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The influence of big data, content marketing, and artificial neural networks on purchase decisions: the moderating role of purchase intentions

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ABSTRACT

This study aims to explore the direct effect of big data variables, content marketing and artificial neural networks on purchase intention variables and purchasing decisions; and 2) the indirect effect of big data variables, content marketing and artificial neural networks on purchasing decisions moderated by purchase interest variables. The method in this study uses a quantitative approach and sampling techniques with simple random sampling, data distributed by google form and offline conducted January - March 2024, a total of 385 data collected. These findings were analyzed with Structural Equation Modeling (SEM) software in the Smart PLS (Partial Least Square) application with indirect and direct. The results showed that directly, big data has a negative but significant effect on purchase intention. Content marketing, directly on purchase intention or purchase decision, has a positive but insignificant effect. And directly, artificial neural networks have a negative but significant effect on purchasing decisions.



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Introduction

The development of information technology and the internet has created major changes in consumer behavior patterns. In Indonesia, increased internet penetration has driven a transformation in the way consumers seek information and make purchasing decisions (Cangara et al., 2022; Putritamara et al., 2023). The rapid growth of e-commerce is clear evidence of this phenomenon. According to the SEA e-Conomy 2023 report by Google, Temasek, and Bain & Company, Indonesia's e-commerce gross transaction value is expected to reach USD 160 billion by 2030. However, amidst this rapid growth, challenges arise in understanding how digital technologies, such as Big Data, Content Marketing, and Artificial Neural Networks (ANNs), influence consumer purchasing decisions. Technology and information development have advanced quickly. Every level of society has been impacted using technology, particularly in Indonesia. With Indonesia's internet usage growing rapidly, information and technology are becoming more and more unstoppable. Nowadays, smartphones are being used to access the internet in addition to laptops and computers.

Currently, many business actors use the internet as a medium for information on the products and marketing they offer (Dwivedi et al., 2021). Therefore, using the internet is another reason why customers conduct online shopping and look for more information about the goods or services they require. Because they are thought to

be more profitable and flexible in terms of locating the desired product, some consumers have shifted from using offline methods to online transactions as a result of this. Online shopping is a form of commerce using electronic devices that allows consumers to purchase goods or services from sellers via the internet (Aryani et al., 2021). A transaction process carried out through media or intermediaries, namely in the form of online buying and selling sites or social networks that provide goods or services that are bought and sold, is called online shopping or e-commerce (Hermantoro & Albari, 2022; Mayangsari & Aminah, 2022). The growth of e-commerce in Indonesia continues to increase from year to year. According to SEA e-Conomy 2023 research from Google, Temasek, and Bain & Company, Indonesia's e-commerce gross merchandise value (GMV) in 2023 will reach US\$62 billion (Rp. 975.3 trillion) and has the potential to reach US\$ 160 billion (Rp. 2.51 trillion). quadrillion) by 2030 (Hoppe et al., 2023). On the other hand, (We Are Social, 2024) noted that Indonesia was ranked 9th in the list of 10 countries that shop online most frequently in early 2024, with the proportion of internet users who shop online every week at 59.3%.

Currently, a very interesting phenomenon that warrants further investigation is the decision-making process that consumers use when conducting online transactions. Moreover, big data is used in the decision-making process. Consumer decision-making when it comes to completing online transactions is influenced by content marketing in addition to the utilization of big data. Having access to content that lives up to expectations is one factor in consumer decision-making (Du Plessis, 2022). In the decision-making process, it can be identified by the existence of artificial neural networks technology which allows application developers to process data and information more quickly and accurately. The key issue at hand is how these technologies can be optimized to enhance the consumer experience and drive purchasing decisions. Big Data offers deep analytics capabilities to provide relevant information to consumers. However, information overload is often a barrier, discouraging consumers from making purchases. Content Marketing, as a content-based marketing strategy, is designed to grab consumers' attention with relevant and valuable material. However, its effectiveness is often limited as many consumers ignore marketing content that does not capture their attention. Artificial Neural Networks (ANNs), on the other hand, provide the ability to personalize the consumer experience, but their impact on purchase decisions is not fully understood, especially in relation to the moderation of purchase intention variables.

The process through which businesses interact with consumers, forge enduring bonds with them, and provide value to them in exchange for value from them is called marketing (Armstrong et al., 2022; Lemon & Verhoef, 2016). Conversely, digital marketing is a part of advertising that promotes goods and services through the use of the Internet and online-based digital technology, including smartphones, desktop computers, and other digital media and platforms (Caffey & Chadwick, 2016; Erwin et al., 2023; Musnaini et al., 2020). Previous research has shown the importance of these technologies in digital marketing, but there are gaps in understanding how they work synergistically. For example, a study by Le and Liaw (2017) showed that Big Data helps consumers find relevant information, but did not address the impact of information overload on purchase intent. Similarly, a study by Shalsabilah and Firmansyah (2023) found that content marketing has a positive influence on purchase intention, but did not explore the moderating role of other variables such as purchase intention.

To fill the gap, this study aims to explore the direct and indirect effects of Big Data, Content Marketing, and Artificial Neural Networks (ANNs) on consumer purchase decisions, considering the role of purchase intention as a moderating variable. This research also makes a practical contribution by offering insights into how these technologies can be effectively integrated in digital marketing strategies. In the context of this research, Big Data is defined as large data sets used to analyze consumer behavior patterns, Content Marketing as a content-based marketing strategy to attract consumer attention, and Artificial Neural Networks (ANNs) as an artificial intelligence technology that personalizes consumer experiences based on their data and behavior patterns. A quantitative approach through Structural Equation Modeling (SEM) is used to analyze the relationship between these variables and their impact on consumer behavior. By exploring these relationships, this research not only strengthens the theoretical understanding of consumer behavior in the digital age but also provides practical guidance for industry players to develop more effective technology-based marketing strategies.

Big Data and Purchase Intention

Big data includes data and information with a very large amount, variety and speed which is able to stimulate consumers to generate buying interest (Dash et al., 2019; Matilda, 2016). Large amounts of data, both structured and unstructured, are referred to as big data (Mahmoudian et al., 2023). Big data is closely related to online buying interest because it can be the main reference for consumers in obtaining the desired product (Dekimpe, 2020; Le & Liaw, 2017; Matilda, 2016; Vasilopoulou et al., 2023). On the other hand, marketers benefit from big data because they can provide valuable products according to consumer interests. Positive big data has an impact on consumers' interest in making online purchases, but on the other hand, negative big data can lead to

exploration of consumers' personal data to be misused by irresponsible parties (Dwivedi et al., 2021; Le & Liaw, 2017).

Previous research has found that there is a positive and significant correlation between big data and consumer buying interest online. Convenience and fast information search make consumers rely more on big data (Zeqiri et al., 2023). The emergence of interest in buying online is due to the discovery of information or products that are relevant to consumers' needs and desires, which consumers then select from various alternatives through big data. Big data also provides a recommendation system that can save a lot of time searching for information, evaluating and selecting and matching preferences easily (Roy & Dutta, 2022). Drawing from the aforementioned explanation, the research's hypothesis (H1) is that big data has a positive and significant effect on online buying interest.

Content Marketing and Purchase Interest

Creating and disseminating worthwhile, timely, and consistent content is known as content marketing, and its goal is to draw in and grow a targeted audience in order to generate profitable consumer interest (Wardani et al., 2024). Content marketing is closely related to interest in buying online because content marketing has value and relevance to provide interest that stimulates consumers to take action, namely transacting online (Agra & Prakoso, 2022). Content marketing is a promotional approach that involves organizing, producing, and disseminating engaging content to appeal to a specific audience and persuade them to become clients of a business. Interest in buying online arises from the driving factors in the form of the availability of content that is interesting, relevant and valuable for consumers (Huo et al., 2023).

Several similar studies regarding the positive and significant influence of content marketing on purchasing interest include research conducted by (Antika & Maknunah, 2023; Cici Ijan & Ellyawati, 2023; Shalsabilah & Firmansyah, 2023) that there is a fairly strong influence of content marketing on purchasing interest with a positive and significant relationship direction. Then this opinion was strengthened by research results (Afwā & Moniko, 2024) that the content marketing variable has a fairly strong influence that is significant and positive when compared to other variables such as quality, brand, price and customer experience. The explanation given above leads to the hypothesis (H2) in this study, which is that content marketing has a significant and positive effect on online buying interest.

Artificial Neural Networks and Purchase Intention

Artificial neural networks are computational models inspired by the central nervous system and used in a wide variety of applications (Halužan Vasle & Moškon, 2024). The existence of artificial neural networks which are able to collect information related to consumers' product search history and then resurface this information at different times is one of the triggers for the emergence of buying interest. Marketers often use artificial intelligence to attract consumer interest in making online transactions (Bilal et al., 2024). Therefore, (Chou et al., 2010; Migdał-Najman et al., 2020) believes that with the existence of artificial neural networks, consumers can easily identify their desires in obtaining the desired products online.

Several studies related to artificial neural networks and online buying interest have been presented by previous researchers, including research conducted by (Suchacka & Stemplewski, 2017) that in predicting online buying interest among active internet users, artificial neural networks have a positive and significant effect on buying interest with an accuracy rate of 87.8% from 99.6% of active users. Another research, conducted by (Esmeli et al., 2020) that user purchasing intentions and behavior correlate with the features of the user's platform and the operating system used. H3 in this study is that, in light of the previously mentioned explanation artificial neural networks have a positive and significant effect on online buying interest.

Big Data and Purchasing Decisions

Big data analysis can yield insights that improve decision-making and result in more successful business plans (Vasilopoulou et al., 2023). Big data has become an important instrument in decision making because it is able to provide accurate, fast and diverse information. Big data is an information asset that needs to be transformed into value using specific technology and analytical techniques because of its high volume, velocity, and variety (Matilda, 2016). Big data is closely related to decision making, especially online purchasing decisions, fast and accurate information obtained from big data is a solution in deciding to buy products online (Akter & Wamba, 2016; Dekimpe, 2020).

Many researchers have presented their research on the positive and significant influence of big data on purchasing decisions. One of them is research conducted by (Vasilopoulou et al., 2023) that big data has had a positive and significant influence on purchasing decisions. Big data has helped consumers to get the products they want, reduces consumer costs in obtaining the information they need and can be relied on at any time if needed by consumers. Other research has been presented by (Le & Liaw, 2017) that big data has a positive and significant influence on decision making both at the managerial level and at the technical level. Big data has

become a reference for consumers in making purchasing decisions online, every purchasing activity always starts with a search for relevant information and of course this information is obtained from big data available on the internet (Mahmoudian et al., 2023). The research's hypothesis (H4) is that, in light of the previously provided explanation, big data has a positive and significant effect on online purchasing decisions.

Content Marketing and Purchasing Decisions

Content marketing is a marketing strategy that provides content that suits consumers' wants and needs (Du Plessis, 2022). Customers are able to utilize content marketing as a means of obtaining information and data about the products they require to make well-informed purchasing decisions (Cici Ijan & Ellyawati, 2023; Shalsabilah & Firmansyah, 2023). Purchase decisions are closely related to content marketing. Consumers require accurate information to avoid making mistakes when making decisions, and content marketing is a reliable source of this information. A need alone does not mean that a decision must be made right away. According to (Agra & Prakoso, 2022) that Content needs to be able to: 1) attract and captivate customers; 2) articulate all of the company's core values in terms of distinctiveness, consistency, quality, and relevance; 3) Take initiative and have the capacity to grow with time.

Previous research has been described by previous researchers. Research conducted by (Wardani et al., 2024) that content marketing has a positive and significant influence on the decision making of social media users. Similar research has been carried out by (Santy & Andriani, 2023) that there is a strong positive correlation between content marketing and purchasing decisions, which shows that the relationship is one-way. This implies that as companies' adoption of content marketing increases, the strength of the relationship between content marketing and purchasing decisions also increases. According to the justification provided, the research's hypothesis (H5) is that content marketing has a positive and significant effect on online purchasing decisions.

Artificial Neural Networks and Purchasing Decisions

According to (Halužan Vasle & Moškon, 2024) that an artificial neural network is a paradigm for information processing that is modeled after the functions of biological nervous systems, such as the information-processing capabilities of the brain.. Artificial neural networks technology has recently been frequently used to solve problems using an artificial intelligence approach, especially in making online purchasing decisions (Bilal et al., 2024). Information processing systems known as artificial neural networks (ANNs) are modeled after biological neural networks, specifically the neural networks found in the human brain (Halužan Vasle & Moškon, 2024). The ability of artificial neural networks to process information accurately is an important component in decision making, especially online purchasing decisions (Suchacka & Stemplewski, 2017). Many companies have utilized artificial neural networks as part of company operations because they are able to detect the information consumers want and need in deciding to purchase a product. Artificial neural networks are closely related to online purchasing decisions. Information that has been designed by marketers through artificial neural networks has become a reference for consumers in making online purchasing decisions.

Existing research discusses artificial neural networks and online purchasing decisions, including research conducted by (Migdał-Najman et al., 2020) that decision making is strongly influenced by artificial neural networks which have been tested on two different media but the result is that the attributes that use artificial neural networks are able to make fast decisions at the right time. Other research has been carried out by (Badea (Stroie), 2014) that when it comes to decision-making, artificial neural networks are generally more effective than traditional discriminant analysis because they have good discriminative power. In light of the foregoing explanation, the research's hypothesis (H6) is that artificial neural networks have a positive and significant effect on online purchases.

Purchase Interest and Purchase Decisions

Intention to buy is part of the consuming attitude component. (Rohani et al., 2023) claims that purchase interest, which is determined by the likelihood that a consumer will make a purchase, is the inclination of a consumer to purchase a brand associated with the purchase. Purchase interest is very closely related to purchasing decisions so that purchasing interest cannot be separated from purchasing decisions because purchasing decisions always start from an interest in making a purchase. Purchase interest is a term used by consumers to describe their intentions to buy several items under a particular brand (Rohani et al., 2023). Another argument from (Djakasaputra et al., 2023) which explains that the buying interest stage is the respondent's propensity to act prior to the actual implementation of the buying decision.

Researchers have conducted research related to purchasing interest and purchasing decisions. One of them is research conducted by (Komalasari et al., 2021) that purchase interest has a positive and significant effect on e-commerce customers' purchasing decisions. Apart from Komalasari's research, similar research has been carried out by (Fatmawati et al., 2023) which showed that customers' perceived value and their decisions to buy

were significantly influenced by the attractiveness of websites, the reputation of the e-commerce industry, and the perceived ease of transactions.

Given the foregoing explanation, the research's hypothesis (H7) is that buying interest has a positive and significant effect on online purchasing decisions.

Big Data, Purchase Intentions, and Purchase Decisions

In studies on the influence of big data on purchasing decisions, many researchers have introduced moderating variables. Purchase interest is a commonly used moderating variable. Some authors like (Yani & Ngora, 2022) have found a positive correlation between purchase interest and purchase decisions. A number of studies related to consumer behavior have also empirically validated the relationship between purchasing interest and online purchasing decisions. (Agra & Prakoso, 2022) thinks that a consumer's self-instruction to buy a product, plan, and take appropriate actions like proposing (initiator), recommending (influencer), choosing, and ultimately making a decision is what is meant by purchase intention.

(Shareef et al., 2008) put forward a model that contains positive correlations regarding big data, purchasing interest, and purchasing decisions. The model is in the form of Quality-Purchase Interaction (QPI Model). Online purchasing decisions are greatly influenced by consumer buying interest and this interest is influenced by big data obtained by consumers via the internet. Other research from (Hornik et al., 2024) who stated that skills in collecting and analyzing big data for decision making are very important, considering that all digital technology functions depend on digital data. The research's hypothesis (H8) is that, in light of the justification provided big data has a positive and significant effect on purchasing decisions which is moderated by purchasing interest.

Content Marketing, Purchase Interest, and Purchase Decisions

In previous research, buying interest is a moderating variable that is widely used in relation to purchasing decisions, and cannot be separated because all purchasing decisions start from an interest in buying. This is in line with opinion (Armstrong et al., 2022) that before deciding to make a purchase, consumers typically go through a number of steps, including identifying the issue, gathering information, weighing their options, and making the purchase. These two variables become interesting when compared with content marketing variables as has been done by several previous researchers, including research conducted by (Agra & Prakoso, 2022) that customer interest which is profitable for companies in making purchasing decisions by consumers begins with the availability of interesting, relevant and valuable content which is able to stimulate consumers to immediately make transactions.

Another argument expressed (Pulizzi, 2014) that with the goal of acquiring, attracting, and engaging a specific and well-defined target audience—which is defined by the emergence of purchasing interest and subsequent purchase decisions—content marketing is a marketing and business process for producing and disseminating worthwhile and captivating content. Other research has been presented by (Shalsabilah & Firmansyah, 2023) which analyzes content marketing from three dimensions, namely content, customer engagement, and goals. An extensive analysis's findings indicate that purchasing decisions and buying interest are significantly influenced by content marketing variables. The research's hypothesis (H9) is that, in light of the previously provided explanation content marketing has a positive and significant effect on purchasing decisions which is moderated by purchasing interest.

Artificial Neural Networks, Purchase Intentions, and Purchase Decisions

Many researchers have used artificial neural networks as a variable in predicting consumer buying interest to find out how far purchasing decisions have been made. One of the research in question is research conducted by (Haluzan Vasle & Moškon, 2024) which analyzes artificial neural networks in terms of evolution, topology, learning algorithms, and applications. This application includes the fields of marketing and consumer behavior. When marketers want to know the characteristics of potential consumers, it is impossible to just rely on their own knowledge, so they need an application that is able to process existing information into profitable data. The resulting data output is then used to influence consumers' buying interest so they can immediately make purchasing decisions. The lifestyle of consumers who desire to purchase high-quality, useful products cannot be divorced from their purchasing decisions (Cici Ijan & Ellyawati, 2023).

There is a fairly strong influence of artificial neural networks on online purchasing decisions through purchase interest. This is in line with research results (Migdał-Najman et al., 2020) which uses The Growing Neural Gas (GNG) Neural Network which allows the identification and segmentation of consumer groups quickly and effectively and facilitates mapping the differences between these groups and comparing consumption behavior expressed by consumers in different markets. Based on the explanation above, the hypothesis (H10) in this research is that artificial neural networks have a positive and significant effect on online purchasing decisions which are moderated by purchasing interest.

Method

Design

This research uses an explanatory quantitative approach that aims to identify and test causal relationships between the variables under study aligned with (Creswell & Creswell, 2017), including direct and moderating effects. This approach is suitable for exploring the complex relationships between Big Data, Content Marketing, Artificial Neural Networks (ANNs), purchase intention, and purchase decisions. Structural Equation Modeling (SEM) with SmartPLS application was used because of its ability to examine complex relationships between latent variables, both directly and through moderating variables. SEM was chosen for its flexibility in handling data that is not normally distributed and models that include reflective and formative indicators. SmartPLS was chosen for its advantages in Partial Least Squares (PLS), which focuses more on predicting the dependent variable and can be used for smaller sample sizes than covariance-based SEM.

Sampling

The sampling technique used was simple random sampling to ensure population representation. Respondents were randomly selected from a population of consumers who had made an online purchase or planned to do so. The randomization process was conducted using software based on a list of potential consumers, with inclusion criteria including being at least 18 years old, having internet access, and having interacted with e-commerce. This technique was chosen to reduce selection bias and ensure broad representation in the population. The sample size was set at 385 respondents, in accordance with the recommendations of the PLS-based SEM literature, which is at least 10 times the number of indicators on the variable with the most indicators. The number of indicators in this study is 38, so this sample size is adequate to produce reliable analysis. The demographic characteristics of the respondents include age 18-50 years, male and female gender, education level of at least high school, and economic status of active e-commerce users from various income levels. These characteristics were chosen to ensure the results of the study are relevant to the population of e-commerce users in Indonesia. Data was collected using a questionnaire distributed online during the research period from January to March 2024.

Data Analysis

The SEM analysis process in this study includes several stages (Hair et al., 2019). First, the development of a theoretical model to identify the relationship between exogenous variables (Big Data, Content Marketing, ANNs), moderating variables (purchase intention), and endogenous variables (purchase decision). Second, measurement model evaluation is carried out by testing convergent ($AVE > 0.5$) and discriminant validity (correlation between latent variables is smaller than the square root of AVE). Third, structural model testing is carried out to evaluate the strength and significance of the relationship between variables using the path coefficient and p-value. Fourth, overall model evaluation is done by measuring R^2 for explained variance and Q^2 for model predictive relevance.

Results and Discussions

Tests of the structural equation model's coefficients for the direct and indirect influences (through moderation) of the path coefficient in the smartPLS application were conducted based on the empirical model presented in this study. Then the direct influence is also explained, meaning there is a direct positive/negative influence between variables, while the indirect influence means there is an indirect positive/negative influence between variables, and the indirect influence is the moderating effect of the purchase interest variable (Y). The hypothesis testing research (H1 to H7) is explained in Table 1 below. Determine whether the relationship between the variables is significant by looking at the p value. If it is smaller than 0.05, on table 1:

Next, the following hypothesis testing is a test between variables with the moderating effect of the purchase interest variable (Y), the value analyzed is the value in the t-statistics resulting from the output of the smartPLS application by comparing it with the t-table value. Hypothesis testing with smartPLS was carried out to calculate the influence of the independent latent variable on the dependent latent variable with moderation. The output of smartPLS bootstrapping results to test the research hypothesis (H8 to H10) is as shown in table 2.

Based on table 2 from the entire model, for the direct effect, it can be seen that there are three paths that have a positive and significant effect, there are two paths that are positive and not significant, and two more paths that have a negative and significant effect. Meanwhile, for the indirect influence of the moderating effect, the three paths have positive and significant values which strengthen the relationship between exogenous variables and endogenous variables.

Table 1. Testing the variable direct effect hypothesis

Hypothesis	Exogenous variables	Endogenous variables	Direct effects	P Value	Information
1	Big data (X ₁)	Purchase interest (Y)	-0.866	0.004	(-) Significant
2	Content marketing (X ₂)	Purchase interest (Y)	0.134	0.546	(+) Not significant
3	Artificial neural networks (X ₃)	Purchase interest (Y)	0.428	0.047	(+) Significant
4	Big data (X ₁)	Purchase decision (Z)	0.660	0.049	(+) Significant
5	Content marketing (X ₂)	Purchase decision (Z)	0.171	0.523	(+) Not significant
6	Artificial neural networks (X ₃)	Purchase decision (Z)	-0.641	0.009	(-) Significant
7	Purchase interest (Y)	Purchase decision (Z)	0.948	0.000	(+) Significant

Source: Data after processing (2024)

Table 2. Testing the variable indirect effect hypothesis (moderating)

Hypothesis	Variable	Original sample (O)	T Statistics (O/STERR)	t table (1.96 5%)	Information
8	Moderating effect of big data (X ₁ *Y → Z)	1,463	3,460	1.96	(+) Significant
9	Moderating effect of content marketing (X ₂ *Y → Z)	1,217	2,545	1.96	(+) Significant
10	Moderating effect of artificial neural networks (X ₃ *Y → Z)	0.525	4,649	1.96	(+) Significant

Source: Data after processing (2024)

The interpretation of direct effect hypothesis testing in table 1 and indirect effect in table 2 can be explained below as follows:

The hypothesis testing results show diverse relationships between variables. For H1, big data (X₁) has a negative and significant effect on buying interest, with a coefficient value of -0.866 and a p-value of 0.004 (< 0.05). This indicates that although big data contributes significantly, it does not positively stimulate buying interest. For H2, content marketing (X₂) shows a positive but insignificant influence on buying interest, with a coefficient of 0.134 and a p-value of 0.546 (> 0.05), indicating that while content marketing positively correlates with buying interest, its effect lacks statistical significance. For H3, artificial neural networks (ANNs) (X₃) demonstrate a positive and significant influence on buying interest, with a coefficient value of 0.428 and a p-value of 0.047 (< 0.05), highlighting that ANNs significantly stimulate consumer buying interest online. On purchasing decisions, H4 confirms that big data has a positive and significant influence, with a coefficient value of 0.660 and a p-value of 0.049 (< 0.05), emphasizing big data's effectiveness in driving online consumer purchasing decisions. Conversely, H5 reveals that content marketing has a positive but insignificant effect on purchasing decisions, with a coefficient of 0.171 and a p-value of 0.523 (> 0.05), suggesting limited impact. In contrast, H6 finds that ANNs have a negative and significant influence on purchasing decisions, with a coefficient of -0.641 and a p-value of 0.009 (< 0.05), implying inconsistencies or inefficiencies in AI applications within digital marketing. Finally, H7 shows that buying interest positively and significantly affects purchasing decisions, with a coefficient value of 0.948 and a p-value of 0.000 (< 0.05), reinforcing its crucial role in influencing consumer actions.

The study further explores the moderating effects of buying interest on the relationship between the independent variables and purchasing decisions. For H8, buying interest (Y) significantly moderates the relationship between big data (X₁) and purchasing decisions (Z), with an original sample value of 1.463 and a t-statistic of 3.460 (> 1.96). This finding indicates that buying interest strengthens the positive relationship between

big data and purchasing decisions. Similarly, for H9, buying interest moderates the relationship between content marketing (X2) and purchasing decisions (Z), with an original sample value of 1.217 and a t-statistic of 2.545 (> 1.96), demonstrating that buying interest enhances the effect of content marketing on purchasing decisions. For H10, buying interest moderates the relationship between ANNs (X3) and purchasing decisions (Z), with an original sample value of 0.525 and a t-statistic of 4.649 (> 1.96). This confirms that buying interest significantly strengthens the relationship between ANNs and purchasing decisions, despite the negative direct effect observed earlier. These findings highlight the critical role of buying interest in bridging the gap between technological tools and consumer purchasing behavior, underlining its importance for creating effective digital marketing strategies.



Figure 1. Impact of Buying Interest on the Effectiveness of Big Data in Driving Purchasing Decisions

The graph above shows the interaction between Big Data utilization and consumer purchase intention in influencing purchase decisions. For consumers with low purchase intention (dashed line), the effect of Big Data on purchase decisions tends to be moderate, while for consumers with high purchase intention (full line), the effect is much more significant. This confirms the importance of considering purchase intention as a moderating variable, where Big Data-based strategies are more effective for consumers with high purchase intention. Conversely, for consumers with low purchase intention, additional strategies such as attractive promotions or education are needed to increase marketing effectiveness.

Big Data and Purchase Intention

Big data has a negative but significant influence on buying interest. This proves that consumers have indeed been presented with a lot of data which continues to increase in quantity so that the increase in data actually causes a decrease in consumer buying interest. Validated data and hoax data have merged into one medium, namely the internet, causing consumers to tend to be less interested in making purchases. In line with the opinion expressed by (O'Reilly Radar Team, 2011) which states that the use of big data as one of the factors influencing buying interest, can actually be considered if data processing has not been carried out first because existing raw data that has not been reduced and validated on the suitability of the data with the user can cause the data to become a pile of junk data that fills the storage space of consumers' devices, making it difficult for consumers to use this data as a reference for carrying out online transactions.

Research support from (Guangting & Junxuan, 2014) which analyzes the negative influence of big data on purchasing interest from the aspects of consumer privacy data leakage, e-commerce network quality, consumer trust, and consumer perceived risk. The difference in research lies in the analysis of the influence of big data related to the large amount of data that consumers have not been able to process conventionally, causing the continuously increasing amount of data to become waste data that fills consumers' devices so that consumers are not interested in using this data as a reference in making purchase transactions. by online.

Content Marketing and Purchase Interest

Content marketing has a positive but not significant influence on purchasing interest. This proves that when consumers use the internet, most of their time is spent browsing social media or watching videos online. The presence of marketing content inserted by marketers among the content accessed by internet users is often skipped without paying more attention to the content of the content inserted by marketers so that This is in line with the results of this research that content marketing has not had a significant impact on consumer buying

interest online. In line with the opinion expressed by (Lieb, 2012) which states that the current development of the marketing world is no longer based on what marketers want and then actualizes it in the form of content marketing, but more than that, marketers must be able to feel what consumers feel.

A similar opinion was expressed by (Sudarsono et al., 2020) that content that is interesting and provides positive value is not a measure of the success of content marketing, but more than that, content marketing must be able to have a significant impact on consumer buying interest. Research support from (Yaqubi & Karaduman, 2019) which states that marketing content that is interesting but published to an irrelevant audience means that the content does not have a significant impact on consumer buying interest.

Artificial Neural Networks and Purchase Intention

Artificial neural networks have a positive and significant influence on purchasing interest. This has the implication that in general, if consumers use applications offered by marketers, consumers are often treated to various attractive promotions which provide consumer surplus in the form of vouchers or promo codes with a certain time limit for use, so this is sometimes something consumers don't want to miss and have an interest in making a purchase. A similar opinion was expressed by (Haykin, 1999) which states that it is no longer possible for companies to use traditional (manual) methods to attract consumers' buying interest, so a new architecture is needed in the form of an intelligent system that is able to make the right decisions in providing useful and relevant information to customers in order to attract consumers' buying interest. Research support from (Korpusik et al., 2016) which states that artificial neural networks have a significant positive influence on purchasing interest. Artificial neural networks are very accurate in identifying consumer buying interests. Similar research results were presented by (Sudarsono, 2022) which states that artificial neural networks are able to collect various data and information stored in applications and then the data is analyzed so that consumers are then given information related to consumer interest in a product.

Big Data and Purchasing Decisions

Big data has a positive and significant influence on purchasing decisions. This has the implication that consumers who use big data as a source of information in making purchasing decisions are consumers who have collected various relevant data and information so that data that has not been validated is no longer a consideration for making decisions. This fact is in line with this research that big data has a positive and significant effect on purchasing decisions. Relevant opinions expressed by (Sharda et al., 2014) which states that online transaction activities are an inseparable part of big data. Consumers are more practical in using big data in identifying in detail the products they want. Likewise, companies are greatly helped by big data because they are able to distribute data and information to consumers in real time without having to go to consumers one by one. Related research from (Jeble et al., 2018) which states that the role of big data is very strategic in carrying out online transactions both as a reference for consumers and as a data information medium for companies.

Content Marketing and Purchasing Decisions

Purchase decisions are positively, but not significantly, impacted by content marketing. This suggests that the majority of a consumer's internet usage is devoted to social media browsing, instant messaging, or online video watching. When marketers present their content among the content that internet users access, it is frequently ignored or passed over without further thought. comprehensive content marketing materials. The same opinion was expressed by (Pulizzi, 2014) which states that consumers are often not interested in information or promotions related to products or services provided by companies, but consumers pay more attention to their own needs and desires and then these needs and desires are correlated with the information provided by the company through content marketing. Previous research is in line with this research, from (Rojanadilok & Daraviroj, 2018) which states that the contribution of positive value content will provide meaning through content marketing that is made of high quality with a very interesting content structure. And if the content is accessed by relevant consumers then of course you will get optimal results.

Artificial Neural Networks and Purchasing Decisions

Artificial neural networks have a negative but significant influence on purchasing decisions. This has the implication that in general marketers in their applications provide various vouchers and attractive promo codes which have very binding terms and conditions so that the more intensively the program is carried out, the more negative impact it will have on consumers' decisions to make purchases because the customer value provided is not comparable. with the sacrifices made by consumers (expense). The same opinion was expressed by (Kant & Levine, 1997) which states that there is a lot of interesting information and promotions presented by companies to attract consumers' buying interest through the artificial neural networks process but are unable to attract consumers to become actual buyers (purchasing decisions). This occurs because there is ambiguity in information such as price cuts, discounts, and attractive promos that are presented, but this cannot be separated from the terms and conditions that consumers must fulfill, for example minimum shopping, maximum discount, voucher validity period, etc.

Relevant research conducted by (Taherdoost, 2023) which highlights the increasing accuracy of artificial neural networks but emphasizes the need to address issues such as interpretability, generalization, and integration to build reliable decision support systems.

Purchase Interest and Purchase Decisions

Purchase interest has a positive and significant influence on purchasing decisions. This has the implication that all consumers who have made transactions online started with an interest in a product offered online. Opinion support from (Madahi & Sukati, 2012) which states that consumers who already have an interest in purchasing will continue their interest into a purchasing decision after the consumer identifies strong reasons and discovers the benefits that may be obtained from the product so that consumers will immediately make a purchasing decision. Relevant research from (Antika & Maknunah, 2023) which states that high purchasing interest encourages faster purchasing decisions in making product purchase transactions online.

Big Data, Purchase Intentions, and Purchase Decisions

Big data which is moderated by the purchase interest variable indirectly has a positive and significant influence on purchasing decisions. This has the implication that basically big data has not been able to encourage consumers' buying interest to make purchases directly because there is a lot of valid and invalid data and information so that it confuses consumers to obtain better information, but the difference is visible when big data is correlated with decisions. purchase because the information obtained by consumers is better and leads to valid information regarding the product of interest.

A similar opinion was expressed by (Pavitra B et al., 2016) which states that data and information obtained by consumers from various sources and in various formats makes it easier for consumers to sort and select this data and information to be used as a reference in identifying in detail the product they want in order to speed up the purchasing decision making process regarding the product they are interested in. Relevant research from (Janssen et al., 2017) which states that the use of big data in the decision-making process is able to produce more accurate, faster and transparent decisions, making it possible for companies and consumers to obtain optimal benefits related to online transactions carried out.

Content Marketing, Purchase Interest, and Purchase Decisions

Content marketing indirectly has a positive and significant influence on purchasing decisions which is moderated by purchasing interest. This has the implication that content marketing is not directly able to attract the attention of internet users and stimulate sales transactions because the average consumer will focus on other content, not on advertisements or content presented by marketers for a very short duration. However, this reality is different if content marketing is moderated by purchasing interest, it can strengthen the correlation between content marketing and purchasing decisions in a positive and significant direction.

Opinion support from (Lieb, 2012) which states that content marketing provides value and profitable feedback for companies when the content is able to convert consumers into customers and customers into repeat buyers, then consumers are willing to share the company's content. The same thing was conveyed by (Sudarsono et al., 2020) which states that online marketing cannot be separated from the availability of interesting, useful and relevant content as a source of information for consumers to make purchases online. Consumer buying interest arises as a result of finding information that is relevant to their needs so that consumers are encouraged to immediately make purchasing decisions online (Agra & Prakoso, 2022).

Artificial Neural Networks, Purchase Intentions, and Purchase Decisions

Artificial neural networks indirectly have a positive and significant influence on purchasing decisions which are moderated by purchasing interest. This has the implication that consumers are often interested in various marketing programs run by marketers through their applications, but these marketing programs sometimes don't sell because there are many requirements that consumers have to pass to get the benefits that result from this. A similar opinion was expressed by (Lestari & Lhaura Van FC, 2017) which states that artificial neural networks can be used in a variety of applications. The company makes it possible to customize each individual through an artificial neural networks architecture to understand their interests and desires so that consumer purchasing decisions are in accordance with information from the company. Meanwhile, previous research from (Prashar et al., 2015) which states that the high consumer buying interest cannot be separated from improving internet infrastructure, marketers use artificial neural networks to understand in more detail consumer purchasing behavior so they can provide relevant information to make it easier for consumers to make purchasing decisions.

Practical Implications

The results of this study have some important practical implications. Companies need to invest their resources in the development of Big Data analysis that focuses on consumer segmentation and behavior prediction. In addition, content marketing strategies should be designed by considering the quality and relevance of content for the target audience. The findings on ANNs underscore the need for consistent personalization

improvements, involving consumer feedback to refine algorithms. For marketing practitioners, understanding the moderation of purchase intention can help in devising more personalized marketing strategies.

Research Limitations

This study has several limitations. First, the data used comes from consumers on e-commerce platforms, so the results may not be generalizable to other sectors. Second, this research model does not consider external factors such as economic conditions or market competition that may influence purchasing decisions. Third, this research is limited to a quantitative approach, which may miss the depth of insight that can be gained from a qualitative approach. Future research is recommended to integrate mixed methods and expand the focus to other sectors.

Conclusions

This study found that Big Data has a significant positive influence on purchasing decisions, while ANNs show a negative influence, and Content Marketing is not significant. Purchase intention as a moderating variable plays an important role in strengthening the relationship between Big Data and purchase decisions. The findings support consumer behavior theory and make new contributions to the digital marketing literature. Practically, these results can be used by companies to optimize digital marketing strategies by leveraging Big Data and increasing the use of AI. Future research is recommended to explore external factors and use a mixed methods approach to generate richer findings.

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Author Contribution

Sudarsono: Conceptualisation and Research Design, Data Collection, Methodology, Writing Entire Paper, Conceptualisation, Data Collection and Analysis, Editing and Layouting. **Azis Rachman**: Supervision and Validation. All Authors have read the final version of the paper.

Declaration Of Interest

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