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Determining the Transformative Role of Artificial Intelligence and Big Data in Saudi Telecom Companies: An Empirical Study

[1]Faisal Saad Alrushud, [2] Ibrahim Saleem Alotaibi
[1,2]Business Administration Department, College of Administrative and Financial Sciences, Saudi Electronic University, Kingdom of Saudi Arabia

تحديد الدور التحولي للذكاء الاصطناعي والبيانات الضخمة في شركات الاتصالات السعودية: دراسة ميدانية

[1]فيصل سعد الرشود، [2]إبراهيم سليم العتيبي
2,1قسم إدارة الأعمال، كلية العلوم الإدارية والمالية، الجامعة السعودية الإلكترونية، المملكة العربية السعودية

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Abstract:

Disruptive technologies like artificial intelligence and big data analytics have altered and transformed how organizations operate. Of these two disruptive technologies, artificial intelligence stands as the latest technological disruptor holding immense potential for transforming the marketing and retail landscape. Practitioners from across the world try to figure out and understand the AI solutions that are best fit for their marketing and retail functions. This study aims to determine the transformative role of artificial intelligence and big data in the Saudi telecom companies' context. Resource-based theory was used to examine how resources like AI and Big data analytics can help drive a competitive advantage if customized to a particular organizational need. A sample of 268 respondents were surveyed and the collected data was analyzed using the central tendency measures, t-test, and Pearson correlation. The study found a relationship between artificial intelligence and big data analytics, creating a marketing plan, effective organizational performance, creating promotional information, developing marketing strategies, and creating competitive prices. It also concluded that the use of artificial intelligence in telecommunications companies led to a transformation in retail and marketing activities, and the use of big data in telecommunications companies led to a transformation in retail and marketing activities. The study highlights theoretical and practical implications for harnessing these technologies more effectively and identifies areas for future research.

Keywords: Artificial Intelligence, Big Data, Organizational Effective Performance, Promotional Activities, Marketing.

الملخص:

لقد أدت التقنيات الثورية مثل الذكاء الاصطناعي وتحليلات البيانات الضخمة إلى تغيير طرق عمل المؤسسات. ومن بين هاتين التقنيتين الثوريتين، يعد الذكاء الاصطناعي أحدث الابتكارات التكنولوجية التي تتمتع بإمكانيات هائلة لتحويل مشهد التسويق وتجارة التجزئة. يحاول الممارسون من جميع أنحاء العالم اكتشاف وفهم حلول الذكاء الاصطناعي التي تناسب وظائفهم في مجال التسويق والبيع بالتجزئة. هذه الدراسة تهدف لتحديد الدور التحولي للذكاء الاصطناعي والبيانات الضخمة في سياق شركات الاتصالات السعودية. حيث تم استخدام النظرية القائمة على الموارد لدراسة الطريقة التي يمكن بها للموارد مثل الذكاء الاصطناعي وتحليلات البيانات الضخمة أن تساعد في تحقيق ميزة تنافسية إذا ما تم تخصيصها لاحتياجات تنظيمية معينة. تم استطلاع عينة مكونة من 268 فردًا وتم تحليل البيانات المجمعة باستخدام مقاييس النزعة المركزية واختبار T وارتباط بيرسون. وتوصلت الدراسة إلى وجود علاقة بين الذكاء الاصطناعي وتحليلات البيانات الضخمة وإنشاء خطة تسويقية، والأداء التنظيمي الفعال، وإنشاء المعلومات الترويجية، وتطوير استراتيجيات التسويق، وخلق أسعار تنافسية. كما خلصت إلى أن استخدام الذكاء الاصطناعي والبيانات الضخمة في شركات الاتصالات أدّى إلى تحول في أنشطة البيع بالتجزئة والتسويق. تسلط هذه الدراسة الضوء على الآثار النظرية والعملية لتسخير هذه التقنيات بشكل أكثر فعالية وتحديد مجالات البحث المستقبلية.

الكلمات المفتاحية: الذكاء الاصطناعي، البيانات الضخمة، الأداء التنظيمي الفعال، الأنشطة الترويجية، التسويق.

1 Introduction

Following the unveiling of the Saudi Vision 2030 in 2016, the government of Saudi Arabia has been considering digital transformation as an important enabler of the vision. This has seen the establishment of the Saudi Data and AI Authority in 2019 to help the country become a world leader in creating an AI ecosystem for private and government sector entities.

Through these disruptive technologies, retailers and marketers in the private sector organizations have gotten valuable insights from huge amounts of data. These technologies enable them to make data-driven decisions that optimize retail operations and enhance customer experience. However, despite the great excitement that private sector entities have about artificial intelligence and big data, they have yet to realize their full promise because they have not had empirical studies outlining the roles of AI and big data.

Practitioners from across the world try to figure out and understand the AI solutions that are best fit for their marketing and retail functions. This research proposal brings up a conceptual framework for understanding the transformative role that Artificial intelligence and big data can play in retail and marketing value chains by conducting an empirical study of the private sector entities in Saudi Arabia, the Saudi Telecom Company, Zain KSA, and Mobily. This research paper aims to examine the impact of AI and big data in retailing and marketing by focusing on planning and strategy in marketing, pricing, and promotion activities in marketing and organizational effective performance.

1.1 Research Questions:

The main research questions of this research paper are the following:

- What is the transformative role of AI and big data adoption in business and marketing?
- What is the role of AI and big data adoption in developing effective planning and strategy, in Saudi telecommunication companies?
- What is the role of AI and big data adoption in promotional activities, pricing activities, and organizational effective performance in Saudi telecommunication companies?

1.2 Research Objectives:

The main objective of this research paper is to determine the transformative role of AI and big data adoption in retail and marketing. Specific objectives are the following:

- To determine the role of AI and big data adoption in effective planning, effective strategy, and pricing activities in Saudi telecommunication companies.
- To determine the role of AI and big data adoption in promotional activities and organizational effective performance in Saudi telecommunication companies.

The research offers one key contribution to the existing literature on artificial intelligence and big data and implementation in retailing and marketing. The first contribution is that this paper has shown how AI and big data technologies can be utilized across different activities in the marketing and retail value chain. This is because several authors have discussed the importance of artificial intelligence to business in general. There has been limited critical scrutiny and coverage of the strategic role as well as the implementation of artificial intelligence in telecommunication companies. Despite the recent expert-based studies on AI and marketing outlining the significance of AI in marketing, the basis of these studies has not been a sound quantitative approach.

2 Literature Review

2.1 Artificial Intelligence Adoption

According to the broadest definition, Sheikh et al (2023) claim that AI is equated with algorithms. However, because algorithms are also present in other fields like pocket calculators, a strictest definition has been proposed for AI. The strictest definition describes AI as an imitation that computers make of human intelligence. This definition is however not appropriate because current applications are not true AI because they are still relatively simple. Furthermore, defining AI as a technology enabling machines to imitate or copy different complex skills, still is not enough because it does not clarify exactly what AI is. The definition that is going to be adopted for this report is that which describes AI as systems displaying intelligent behavior like that of humans by not only analyzing their environment but also taking actions

with some level of autonomy to achieve particular goals (Russell & Norvig, 2010; Sheikh et al., 2023; Hildebrand, 2019).

The current marketing landscape is increasingly automated, data-driven, and intelligent. According to Kumar et al. (2019), the greatly focused method of contemporary marketing has had a direct effect on the outcomes of marketing. This observation has been supported by Paschen et al (2019). Wirth (2018) claimed that technological advancements have consistently yielded longitudinal shifts as far as marketing evolution is concerned. This has been supported by Siau (2017) who has justified that the technological advancements have shown that marketing can work seamlessly with artificial intelligence and big data to make a difference. Epstein (2018) showed that innovative and advanced AI-powered solutions related to marketing can rapidly fit and adapt to the changing business needs and develop solution packages and communications that are lucrative and critical to relevant stakeholders. Kumar et al. (2024) found that the subject of marketing that is AI-powered is becoming increasingly relevant, and it is attracting growing attention among researchers across the world. Prior research has independently evaluated the effect of AI on some discrete marketing functions (Hildebrand, 2019; Hadi et al., 2019; Jones, 2018; Jarek & Mazurek, 2019; Stalidis et al., 2015; Siau, 2017; Boyd et al., 2018).

Artificial intelligence can be described as a system of intelligent machines that sees the environment and interprets it to successfully meet its goal. Russeland and Norvig (2016) describe artificial intelligence as computers or machines that simulate the affective and cognitive functions of the human mind. The generation and adoption of artificial intelligence is a phenomenal development, and experts have been working tirelessly to advance and improve artificial intelligence concepts over the past few decades. This tireless work by the experts has resulted in some great innovations like machine learning applications and big data analytics (Thontirawong & Chinchanachokchai, 2021).

Most people generally think that artificial intelligence is about automated robots working for humans because most people have only perceived human-machine interaction in shows or movies through robots. However, artificial intelligence can refer to any kind of machine that is required to think like a human leading to continuous problem-solving and learning (Overgoor et al. 2019). These features are the ones that make AI to be unique. There are times when people find a repetitive task to be dull. This is where machines come in and when machines are used, people can never experience boredom from the same repetitive task or job. A system that is based on artificial intelligence can do repetitive tasks for humans in a continuous manner (Chae & Ko, 2016; Kumar & Gupta, 2016).

It is possible to do repeated work using many technologies. These technologies, however, may not think independently. They have no thinking capacity outside their code. Machine learning is unique from these technologies because it is a subset of artificial intelligence that aims to give machines the ability to learn a job without having a pre-existing code. Machines or computers in this case are fed with some examples and problems regarding the job so that they can not only learn but also adapt their strategy or reasoning to independently carry out the activities (Verma et al., 2021).

A good example of machine learning is an image-recognition machine that is fed with millions of pictures to analyze. Once the machine goes through many endless permutations, the machine can recognize faces, shapes, and patterns. According to this example, the machine is only learning for the particular repeated task. However, experts are also training machines to be able to learn more than just a particular task.

One of the very important features or characteristics of artificial intelligence is data ingestion. Systems that are artificially intelligent work on vast amounts of data. These systems can collect data as per requirement or instruction and analyze the big data. Companies like Amazon and Google handle huge quantities of data. This huge amount of data cannot be analyzed by humans. Humans also cannot be able to store information or data about multiple people from multiple sources. However, the artificially intelligent system can do this storage.

Another important feature of systems that are AI-enabled is that they have been designed or made to not only observe but also react to their environments. These systems can understand the environment and take appropriate actions, keeping in mind the situations might recur (Oosthuizen et al., 2021).

2.2 Big Data Adoption in Business

Big data refers to a term used primarily for denoting vast data sets ranging from terabytes to Exabytes. Big data has gained significance because data is generally complex and unstructured and brings together a wide variety of sources hence requiring sophisticated technologies for capturing, storing, processing, analyzing, and visualizing (Chen et al., 2012). Salehan and Kim (2016) note that today, big data has become a trendy and common technology practice and term that could allow organizations to obtain actionable insights as well as establish a competitive advantage in the rapidly turbulent and dynamic business environment. According to Akter and Wamba (2016), there is a growing stream of studies that focus on the significant effect of big data and the way big data is reshaping the business landscape.

Waller and Fawcett (2013) have also noted that the role that big data has in supporting the process of decision-making and improving the different organizational functions from supply chain to marketing has received increased recognition. According to Tan and Zhan (2017), big data can be harnessed for strengthening communicative practices like the exchange of ideas among supply chain partners, the characterization of competitors and market size, and the investigation of market-based problems. Studies by Demi and Lecocq (2015) show that big data gives many new opportunities for organizations to reach new market segments and develop innovative business models Bharadwaj and Noble (2015). Scholars and data scientists have also recognized the role of big data in facilitating forecasting that is not only better but also more precise. Retailers can, for example, use advanced big data analytical tools for collecting huge data sets related to the sales of the products and simulate or update their demand as well as manufacturing forecasts for the upcoming periods. This eventually improves manufacturing and retail business performance (Shen et al., 2019). Because of this, the predictive capabilities of big data can allow organizations to achieve such things as making well-informed decisions, improving supply chain operations, and strengthening brand attachment.

2.3 AI and Big Data Adoption in Promotional Activities

According to Pedersen et al. (2018), AI can be used to create an attractive website for promotion in simple steps. AI makes significant contributions as far as the designing of websites according to such customer information as phrases, texts, and images that urge or convince them to buy.

Yilun and Michal (2018) found that AI can improve ways of conducting product promotion. This was supported by Davenport et al. (2020) who claimed that AI offers programmed videos and ads that target the consumers as per their personality. Hoffman and Novak (2018) also observed that AI is suitable for conducting customer promotions and improving the promotions in the future as per the achieved results.

Khodabandehlou and Rahman (2017) observed that a company could use AI to give a promotional message as per the characteristics of the customers. These customer characteristics are identified through the collection and analysis of the customer information. Shen (2014), on the other hand, showed that AI could improve promotional messages before sending them again as per the changes that may happen to the customer. Raunaque et al., (2016) noted that by using AI, a company can use e-mail to promote the product based on the identification of the characteristics of the customer who was previously identified and sending an e-mail to each customer as per the desires and characteristics of the good or product presented.

Research shows that marketers utilize AI to increase client demand. AI gives customers a positive user experience via integrated applications that use machine learning. AI can enable marketers to keep track of purchases, for example, when and where the purchases are made. AI also enables marketers to analyze the data and offer marketing messages that are customized to customers. For

example, when a customer visits a nearby retailer, he or she is given messages that contain special offers and suggestions for improving their average order value.

The other advantages of the marketing approach that is AI-based are client micromanagement and decision-making. Data is very important for improving recommendations that machine learning algorithms make to customers (Thontirawong & Chinchanachokchai, 2021). AI also allows programmatic media bidding, which refers to the automated procedure for purchasing and selling advertising ads on the internet. These are computer-based models that use machine learning traits and audience data to present relevant and targeted advertisements to target consumers (Karimova & Goby, 2021). Because machine learning and AI algorithms are utilized to assist marketing models, the risk of human error is lowered, audience data is made to be efficient, and marketers can scale display advertising. People like viewing advertisements that address their concerns or that are relevant to them.

Marketers can use AI and Big Data to create targeted advertisement strategies that suit customers. This enables them to have targeted marketing campaigns involving ad targeting. Marketers can use machine learning to differentiate between actual conversion, buying, and exploratory behavior. Through machine learning, it is possible to retarget prospects that have a greater chance of being converted.

AI applications come with facial recognition features, which aid in tracking in-store visits by customers and linking images to the customers' social media profiles. Pairing these sophisticated technologies with AI-powered smart notifications enables them to send welcoming messages and real-time discount offers to each visitor, leading to a new level of customized user experience (Thontirawong & Chinchanachokchai, 2021).

Promotion management is about search engine optimization, advertising campaign management, media scheduling, and media planning. Promotion strategies are changing from being physical to being phygital. Social media campaigns and digital marketing made an inroad or an entrance because of digital transformation experienced across the globe. In the current dynamic technological world, it is the customer who is deciding the place, content, and timing.

Huang and Rust (2020) claim that AI comes in to offer customization and personalization of messages according to the customer's liking and profile. It is also possible to use content analytics for optimizing value and ensuring that there is message effectiveness. Emotive AI algorithms can be used for tracking customer dislikes and likes in real-time. Verma and Yadav (2020) observed that a concept called netnography on the content on social media can be used to give avenues for marketers to align and direct their marketing tactics according to the customer's liking with the help of Big Data.

2.4 AI and Big Data Adoption in Developing Effective Strategy

Grewal et al. (2020) found that AI can help in the preparation of marketing strategies because it can obtain information needed to understand the market sectors and target markets. According to Rai (2020), AI is used to obtain information on the quantity demanded and market share. Shankar (2018) noted that AI could be used to divide markets into target segments as per their characteristics. AI also makes it possible to identify access to various segments of consumers and then offer appropriate products and consequently prepare appropriate marketing strategies that fit each segment Ozcelik and Varmali (2019). Overgoor et al (2019) obtained that AI makes it possible for the company to come up with different marketing strategies and to choose the market sectors that demand products that the organization offers and consequently target customers in a better way (Demil & Lecocq, 2015; Ajanthan, 2017). From a strategic angle, AI and Big Data are turning out to be increasingly significant in marketing. Organizations like Under Armor, Spotify, Rare Carat, and Google are among the growing list of companies that enhance their performance by AI-based platforms like Google Assistant, Amazon Lex, Microsoft Cognitive Services, or IBM Watson. Using these AI technologies has enabled these organizations to increase and enhance their customer interaction and relations across marketing

channels (Oosthuizen et al., 2021). It has also improved automation and market forecasting. AI has, therefore, been seen as the most influential technology for companies and it is expected to grow from $10.1 billion to $126 billion in 2018 and 2025 respectively (Verma et al., 2021). According to a recent survey by business analysts, a priority area for the use of AI is in marketing and sales. This survey shows that 24 percent of companies in the United States already use AI and 60 percent are expected to use AI in 2022.

According to Gacanin and Wagner (2019), customer experience management that used to be done autonomously had implementation challenges. Their study described the way the intelligence network as well as critical business value drivers were created using machine learning and artificial intelligence. Through the use of an AI-driven chatbot, these researchers found that customer experience was able to improve. Maxwell et al., (2011) also found that machine learning and artificial intelligence allowed for efficient data processing because these technologies allowed for the formulation of the correct decision. Chatterjee et al. (2019) found that artificial intelligence is needed in analyzing customer purchases, habits, dislikes, and likes. An artificial intelligence user interface was found to be beneficial to the functions of customer relationship management (Seranmadevi & Kumar, 2019). In retailing, a study by Sujata et al. (2019) found that artificial intelligence and the Internet of Things were able to convert traditional or conventional retail stores or shops into smart retail shops. Ease of shopping and customer experience were elevated in smart retail stores. The smart retail stores also promoted better supply chains. AI also helps in guiding online businesses Kumar et al. (2024).

2.4.1 AI and Big Data Adoption in Developing Effective Planning

AI is a powerful tool when it is linked with high-quality market research data. A combination of AI and big data can allow companies to accomplish a wide range of activities and tasks. As far as the segmentation of the target market, AI is substantially more efficient and faster than humans. Studies have shown that artificial intelligence has the potential to support marketers in planning marketing activities. Consequently, artificial intelligence helps marketers to segment, target, and position their products or services. Huang and Rust (2017) have also shown that apart from helping to segment, target, and position their products and services, AI along with Big Data can also be used to envision the strategic direction or orientation of a firm. Marketers can narrow down the customers who are being targeted using a combination of machine learning, data optimization methods, and causal forests (Thontirawong & Chinchanachokchai, 2021; Dekimpe, 2020).

2.4.2 AI and Big Data Adoption in Pricing Activities

According to Singh et al. (2019), AI has the ability to define pricing strategies that a company should use to increase its sales. Shankar (2018) shows that AI helps the company reach or attain the right price for the products through the use of a flexible pricing strategy. According to Hoffman and Novak (2018), AI can help in detecting pricing errors. Furthermore, Liu (2020) concluded that AI can adjust price quotations as per the desires of the customers. AI can also compare the prices of the competitors with those of the organization. In pricing, several aspects are factored in before finalizing the price. Pricing is a job that is calculation intensive. Furthermore, Big Data would contribute significantly to comparison with rivals.

2.5 AI and Big Data Adoption in Organizational Effective Performance

Scholars in the field of organizational performance management have focused on performance specifically as financial and operational perspectives that have a direct impact on organizational strategies and competitiveness. The focus of the operational perspective is on such organizational success factors as processes management, cost management as well as overall quality control that result in long-term competitive advantage (Priem, 1994). On the other hand, the focus of the financial perspective is on the assessment of the company's assets and liabilities. Technology plays an important role in improving organizational performance to achieve such organizational goals as customer satisfaction,

financial targets, and operational excellence. Alessandri and Khan (2006) show that a company's investment in artificial intelligence as well as other information technology as Big Data makes a big contribution to the improvement of its processes, equipping workers with continuous training and know-how.

2.6 Theoretical Framework

Several studies have examined the impact of artificial intelligence and big data analytics on the overall performance of an organization. The findings of most of these studies show that companies that use artificial intelligence and big data analytics in making complex decisions have a competitive edge in the marketplace. However, according to Aydiner et al. (2019), it is not possible to achieve the desired level of performance if companies fail to make effective responses to relevant environmental demands and external pressures. This paper, therefore, uses the resource-based view theory to explain the adoption of artificial intelligence and big data analytics as resources that telecommunication companies in Saudi Arabia can use to increase their performance and attain a sustainable competitive advantage (Almarri & Gardiner, 2014). The resource-based theory of a company serves as a strategic management theory that managers can use when they are managing a project. The theory is described as a promising theory because it examines the way resources like AI and Big data analytics can help drive a competitive advantage if they are customized to a particular organizational need (Almarri & Gardiner, 2014).

2.7 Research Model and Hypothesis

The conceptual framework shows the relationship between the study's independent and dependent variables. It shows the influence that the independent variables have on the dependent variable. Among the independent variables in this study are Artificial Intelligence and big data. The dependent variables on the other hand are the planning and strategy activities, pricing and promotion activities, and operational efficiency.

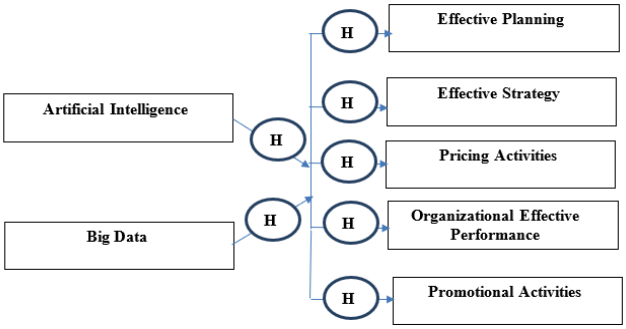

Figure 1 Research Model and Hypothesis

2.7.1 Hypothesis development

Hypothesis 1

There is a significant correlation between using AI and effective planning.

Hypothesis 2

There is a significant correlation between using AI and effective strategy.

Hypothesis 3

There is a significant correlation between using AI and pricing activities.

Hypothesis 4

There is a significant correlation between using AI and organizational effective performance.

Hypothesis 5

There is a significant correlation between using AI and promotional activities

Hypothesis 6

There is a significant correlation between using Big Data and effective planning.

Hypothesis 7

There is a significant correlation between using Big Data and effective strategy.

Hypothesis 8

There is a significant correlation between using Big Data and pricing activities.

Hypothesis 9

There is a significant correlation between using Big Data and organizational effective performance.

Hypothesis 10

There is a significant correlation between using Big Data and promotional activities

4 Methodology

4.1 Research Design

According to Creswall (2021), research approaches refer to procedures and plans ranging from steps to detailed techniques of collecting data, analyzing

data, and interpreting the data. Creswall (2021) further notes that the several decisions used in the process help in deciding the kind of approach that should be applied in a particular study as informed by the philosophical assumptions used in the study. Included in the research approaches are research designs or procedures of inquiry and particular research methods applied for collecting, analyzing, and interpreting data. However, Lewis (2015) claims that the selection of the research approach is determined by the kind of research problem or the issue that the study is seeking to address. Research approaches can be customized in many ways in order to come up with a research approach that is most suitable for a specific study. Consequently, the three main categories of research approaches are quantitative, qualitative, and mixed research methods. According to Creswall (2021), all three research approaches are not seen to be so distinct or discrete from one another.

4.2 Research Method

According to Saunders et al (2015), almost all research requires some numerical data. This means that data needs to be quantified so that a researcher can be able to answer research questions and meet the objectives of the study. Based on the interpretive research approach and the philosophical assumption, the current study adopted a quantitative research method. Haq (2014) notes that the quantitative research method involves a collection of numerical data and then using statistical methods to analyze the data and explain a particular phenomenon. Mujis and Dunne (2010) support the use of quantitative research by claiming that this method assumes that only a single reality exists regarding the conditions that researchers cannot influence in any way. Quantitative research can also be used to find the cause-and-effect relationship between variables, hence verifying or nullifying some hypothesis or theory (Newman & Benz, 1998; Pinsonneault & Kraemer, 1993).

4.3 Target Population

Population in sampling can be defined as the whole group of items of interest a researcher wants to study. Target population refers to the total number of items the scientist wants to utilize in making analyses and inferences. This study sampled employees of Saudi telecommunication companies. The choice of this targeted population was based on the convenience and ease of access.

4.3.1 Sampling Technique

The sample size for this study was obtained using a random sampling method. Random sampling significantly reduces selection bias by ensuring that every individual in the population has an equal chance of being selected. This fosters a sample that is representative of the entire population, thereby enhancing the validity of the research findings. The randomness of the sample helps simplify the analysis process and findings derived from a randomly selected sample can be generalized to the broader population (Creswall, 2021). This is crucial for research aiming to make inferences or predictions, as it allows researchers to extend their conclusions beyond the sample itself. Thus, it is a foundational method in research that enhances the quality and reliability of data.

4.3.2 Sampling Size

A sample size can be defined as a population subset that is taken to represent the whole targeted population. This research used a sample size of 268 employees of Saudi telecommunication companies. This sample represented the whole population of Saudi Telecommunication companies.

4.4 Questionnaire Development

The questionnaire was developed by adopting previous studies which have researched the different variables identified in the current study, see appendix. The table below shows the different previous studies that covered the variables in the current study, as in Table 1.

Table 1 Cronbach's alpha of Scales adopted

Variable	Items	Cronbach's Alpha	Sources
Artificial Intelligence	6	0.867	Abrokwah-Larbi et al. (2023)
Big Data	3	0.79	Mikalef et al. (2019)
Strategy	5	0.688	Shahare (2022)
Planning	5	0.88	Mikalef et al. (2023)
Pricing	4	0.824	Andreti et al. (2013)
Promotion	6	0.819	Andreti et al. (2013)
Organizational effective performance	14	0.83	Gold et al. (2001)

4.5 Data Collection

The data was collected through the administration of an online survey questionnaire. All variables as well as respective items were measured on a 5-point Likert scale. Before launching the survey questionnaire, it was deployed to a group of researchers who have significant experience. These experienced researchers verified that the content was understood and clear. The link was circulated internally via email by telecommunication companies' contact departments and lasted two weeks.

4.6 Validity and Reliability

Cronbach's alpha coefficient was used to measure the reliability of the study in Table 2:

Table 2: Alpha Cronbach's Reliability Test

Variable	Items	Reliability
Artificial Intelligence	6	0.85
Big Data	3	0.71
Strategy	5	0.88
Planning	5	0.87
Pricing	4	0.84
Promotion	6	0.78
Organizational effective performance	14	0.80

It is clear from Table 2 that Cronbach's alpha coefficient for scales adopted was not less than 0.7, which is an acceptable level (Peterson, 1994).

4.7 Ethical Considerations

The study was guided by ethical considerations that ensure that the scientific investigations are done responsibly and ethically to safeguard the well-being and rights of participants. One of the ethical considerations was voluntary participation. Participants were to choose willingly to participate without pressure or coercion. Another ethical consideration was informed consent. Information consent was obtained from participants before data collection. As far as informed consent is concerned, the study's procedures, purpose, benefits, and risks were explained to participants before being asked to make an informed decision. Anonymity was also maintained to protect the privacy of the participants and keep their identities confidential. Ethical approval was sought from the institutional review board before commencing the study.

5 Results and Discussion

5.1 Demographic Data

Table 3 shows that the percentage of individuals who are Below 25 years was 6.3%, 38.4% for those who are from 25- 34 years, 27.2% for those who are from 35 - 44 years, 12.7% for those from 45 -54 years, and 15.3% for those from 55 years and above.

Table 3: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 25 years	17	6.3	6.3	6.3
	25- 34 years	103	38.4	38.4	44.8
	35 - 44 years	73	27.2	27.2	72.0
	45 -54 years	34	12.7	12.7	84.7
	55 years and above	41	15.3	15.3	100.0
	Total	268	100.0	100.0	

Table 4, shows 52.2% were females and 47.8% were males in the sample size.

Table 4: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	128	47.8	47.8	47.8
	Female	140	52.2	52.2	100.0
	Total	268	100.0	100.0	

Table 5 shows that the percentage of education in the sample who are primary level was 7.8%, 8.6% for those who are secondary level, and 59.7% for those who have diploma level, they accounted for 21.3% of the sample size who have post-graduate degree, and 2.6% who have master's degree.

Table 5: Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary Level	21	7.8	7.8	7.8
	Secondary Level	23	8.6	8.6	16.4
	Diploma Level	160	59.7	59.7	76.1
	Post graduate Degree	57	21.3	21.3	97.4
	Master's Degree	7	2.6	2.6	100.0
	Total	268	100.0	100.0	

According to the data in the table, the top-level management was 36.6%, while middle-level management was 16%, and non-management was 47.4%, as in Table 6.

Table 6: Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Top-level Management	98	36.6	36.6	36.6
	Middle-level management	43	16.0	16.0	52.6
	non-management	127	47.4	47.4	100.0
	Total	268	100.0	100.0	

Table 7 shows that 33.6% of the sample were Human Resources, 29.9% ICT, and 36.6% Marketing.

Table 7: Department

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Human Resources	90	33.6	33.6	33.6
	ICT	80	29.9	29.9	63.4
	Marketing	98	36.6	36.6	100.0
	Total	268	100.0	100.0	

According to Table 8, 18.7% of individuals choose not at all, 19% choose rarely, and 7.8% choose Once in a while, 26.1% choose often, 28.4% choose quite often.

Table 8: Usage of AI and Big Data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	50	18.7	18.7	18.7
	Rarely	51	19.0	19.0	37.7
	Once in a while	21	7.8	7.8	45.5
	Often	70	26.1	26.1	71.6
	Quite often	76	28.4	28.4	100.0
	Total	268	100.0	100.0	

5.2 Hypothesis Testing and Discussion

The current study's main aim was to determine the transformative role that AI and big data technologies have in telecommunication companies in Saudi Arabia.

The t-test was used to determine the existence of statistically significant differences between the averages of the sample obtained. It requires that the calculated t-value needs to be higher than the tabulated t-value and the significance level needs to be either less than or equal to 0.05. This way means there is a relationship between the dependent variable and independent variable in the study. In case the calculated t-value is less than the tabulated t-value and the obtained significance level is higher than 0.05, there is no relationship between the dependent and independent variables in the study (Kozak & Piepho, 2018).

Regarding the t-value for the sections and axes of the questionnaire, it is evident that the calculated t-value is higher than the tabulated t-value and also the significance level for all statements was 0.00, which is less than 0.05 and this means that there is a strong relationship between the independent variables namely the artificial intelligence and big data and the dependent variables namely strategy, planning, pricing, promotion, and organizational effective performance. Both independent variables increased the effectiveness of strategy, planning, pricing, promotion, and organizational effective performance.

Regarding the Pearson coefficient, the correlation results can be interpreted by looking at the p-value obtained alongside the Pearson coefficient. A p-

value that is less than 0.05 means that the correlation is statistically significant. Here, the calculated Pearson coefficient can be used. A p-value that is higher than 0.05 means that the correlation is not statistically significant, and the Pearson coefficient is not reliable.

As far as the results of the current study are concerned, the p-value is less than 0.00, which is 0.05 and this means that the correlation is statistically significant and can be used. As far as the Pearson coefficient is concerned, a value nearing 1 shows a perfect correlation. If the Pearson coefficient value is between 0.5 and 1, then there is a strong correlation. A medium correlation is revealed by a value between 0.3 and 0.49 while a small correlation exists when the value is below 0.29. The findings of the current study show that the correlation coefficient for all the variables is between 0.5 and 1. This means that there is a strong correlation, and all hypotheses are accepted. The finding agreed with the study by Ferrell and Ferrell (2020) who observed that AI could help in doing market research that enabled the company planners to learn about consumer satisfaction and characteristics, market share, and customer data sales.

Table 9: Hypothesis Test

H	Path	P. Value	Decision
1	AI → Planning	.000	Accepted
2	AI → Strategy	000	Accepted
3	AI → Pricing activities	000	Accepted
4	AI → Organizational Effective Perf.	000	Accepted
5	AI → Promotion activities	000	Accepted
6	B. Data → Planning	000	Accepted
7	B. Data → Strategy	000	Accepted
8	B. Data → Pricing activities	000	Accepted
9	B. Data → Organizational Effective Perf.	000	Accepted
10	B. Data → Promotion activities	000	Accepted

In the light of the hypothesis tested, several important findings were obtained. There is a significant correlation between AI and big data analytics and organizational effective performance in Saudi Telecommunication companies, it was found that there is a clear effect of AI and big data on improving organizational effective performance. This is in line with Alessandri and Khan (2006) who showed that a company's investment in artificial intelligence as well as other information technology makes a big contribution to the improvement of its processes, equipping workers with continuous training and know-how.

Furthermore, there is a significant correlation between AI and big data analytics and the creation of promotion information in Saudi Telecom companies, the results revealed that there is a clear impact of AI and big data on improving the generation of promotional messages in Saudi telecommunication companies. The findings of this hypothesis supported those obtained by Khodabandehlou and Rahman (2017) who observed that a company could use AI to give the promotional message as per the characteristics of the customers. Also, there is a significant correlation between using AI techniques and setting marketing strategies in Saudi Telecom Companies, the findings showed that there is a significant impact of AI and big data on marketing strategy formulation in Saudi Telecom companies. This agreed with the study by Grewal et al. (2020) who found that AI can help in the preparation of marketing strategies because it can obtain information needed to understand the market sectors and target markets.

Moreover, there is a significant correlation between AI and big data analytics and the creation of competitive pricing in Saudi Telecom companies, the findings showed that there is a significant impact of AI and big data on pricing strategies in Saudi Telecommunication companies. This agrees with Shankar (2018) finding that AI helps the company reach or attain the right price for the products through the use of a flexible pricing strategy and with Sujata et al. (2019) who found that artificial intelligence and the Internet of Things were able to convert traditional or conventional retail stores or shops to smart retail shops. Lastly, the results agree with studies by Demi and Lecocq (2015) that showed big data gives many new opportunities for organizations to reach new market segments and develop innovative business models Bharadwaj and Noble (2015).

6 Conclusion

The study concluded that there is a statistically significant correlation between artificial intelligence, big data analytics, and the creation of marketing plans in Saudi telecom companies. There is also a statistically significant relationship between artificial intelligence, big data analytics, and effective organizational performance in Saudi telecom companies. The study also concluded that there is a statistically significant relationship between artificial intelligence and big data analytics and the creation of promotional information in Saudi telecom companies. There is a statistically significant relationship between the use of artificial intelligence techniques and the development of strategies in Saudi telecom companies. Furthermore, there is a statistically significant relationship between intelligence Artificial intelligence, big data analytics, and creating competitive prices in Saudi telecom companies.

6.1 Theoretical Implications

This study could contribute to the ongoing debate on the extent to which technology, specifically AI and big data, drives societal change. It examines the transformative role of these technologies in Saudi telecom companies, the research can shed light on their potential to reshape industry practices and consumer experiences.

Besides being used for improving operations, AI and big data applications can significantly affect the administrative uses for the organization and the employees. Managers play an important role since they can create an organizational culture that embraces the use of AI and big data. Their support is crucial in ensuring that AI and big data applications are harnessed. These new technologies can be used to increase the levels of customer satisfaction.

The research can contribute to the understanding of digital transformation in the telecommunications industry, highlighting the role of AI and big data in driving innovation and improving operational efficiency. Furthermore, it can contribute to the theoretical understanding of data-driven decision-making, exploring how AI and big data can enhance the quality and speed of decision-making processes. Thus, by addressing these theoretical implications, the research can provide valuable insights into the future of the telecommunications industry and the broader impact of AI and big data on society.

6.2 Practical Implications

The integration of AI and big data technologies into marketing and retail operations can yield substantial benefits. AI algorithms can analyze vast amounts of data to identify patterns and trends that humans might miss, enabling more informed decision-making. Furthermore, future trends can be forecasted, and businesses can proactively adapt to market changes and consumer preferences. AI-powered tools coupled with big data can segment customers based on their behaviors and preferences, allowing for highly targeted marketing campaigns for tailored marketing effectiveness.

Additionally, applying AI and Big Data to telecommunication companies in Saudi Arabia, the following recommendations might be made from the research results to improve strategy, planning, pricing, promotion, and organizational effective performance:

- AI and Big Data help marketers to make accurate predictions of customer needs.
- AI and Big Data support marketing promotion through human error elimination.
- AI and Big Data can be used to facilitate interaction with users by analyzing data.
- AI and Big Data can be used to facilitate the process of collaborative decision-making.
- AI and big data can help increase the business's brand awareness in real-time.
- Recognizing and addressing the customer’s changing behavior using AI and Big Data.
- AI and Big Data can be used to enable predictive analytics that help in identifying the most effective content for campaigns, channels, and timing hence minimizing effort and maximizing impact.

Hence, with the power of AI and big data harnessing, businesses can gain a competitive edge, drive innovation, and achieve sustainable growth in a dynamic market.

6.4 Limitations and Future Research

The study was confined to Saudi telecom companies, limiting its generalizability to other sectors or regions. While the study utilized a significant amount of data, data accessibility, and quality might have constrained the depth of analysis in certain areas. The intricate nature of AI and big data technologies and their rapid evolution pose challenges in fully capturing their transformative impact within a specific timeframe. Furthermore, the rapidly evolving technological landscape, particularly in AI and big data, may render certain findings obsolete relatively quickly.

A comparative analysis of AI and big data adoption across different sectors in Saudi Arabia can provide broader insights into their transformative potential. Also, longitudinal studies can assess the long-term impact of AI and big data on various organizational and societal outcomes. Therefore, further research is needed to explore the ethical implications of AI and big data usage in the telecom industry, including issues like data privacy, algorithmic bias, and job displacement. Moreover, examining how AI and big data can contribute to sustainable practices in the telecom sector, such as energy efficiency and resource optimization, is a promising avenue for future research. Additionally, exploring the dynamics of human-AI collaboration in the telecom industry, including the development of skills and competencies to effectively work with AI systems, is crucial. Lastly, in-depth case studies of successful AI and big data implementations in Saudi telecom companies can provide valuable lessons and best practices.

To conclude by addressing these limitations and exploring the suggested future research directions, researchers can further deepen our understanding of the transformative role of AI and big data in the Saudi telecom industry and beyond.

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Appendix

Variable	Items	Symbol
AI USAGE	Artificial Intelligence marketing helps my business in accurate prediction of customer needs	**AI1**
	Artificial Intelligence marketing supports my business in marketing promotion through human errors elimination	**AI2**
	Artificial intelligence marketing makes it possible for my business to interact with users through the use of analyzed data	**AI3**
	Artificial intelligence marketing helps in the process of collaborative decision-making in my business	**AI4**
	Artificial intelligence marketing has increased the brand awareness of my business in real-time	**AI5**
	Artificial intelligence marketing has enabled my business to personalize its marketing activities to specific customers	**AI6**
Source	Abrokwah-Larbi, K., & Awuku-Larbi, Y. (2023). The impact of artificial intelligence in marketing on the performance of business organizations: evidence from SMEs in an emerging economy. *Journal of Entrepreneurship in Emerging Economies*.	
BIG DATA USAGE	We have access to very large, unstructured, or fast-moving data for analysis	**BD1**
	We integrate data from multiple sources into a data warehouse for easy access	**BD2**
	We integrate external data with internal to facilitate analysis of business environment	**BD3**
Source	Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J. (2019). Big data analytics and firm performance: Findings from a mixed-method approach. *Journal of Business Research*, *98*, 261-276.	
STRATEGY	Artificial Intelligence is supporting marketers to focus on ideas that are more innovative to fulfill the needs of customers	**S1**
	Artificial Intelligence helps in understanding purchase habits of the customers	**S2**
	Artificial intelligence helps in recognizing and addressing the customer's changing behavior	**S3**
	AI support marketers when they want to predict their customer's needs to align services and products	**S4**
	AI results in problem-solving and reasoning in a more directed manner	**S5**
Source	Shahare, P. (2022). Role of Artificial Intelligence in Marketing and Customer Relationship Management: A Quantitative Investigation of Recent Practices, 11(1), 912-924.	
PLANNING	AI and big data adoption improve marketing planning skills	**PL1**
	AI and big data adoption improve the ability to effectively segment and target market	**PL2**
	AI and big data adoption improve marketing management skills and processes	**PL3**
	AI and big data adoption help in developing creative marketing strategies	**PL4**
	AI and big data adoption improve the thoroughness of marketing planning processes	**PL5**
Source	Mikalef, P., Islam, N., Parida, V., Singh, H., & Altwaijry, N. (2023). Artificial intelligence (AI) competencies for organizational performance: A B2B marketing capabilities perspective. *Journal of Business Research*, *164*, 113998.	
PROMOTION	AI and big data help to create coupons to be changed with merchandise	**PR1**
	AI and big data help in seasonal promotions	**PR2**
	Customer preference is enhanced by adopting AI and big data in a privileged card	**PR3**
	Customer preference is enhanced by adopting AI and big data in promotions	**PR4**

	AI and big data adopted in the company give information when it has promotions	**PR5**
	AI and big data adopted in the company have attractive promotions	**PR6**
Source	Andreti, J., Zhafira, N. H., Akmal, S. S., & Kumar, S. (2013). The analysis of product, price, place, promotion and service quality on customers' buying decision of convenience store: A survey of young adult in Bekasi, West Java, Indonesia. International Journal of Advances in Management and Economics, 2(6), 72-78.	
PRICING	AI and big data adopted in pricing are cheaper	**PI**
	AI and big data adopted in pricing have the lowest price	**P2**
	AI and big data adopted in pricing offer best price every day	**P3**
	Customers prefer to shop in the company store because the price offered	**P4**
Source	Andreti, J., Zhafira, N. H., Akmal, S. S., & Kumar, S. (2013). The analysis of product, price, place, promotion and service quality on customers' buying decision of convenience store: A survey of young adult in Bekasi, West Java, Indonesia. International Journal of Advances in Management and Economics, 2(6), 72-78.	
OPERATIONAL EFFICIENCY	Over the past two years, my organization has improved its ability to innovate new services/products	**E1**
	Over the past two years, my organization has improved its ability to identify new business opportunities	**E2**
	Over the past two years, my organization has improved its ability to coordinate the different units' development efforts	**E3**
	Over the past two years, my organization has improved its ability to anticipate potential market opportunities for new services/products	**E4**
	Over the past two years, my organization has improved its ability to do rapid commercialization of new innovations	**E5**
	Over the past two years, my organization has improved its ability to adapt quickly to changes that are unanticipated	**E6**
	Over the past two years, my organization has improved its ability to anticipate crises and surprises	**E7**
	Over the past two years, my organization has improved its ability to quickly adapt its objectives and goals to market/industry changes	**E8**
	Over the past two years, my organization has improved its ability to decrease response times in the market	**E9**
	Over the past two years, my organization has improved its ability to react to new information about the market or industry	**E10**
	Over the past two years, my organization has improved its ability to be responsive to new demands in the market	**E11**
	Over the past two years, my organization has improved its ability to avoid overlapping development of corporate initiatives	**E12**
	Over the past two years, my organization has improved its ability to streamline internal processes	**E13**
	Over the past two years, my organization has improved its ability to reduce redundancy of knowledge and information	**E14**
Source	Gold, A.H., Malhotra, A. and Segars, A.H. (2001), "Knowledge management: An organizational capabilities perspective", Journal of Management Information Systems, Vol. 18 No. 1, pp.185-214.	