resulting in increased awareness among individuals regarding AI platforms such as chatbots and their potential benefits. Consequently, individuals are more inclined to actively interact with and recommend AI bots. The ease of interaction and constant availability of virtual assistants such as Siri, Alexa, and chatbots foster a favorable user-product connection. As a consequence, users allocate a greater amount of time on the website, actively interacting with the material, leading to increased brand recognition for the company. The upcoming generation of AI platforms possesses the potential to analyze user input and effectively meet customer demands, thanks to a mix of inherent functionalities and adaptability. The process of experimentation plays a crucial role in enabling brands to enhance customer experience through the utilization of messengers, with chatbots emerging as a significant and influential element in this regard (Lin& Wu, 2023). By integrating a customized approach with the efficacy of artificial intelligence, enterprises have the ability to leverage AI platforms in order to enhance their financial gains and establish a stronger brand presence. The AI Platform facilitates customer interaction with the business through online channels, enabling them to access information and receive personalized product recommendations. This is achieved without experiencing the burden of recurring chores, such as enduring long wait times on hold or being moved between several

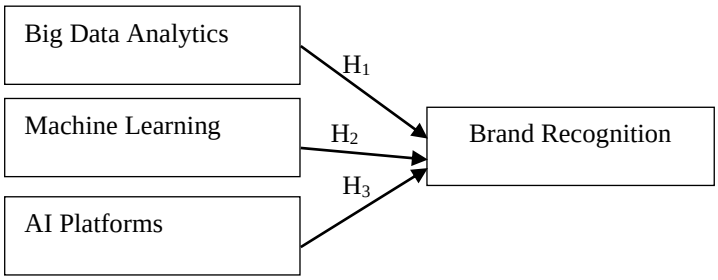
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departments. AI platforms are known for their ability to operate with speed and efficiency, hence contributing to heightened levels of customer satisfaction (Gupta & Jain, 2023). Additionally, these platforms serve as a means to differentiate a firm from its competitors, ultimately enhancing brand awareness. Artificial intelligence (AI) enables brands to effectively preserve a uniform, seamless, and favorable consumer experience (Santos & Bacalhau, 2023).

H3: AI Platforms have a significant relationship with brand recognition.

Theoretical Framework

Figure 1. Research Conceptual Framework



3. Research Methodology

3.1 Data Collection and Measurements

Malaysia's 32.7 million population, with 81% online shoppers, has limited survey opportunities due to limited marketing and AI knowledge. A limited number of 150 surveys were distributed online, with an 84 percent confidence level response and a minimum of 126 sample sizes. Probability and non-probability sampling techniques were used to ensure the sample was representative of the Malaysian population. When using random sampling methods to target internet users, there is a higher chance of reaching potential e-commerce customers. Non-probability sampling, where individuals are chosen based on accessibility, offers a convenient and cost-effective option for preliminary data collection. The research employs Likert scales to gather data through a questionnaire that gauges understanding of big data analytics, machine learning, artificial intelligence platforms, and brand recognition. The study utilized an internet-based survey developed using Google Forms to gather data from Malaysian individuals who both purchase and sell goods online. This user-friendly platform simplified the process for participants to comprehend and provide information about their experiences (Table 1). The survey was made available to participants through various social media platforms, including Facebook, LinkedIn, WhatsApp, and Ms Teams. This ensured easy access and convenience for respondents to complete the questionnaire. Ethical guidelines were followed in this study by ensuring that participants joined willingly, that their information was kept private, and that their identities were shielded. A spreadsheet in Excel was used to gather data, Google Forms was used to store the data, and IBM SPSS software was used to examine the data further. Additionally, a completed questionnaire can be collected in a short period of time. Through the hyperlink, the respondents were invited to access the questionnaire and used a one-time survey strategy. The questionnaire also includes the purpose of the research and an explanation related to the instructions for completing the questionnaire. The questionnaire was posted on Facebook and LinkedIn, which are related to marketing groups and Malaysian e-commerce buyers and sellers through telecommunication applications such as WhatsApp and MsTeams. Because of the open-sharing link, no specific total number of questionnaires has been distributed. For every respondent who has completed the questionnaire, the data is collected in a data file.

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The data file is automatically stored in the Google Forms database in the form of an Excel spreadsheet. Next, the data is transferred to IBM SPSS software version 29 for further analysis.

Table 1 Measurements of Constructs

Code.	Materials	Scale
BDA1	Customer profiling may increase consumer-perceived value	1 2 3 4 5
BDA2	Customer profiling helps the company to see which offerings generate more profit	1 2 3 4 5
BDA3	Customer profiling helps the company see which segments are more attractive	1 2 3 4 5
BDA4	Customer profiling may help the company to customize pricing for the individual customer	1 2 3 4 5
BDA5	Good customer relationship management (CRM) may increase the quality, performance and capability of the platform to influence customers' trust and loyalty	1 2 3 4 5

Source: Akter, S., & Wamba, S. F. (2016). Big Data Analytics in e-commerce: A systematic review and agenda for future research

Code	Materials	Scale
ML1	It's good that smart features can understand human emotion and offer emotional comfort to the customer	1 2 3 4 5
ML2	It's good that smart features can be a good companion by mimicking customer's styles of communication	1 2 3 4 5
ML3	Smart features can be useful to develop Customer Knowledge Creation	1 2 3 4 5
ML4	Smart features can be useful to create the profile of future customers	1 2 3 4 5
ML5	Smart features can be useful in developing relationship strategy	1 2 3 4 5

Source: Bag, S., Gupta, S., Kumar, A., & Sivarajah, U. (2021). An integrated artificial intelligence framework for knowledge creation and rational decision-making in B2B marketing is needed to improve firm performance.

Code.	Materials	Scale
AIP1	AI platforms can automate answers to customers' most-asked questions	1 2 3 4 5
AIP2	AI platforms can automate repeated tasks when interacting with customers	1 2 3 4 5

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AIP3	AI platforms can handle more questions from customers automatically	1	2	3	4	5
AIP4	AI platforms can provide personalized experiences to customers	1	2	3	4	5
AIP5	AI platforms can deal with customers' specific needs or requests	1	2	3	4	5
AIP6	AI platforms can interact with customers 24/7 (any time of the day)	1	2	3	4	5
AIP7	I can see the benefits of AI platforms that can deal with customers' requests better than humans	1	2	3	4	5
AIP8	I believe AI platform can perform well during customer interactions	1	2	3	4	5

Source: Lin, X., Shao, B., & Wang, X. (2022). Employees' perceptions of chatbots in B2B marketing: Affordances vs. disaffordances.

Code.	Materials	Scale			
BR1	I enjoy the content when Artificial Intelligence (AI) is being used in marketing campaigns	2	3	4	5
BR2	I get irritated when brands show irrelevant advertisements	2	3	4	5
BR3	I prefer it when AI predicts my personality traits	2	3	4	5
BR4	I prefer when marketers use AI platforms to provide a better user experience	2	3	4	5
BR5	Through improved brand recognition e-commerce can target more customers	2	3	4	5

Source: Shaily, S., & Emma, N. (2021). Integration of Artificial Intelligence Marketing to get Brand Recognition for Social Business

3.2 Data Analysis and Findings

3.2.1 Pilot Study

The study conducted a pilot test of a questionnaire in a Malaysian context to assess its feasibility and reliability. The pilot test involved nine machine learning experts in three countries to ensure the clarity and suitability of the questions. The study aimed to prevent misconceptions and misinterpretations of questions and study purposes. The questionnaire was designed with input from experienced professionals in the marketing and AI industries. After the pilot study, corrections were made to the topic. A sample of 23 individuals similar to the study population was selected to examine respondents' understanding of the questionnaire. From the 23 respondents, a reliability analysis was carried out using SPSS, and the results are shown in Table 2, and all items met the specific specifications.

Table 2 Reliability Analysis of Variables for Pilot Test

Variables	Materials	Cronbach's Alpha
Big Data Analytics (BDA)	5	0.861
Machine Learning (ML)	5	0.830
AI Platforms (AIP)	8	0.826
Brand Recognition (BR)	5	0.788

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Source: collected by the researchers

3.3 Descriptive statistics (respondent profile)

In this study, the questionnaire is shared via telecommunication applications such as WhatsApp and MsTeams and shared via social media groups such as Facebook and LinkedIn that are related to marketing groups. The questionnaire is created using online Google Forms, which enables it to be shared easily by sharing the questionnaire link. In total, 126 respondents answered the questionnaire that was distributed, and all 126 were valid and completed. The data were collated within the month of November 2022.

Among the total respondents, about 64.3 percent (81) of the sample population are female, while the males constituted only 35.7 percent (45). This is considered common as males are more objective-focused when purchasing compared to females, and as a result, females will easily purchase more than males (Parengkuan, 2017). Most of the respondents are adults aged 31 and above from the millennial generation, which represents 45.2 percent. The majority of respondents are Malay (85.7 percent), followed by Chinese (9.5 percent), and only 4.8 percent are Indian. Thus, it indicates that all the respondents are local Malaysians. Most of the respondents have obtained a bachelor's degree (81 respondents); this corresponds with the age group majority, which is the graduating age. Nowadays, most universities are equipped with technology and digitalization to further enhance their educational systems. Therefore, this shows that most respondents (92.9 percent) have more than 10 years of experience using digitalization. The use of the Internet first arrived in Malaysia in 1995, which indicates that most respondents were born and raised in the Internet era. This makes them familiarize themselves with the use of digitalization and technology, which corresponds with the result shown above. To further fortify this hypothesis, a question related to Internet experience has also been conducted among the respondents. With years of Internet experience, most of the respondents that participated in the survey have experience in online shopping (97.6 per cent), which makes the data more valuable as it fits the research's topic. The result proves that the growth of digitalization and internet connectivity has further changed the way consumers purchase their products, transitioning from physical purchases to online purchases. In addition, the majority of the respondents (97.6 percent) prefer Shopee as their e-commerce platform to purchase products online, followed by Lazada with 54.8 percent. Shopee is a multinational technology company that was established in 2015 and has been expanding its operations throughout Southeast Asia. Most of the respondents are from the M40 income group with monthly household income, which is more than RM10,000 (47.6 percent). In terms of spending behavior, the majority of respondents (83.3 percent) spent below RM1,000 per month on online shopping, and most of the respondents (47.6 percent) shop only when needed. The knowledge of artificial intelligence (AI) has also been conducted among the respondents. All respondents are aware of AI and understand its meaning. However, only 88.1 percent have encountered AI in marketing. In addition, Table 4 shows that the independent variable 'Big Data Analytic (BDA)' has the highest mean score of 4.41, while the lowest mean score of 4.12 is secured by another independent variable, which is 'AI Platforms (AIP)'. Despite being the lowest mean, it still qualifies as a high rating score, according to Cohen, Manion, and Morrison (2000). This result indicates that the majority of the respondents have a positive attitude and impact towards the three factors that influence brand recognition on an e-commerce platform. Besides that, the normality of the data distribution is also calculated to a certain extent by the skewness and kurtosis values for each variable within the range of -2 and +2.0 (Mandisa, 2010).

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3.4 Pearson Correlation Analysis

The purpose of conducting a multiple collinearity analysis is to measure the predictiveness between variables (Table 3). Based on the result of the Pearson correlation analysis shows that all independent variables (big data analytics, machine learning, and AI platforms) express a positive and significant correlation with the dependent variable (brand recognition). If the correlations show a positive result, this means that the relationship between the variables supports each other and has a strong relationship with the dependent variable of brand recognition (BR). The strongest positive relationship with dependent variables (BR) is AI platforms (0.669), and the weakest positive relationship with dependent variables (BR) is big data analytics (0.436).

Table 3 Pearson Correlation Analysis

Variables	BDA	ML	AIP	BR
Big Data Analytics (BDA)	1			
Machine Learning (ML)	0.662	1		
AI Platforms (AIP)	0.367	0.382	1	
Brand Recognition (BR)	0.436	0.558	0.669	1

∗ Correlation is significant at the 0.01 level (2-tailed); **Source: SPSS Analysis**

3.5 Multiple Regression Analysis

The regression produces the correlation coefficie3+nt (r), coefficient of determination (R2), and adjusted coefficient of determination (adjusted R2). The purpose of this indicator is to show how efficient the predictiveness of an independent variable is towards the outcome of a dependent variable. The coefficient of determination (R2) serves as the degree of variance assessed by the independent variable. This is to say, the R square (R2) specifies creating a value that is related to the percentage of the total variation in the dependent variables that is related to the independent variables or collectively (Yao et al., 2018). As for the F value, it is used to measure the overall efficiency of the regression model in analyzing, predicting, and explaining the variation in the dependent variable (Pope & Webster, 1972). The multiple regression analysis was conducted using SPSS software, version 29. The prime objective of this study is to assess and measure the significant relationship between the three independent variables and the dependent variable. From the regression analysis, the model summary, as shown in Tables 4, 5, and 6 below, determined that the dimensions of big data analytics, machine learning, and AI platforms have an influence on brand recognition. The result of the multiple regression analysis gave answers to the research objectives as well as the hypotheses in this study.

Table 4 Regression Analysis for Brand Recognition

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	0.745	0.555	0.544	0.42307

Predictors: (Constant), BDA, ML, AIP

Table 5 ANOVA (Significance of Regression Model)

Model	Sum of Square	Df	Mean Square	F	Sig.

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1	Regression	27.260	3	9.087	50.767	.001[b]
	Residual	21.837	122	0.179		
	Total	49.097	125			

Predictors: (Constant), CSQ, PP, PQ, BI, [B] Predictors (Constant)

Table 6 Regression Analysis for Brand Recognition

Variables	**B**	**Beta** (β)	**T**	**Sig.**
Big Data Analytics	0.012	0.010	0.117	0.907
Machine Learning	0.392	0.348	4.234	0.001
AI Platforms	0.575	0.533	8.046	0.001

Dependent Variable: Brand Recognition; **Source: SPSS Analysis**

Through the regression analysis, it is found that only two dimensions of independent variables (Machine Learning and AI Platforms) have significant relationships with brand recognition. This is derived at a significant level of $p<0.05$. Machine learning ($t = 4.234$, p-value = 0.001) and AI platforms ($t = 8.046$, p-value = 0.001) While Big Data Analytics ($t = 0.117$, p-value = 0.907) is not significant towards the dependent variable, which is brand recognition, Comparatively, the strength of the relationship between independent variables and dependent variables comes from the AI platforms, where beta = 0.533, followed by machine learning, where beta = 0.348, and big data analytics, where beta = 0.010. Therefore, the dimension relating to big data analytics, machine learning, and AI platforms should be emphasized in order to increase brand recognition on e-commerce platforms. In addition, Table 7 shows the standardized beta coefficients for AI platforms (B = 0.575), machine learning (B = 0.392), and big data analytics (B = 0.012). Integration with the AI platform will increase brand recognition on the e-commerce platform by 0.57. Integration with machine learning will increase brand recognition on the e-commerce platform by 0.39 percent. Integration with big data analytics will increase brand recognition on the e-commerce platform by 0.01 percent. Based on the results (Table 7), it can be concluded that H2 and H3 are accepted as the independent variables that have shown a positive relationship with brand recognition, and H1 is rejected.

Table 7 Summary of findings based on Hypothesis Testing

Hypotheses	**P – Value Significant(P<0.05)**	**Decision**
H_1: There is a relationship between Big Data Analytics and brand recognition.	(P=0.907) Not Significant	**H_1** Rejected
H_1: There is a relationship between Machine Learning and brand recognition.	(P=0.000) Significant	**H_2** Accepted
H_1: There is a relationship between AI Platforms and brand recognition.	(P=0.000) Significant	**H_3** Accepted

Source: SPSS Analysis

4. Discussion of Findings

In short, the respondents have a positive response towards big data analytics, machine learning, and AI platforms that lead to brand recognition on e-commerce platforms. Based on the results, the study shows that brand recognition generated positive reflections with an average value of 4.19 out of the range of one (strongly disagree) to five (strongly agree). The indicators for big data analytics, machine learning, AI

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platforms, and brand recognition also had a high mean of 4.41, 4.20, 4.12, and 4.03, respectively. The indication shows that the three main independent variables play an important role in creating a great opportunity for brand recognition on e-commerce platforms. Besides that, there is proof that machine learning and AI platforms are the main reasons for the brand to gain brand recognition on e-commerce platforms. Among the significant independent variables, the strongest strength of the relationship between the independent variables and the dependent variable (brand recognition) is machine learning ($t = 4.234$, p-value = 0.001, and $\beta = 0.348$), followed by AI platforms ($t = 8.046$, p-value = 0.001, and $\beta = 0.533$). Meanwhile, Big Data Analytics shows that brand recognition is insignificant ($t = 0.117$, p-value = 0.907, and $\beta = 0.010$) but still shows a strong relationship between the independent variables and the dependent variable.

4.1 Integration of Big Data Analytics and Brand Recognition

This study investigates the relationship between big data analytics and brand recognition towards e-commerce platforms in Malaysia. Big Data Analytics refers to analytics tools that help collect, measure, analyze, and report data to web visitors in order to understand and optimize the use of e-commerce platforms (Micu et al., 2021) that may lead to brand recognition. In this study, the context for big data analytics refers to data mining and creating customer profiles from consumers' shopping habits, shopping patterns, and consumer feedback. The result of the regression analysis indicates that there is no significant relationship between big data analytics and brand recognition in e-commerce platforms. Hence, the result indicates that hypothesis 1 is rejected as there is no significance. Therefore, without the integration of big data analytics, e-commerce can still gain brand recognition among online shoppers in Malaysia.

4.2 Integration of Machine Learning and Brand Recognition

The extension of this study also examined the relationship between machine learning and brand recognition. The term machine learning in this context is described as the techniques needed to work intelligently with a large amount of data by developing useful algorithms for synthesizing, classifying, or sorting this data (Micu et al., 2021). In this context, machine learning in e-commerce platforms involves smart features such as image recognition (lens), facial recognition, and voice recognition that are able to understand or mimic human emotion and then offer emotional comfort or other better communication styles to consumers. The positive results from the analysis prove that the respondent agrees and feels that machine learning is among the best elements of AI marketing that e-commerce uses when developing its platforms that lead to brand recognition. To a certain extent, the perception of machine learning is also associated with the algorithms, which is also another factor that influences brand recognition. The evolving digitalization and computer enhancement machines have enabled the brand to be noticed; hence, high-quality machine learning is able to perform its function without any error or accident. This can be achieved by increasing the accuracy of the machine learning model and by improving machine learning algorithms. It is hypothesized that building, training, and deploying machine learning will result in an improvement in brand recognition and the possibility of developing a relationship between the customer and the brand, especially on e-commerce platforms. Therefore, the objective of machine learning is to integrate into e-commerce platforms, which results in brand recognition.

4.3 Integration of AI Platforms and Brand Recognition

Artificial intelligence possesses anthropomorphic qualities and acquires knowledge and expertise through social interaction and experiential learning. Within a genuine business setting, the utilization of robots and

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robotic machinery is being discussed for various purposes, such as production, customer service, and warehousing logistics. The functional capabilities of AI include predictive analytics, control methods, planning and dispatching, knowledge storage, processing and presentation, speech recognition, computer vision, biometrics, image and video segmentation, character recognition, object tracking, general vision, and natural language processing, which encompasses the extraction of new knowledge, machine translation, and dialogue. These functions have the ability to be utilized separately or together (Kraus et al., 2022). Most importantly, AI has the power to create a greater customer experience while simultaneously strengthening internal retail operations. The integration of AI will effectively address the need for resolving customer service problems instantly and offer innovative shopping features such as virtual fitting rooms and mirrors, as well as cashier-less stores and other advanced retail concepts (Nagamalleswara et al., 2023). In the context of e-commerce, AI Platforms such as Sentient and Chatbots which is able to automate answers to customers' most-asked questions, automate repeated tasks when interacting with customers, handle more questions from customers automatically, and interact with customers any time of the day. The positive and significant relationship between AI platforms and brand recognition has been proven and confirmed, and it is supported by previous literature by the researcher (Shaily & Emma, 2021). That describes AI platforms as having a positive influence on brand recognition in e-commerce as well as in social business industries. AI platforms nowadays are taking brands into consideration when developing their products to get brand recognition. Hence, it can be concluded that AI platforms have an impact on brand recognition, especially in the e-commerce market. Hence, managing and strategizing AI Platforms is essential in improving brand recognition, especially in the e-commerce market in Malaysia.

5. Theoretical Implication, Practical and Industrial Implications

The findings of this study indicate the importance of AI marketing elements as a factor towards brand recognition on e-commerce platforms. This study has proven that there is a positive relationship between the contributing factors (machine learning and AI platforms) and brand recognition, which is supported by Festinger's cognitive dissonance theory. This study is similar to previous studies conducted by Shaily and Emma (2021), who found significant and positive contributions of big data analytics and AI platforms in influencing brand recognition in social business in Bangladesh. Therefore, it further developed and strengthened the theoretical view by confirming and contradicting previous research on the two factors of machine learning and AI platforms as important drivers that lead to brand recognition in e-commerce in Malaysia by improving the consumer’s perception of technology.

The present study has various practical and industrial applications concluded as:

Strategic Marketing and Branding: Companies can utilize the findings from the study to enhance and optimize their strategic marketing endeavors. Comprehending the influence of AI components on brand awareness empowers marketers to customize their branding tactics for maximum efficacy.

Competitive Intelligence: This research gives local marketers tools to gather competitor data. By analyzing how rivals use AI for brand recognition, marketers can uncover industry trends, allowing them to stay ahead in the market. The research highlights that mechanisms of AI donate to personalized user experiences. By leveraging this data, companies can implement AI-based strategies, leading to increased customer satisfaction and loyalty.

Preparing Employees and Enhancing Skills: This study delivers valuable information that enables businesses to determine which AI-related abilities and expertise are necessary for their staff. This

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information is crucial for preparing employees and directing the development of training programs that address any existing skill deficiencies.

Refining Positioning Strategies: Marketers can analyze their competitors' press releases and social media presence to identify central keywords. By using this information, they can progress their own positioning strategies and become more competitive in the marketplace.

Driving Product Development and Innovation: When businesses understand how AI technology effects brand awareness, they can uncover valuable information that drives the creation and enhancement of their products. This knowledge allows companies to develop products that meet the evolving demands of consumers and align with the latest market dynamics.

Expanding into New Markets and Internationalization: By highlighting the significance of integrating AI, the study delivers businesses with a rich plan for navigating implementation challenges in their technology adoption journeys. This guidance is crucial for businesses aiming to increase their customer base or increase globally. It includes industrial applications in marketing, branding, customer service, employee training, and overall business strategy. E-commerce industries can benefit from the insights provided in this study.

6. Limitations of the study and recommendation for future research

The study's main limitation is its eight-month time constraints, which may not fully reflect the impact of AI marketing on brand recognition. The sample size is mainly from a certain age, ethnicity, income status, and educational background, and the knowledge and awareness of AI in marketing are mixed. Additionally, the scarcity of contemporary studies on AI and strict ethical standards limit access to resources. Potential Avenues for Future Research in the Field of Communication: The study focuses on filling the research gaps regarding AI and brand recognition in rising nations such as Malaysia. This paves the way for future research opportunities in the field of communication. It motivates researchers to investigate the changing interactions between technology and communication. This study is essential for a communication-focused journal because it not only corresponds to the current technological environment but also provides valuable insights for professionals and scholars seeking to understand the complex connection between AI, brand recognition, and communication strategies in the digital era.

7. Conclusions

AI marketing and brand recognition are positively correlated, with AI marketing enhancing customer service and consumer engagement. This study provides a theoretical framework for understanding e-commerce user perceptions and characteristics in Malaysia. The findings show that millennials are familiar with AI elements, but big data analytics is insignificant. AI platforms, such as Siri, Alexa, or chatbots, are the most powerful elements in AI marketing, leading to brand recognition in the e-commerce industry. Big Data analytics does not lead to brand recognition, but rather, meaningful customer experiences infused with sentimental and emotional values through machine learning can help brands re-strategize their strategies. AI marketing can help brands increase consumer engagement and brand recognition if used effectively and efficiently. The two elements of AI marketing (machine learning and AI platforms) have a strong relationship with dependent variables, and AI marketing has the potential to create brand intelligence in the e-commerce industry. This study investigates the influence of artificial intelligence (AI) on the recognition of brands among users of electronic commerce (e-commerce) in Malaysia. The results suggest that machine learning and AI platforms have a substantial influence on brand recognition; however, the impact of big data

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analytics may not be significant. The results offer useful information for firms aiming to develop effective strategies to establish brand recognition among e-commerce shoppers in the region.

Author contribution statement:

ELKHANSA MEDJEDEL: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

AHMED SAID SAKOUCHI: Performed the experiments; Analyzed and interpreted the data.

ABU BAKAR ABDUL HAMID: Conceived and designed the experiments; Wrote the paper.

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