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The Role of Data Analytics in Enhancing Customer Service Delivery

Research Methodology Paper

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1. Introduction

Elkmash, Abdel-Kader, & El Din (2022: 38) stated that the term "big data analytics" (BDA) refers to the application of analytics techniques that comprise very huge data sets that could be structured, semi-structured, and unstructured information from many sources and range in size from terabytes to zettabytes. These days, using standard data processing methods makes it difficult for measuring systems in firms to perform efficiently due to the ongoing growth of data produced by smart devices, sensors, radio-frequency identification technology, social media, available video surveillance, and more. To solve this problem there is a need to use innovative methods such as BDA while storing, processing, and analyzing the data to construct useful information and analyze a sizable amount of structured and unstructured data that will assist in the decision-making process.

The main focus of the paper is “The role of data analytics in enhancing customer service delivery”. The reasoning behind the paper and the discussed ideas is to address how it is vital to use big data analytics to provide a competitive advantage for companies as it provides answers to questions that firms had not even thought to ask (Grover, et al., 2018:390). Also, it discusses the importance of big data in developing the decision-making process in organizations to support customers and business partners, to achieve a competitive advantage (Wright, Robin, Stone, & Aravopoulou, 2019: 282).

The paper is organized as follows: “Big data Analytics Overview” section which illustrates the definition of big data, the definition of big data analytics, the techniques used in big data analytics which are machine learning, sentiment analysis, and social network analysis, and the applications used in it. The “Customer Service Delivery Overview” section tackles the definition of customer service, its importance, and lastly its challenges.

The last section “Strengthening customer service delivery through big data analytics” discusses the applications of big data

analytics in customer service delivery, upgrading the CRM by using machine learning, and the impact of social network analysis on customer service.

2. Literature Review

This paper discusses the effect of data analytics in improving customer services by classifying the paper into three chapters: Big data Analytics Overview, Customer Service Delivery Overview, and Strengthening customer service delivery through big data analytics. The first chapter is going to discuss Big Data Definition, Big Data Analytics Definition, Big Data Analytics Techniques, and Big Data Analytics Applications. The second chapter illustrates the Customer Service Definition, Customer service delivery types, Customer Service Importance, and Customer Service Challenges. The last chapter tackles Big Data Analytics Applications in Customer Service delivery, The Use of Machine Learning in Enhancing CRM, and The Effect of Social Network Analysis on Customer Service.

2.1 Big data Analytics Overview

In this section, an overview of big data analytics will be presented as follows: firstly, defining big data and big data analytics; secondly, illustrating the big data analytics techniques. Lastly, presenting the big data analytics applications.

2.1.1 Big Data Definition

Big data has been defined by many researchers differently; yet, they share the same concept. Extremely massive data sets that can be computationally examined to show

patterns, trends, and correlations, especially relating to human behavior and interactions are known as big data (Soubra, 2021: 3). However, Big data is identified as enormous amounts of both structured and unstructured data whose analysis would take a long time using conventional techniques (Del Vecchio, Mele, Passiante, Vrontis, & Fanuli, 2020: 802). Additionally, it is the term used to describe an increase in data volume that is

greater than what can be stored, processed, and analyzed by traditional data technologies. (Wright et al.,2019: 281). Also, the "big data"' term is ill-defined if the volume is the only indicator. (Zhou, Qiao, Du, Wang, Fan, & Yan, 2018: 514).

2.1.2 Big Data Analytics Definition

Same as big data, Big Data Analytics (BDA) has been arguably defined by different researchers. BDA has been defined by Elkmash, Abdel-Kader, and El Din (2022: 38) as it is the adaptation of advanced analytic techniques to extensive and varied data sets that include unstructured, semi-structured, and structured data from various sources and sizes ranging from terabytes to zettabytes. Moreover, BDA was pointed out as the method of converting big data into useful information to enhance organizational performance (Wright et al.,2019: 283). Furthermore, Big Data Analytics examines and obtains intelligence from big data by using certain techniques (Lee, Kwon, & Back, 2021: 2121). Therefore, Big Data Analytics is defined as an important tool for organizations to implement as it enables the aggregation of large data sets, thus increasing the ability to enhance customer demand prediction (Capurro, Fiorentino, Garzella, & Giudici, 2021: 274).

2.1.3 Big Data Analytics Techniques

Big data analytics has many techniques, but the most common and effective techniques are Machine Learning, Sentiment Analysis, and Social Network Analysis which will be talked about in this section.

2.1.3.1 Machine learning

With the emergence of big data, and machine learning, the intelligence displayed by computers or computer systems, commonly referred to as artificial intelligence, has evolved quickly by providing ways to draw insights, predictions, and decisions from

enormous amounts of data. Moreover, Machine learning enables the analysis of structured and unstructured data as well as the improvement of big data predictions (i.e., online reviews). Thus, it enables computers to recognize significant patterns and improves prediction accuracy, without the involvement of experts in each process. (Lee et al., 2021: 2118)

Examples of machine learning include Supervised Machine Learning which is used when data has a certain pattern in the form of x and y, and its purpose is to predict y given by x; while unsupervised Machine Learning is used when data does not have a pattern, so its goal is to detect patterns in data. In particular, Unsupervised ML involves clustering, dimension reduction, and classification, whereas supervised ML includes prediction and classification (Lee et al., 2021: 2121-2122).

Additionally, the researchers viewed deep learning as the technological development of machine learning that can learn from data and mistakes without human intervention. They viewed machine learning as a branch of AI that can learn from data, detect patterns, and make decisions without human engagement. In other words, Big Data is frequently associated with AI because it is thought to be the raw material for AI and has a significant impact on its capabilities and value creation. (Ledro, Nosella, & Vinelli, 2022: 49).

2.1.3.2 Sentiment analysis

The automatic extraction of positive or negative opinions from text is the focus of sentiment analysis. It is typically useful to identify the polarity of sentiment in a text (positive, negative, or neutral), as well as the strength of sentiment expressed, as texts regularly contain a mix of positive and negative sentiment (He et al., 2018: 155). Sentiment analysis can enhance consumers' perspectives not just outside of the firm, but also within it, by utilizing CRM capabilities for data collection and analysis. Organizations may use sentiment analysis to analyze verbal and textual interactions with consumers throughout

the customer experience, from negotiation to post-purchase, request, or after-sales assistance (Ledro et al., 2022: 56).

Machine learning techniques are mostly used in sentiment analysis to categorize texts into positive or negative categories. Consequently, Governments and organizations can scan and monitor online information to detect critical conditions, important issues, and emerging events by using sentiment analysis. Also, mining customer sentiments on products or businesses through their evaluations or online posts (He et al., 2018: 155-156).

2.1.3.3 Social network analysis

Business social media analytics is an emerging area of research and is based on the development of informatics tools and frameworks for gathering, monitoring, summarizing, and visualizing social media data to produce knowledge that is beneficial to a company's competitiveness. The value of business social media analytics comes from the support it can provide in utilizing the knowledge assets generated on social media by users for a variety of purposes, including forecasting market and consumer trends, enhancing performance, personalizing and customizing offerings, and developing new goods and services. This benefit can be obtained through business social media analytics, a method that can gather and extract data from various social media platforms to produce insights beneficial to businesses' competitiveness. (Del Vecchio et al.,2020: 802).

Since social media can capture a consumer's attention and motivate them to act, businesses use it extensively nowadays. Social media users' evaluations are used by millions of customers to examine goods and services before making a purchase. Social media platforms are widely used, which has resulted in a huge amount of user-generated content (UGCs). To make the most use of UGCs, organizations must have the capacity to gather, store, and analyze social media data to get information and useful knowledge for forecasting and decision-making. (He et al., 2018: 154).

2.1.4 Big Data Analytics Applications

Businesses can process data and get access to the opinions of many customers using big data analytics. This is an innovative shift because a large number of customer

data may result in a comprehensive understanding of the market and more creative ideas as a result (Zhou et al., 2018: 533). Big data analytics have various uses that provide many benefits to different industries and increase their business value. Firstly, Big data analytics has enabled banks to store data, analyze massive amounts of information rapidly, gain business insights, and potentially launch new, major services (Soubra, 2021: 4). Secondly, Big data analytics implementation can boost marketing ROI by 15-20%. Next, by enhancing decision-making processes, big data analytics enables organizations to derive value from large volumes of heterogeneous data (Wright et al., 2019: 283,287).

Moreover, through analytics tools that can process, capture, and share a vast amount of structured and unstructured data, big data analytics can assist organizations in the discovery of hidden knowledge and the generation of new knowledge. Finally, Big data analytics helps businesses with their marketing strategy by enabling them to acquire and manage three different types of customer knowledge assets, such as knowledge from, for, and about customers (Del Vecchio et al., 2020: 803).

2.2 Customer Service Delivery Overview

In this section, an overview of customer service delivery will be presented as follows: firstly, defining customer service; secondly, explaining the importance of customer service. Lastly, introducing customer service challenges.

2.2.1 Customer Service Definition

Chen, et al. (2021:720-723) defined customer service as a group of interactions between the consumer of the service or the product that the company provides in the market and the employee that handles the frontline customer service which carries the responsibility to serve the customer, handle their requests, solve their problems, and maintain the customers' satisfaction about this service. While Customer service is a function

of service firms to customize and enhance the customers' experience based on their preferences and likes which will result in improving customer satisfaction was how (Yerpude, 2020: 111) stated its meaning.

Janahi & Al Mubarak (2017, 596) claim that customer service is a strategy used by businesses to adapt to increasing competition, grab opportunities and chances for the organization, boost profitability, and boost customer satisfaction which will provide greater market access to the company.

2.2.2 Benefits of Customer Service

Adam, et al., (2021:428-429) illustrated the customer service around-the-clock service that improves the quality of the services that the firm provides to its customers. Also, customer service is vital as it provides rapid answers to all the customer's queries, and delivers cost-effective solutions. Customer service technologies substitute the service employees which reduces costs for the company, increases time efficiency, and adds up to the experience of the customer.

Yerpude, (2020:104-111) clarified that customer service is crucial in organizations as it assists in building trust between the customer and the brand, and enhances the connection and relation with the customer. Moreover, customer service makes customization and personalization simpler as it tackles the customers' problems and needs separately which increases their satisfaction with the service. As a result of customer satisfaction, they start attracting more new customers, generating higher profit for the organization.

Furthermore, Customer service helps organizations to compete in the market, seize opportunities and possibilities for the organization, increase profitability, and increase customer happiness, which will provide the firm with broader market access. (Janahi & Al Mubarak, 2017, 596)

2.2.3 Challenges Faced While Delivering Customer Service

Customer service delivery faces many challenges regarding the achievement of customer satisfaction or loyalty which affects organizational performance.

For instance, interactions with systems like chatbots might promote undesirable client behaviors like disloyalty, which could be harmful to both service providers and users. Additionally, it could respond to user requests inappropriately, leaving a gap between what the user expects and how well the system performs. (Adam, Wessel, & Benlian, 2021: 427-428).

Moreover, Delays in replying can cause a negative reputation for the company and can increase customer dissatisfaction since complaints from customers may be the consequence of failings in the company (Gunarathne, Rui, & Seidmann, 2018: 497). Also, Poor customer service performance is frequently caused by ineffective procedures and a lack of simplified information. (Miraldo et al., 2019:363).

Furthermore, Customers seem to be less forgiving of errors made in the course of a customer service relationship, especially if they have previously encountered a similar incident. Customers are less understanding if these mistakes negatively affect their personal experience. Thus, in situations of service failure, their utilitarian perspective (which claims that all occurrences should be avoided) appears to emerge over their sense of solidarity (which acknowledges human fallibility) (Cusin& Flacandji, 2022: 102).

2.3 Strengthening customer service delivery through big data analytics

In this section, we are going to discuss the impact of using big data analytics in customer service delivery. This section is classified into big data analytics applications in customer service delivery, the use of machine learning in enhancing CRM, and the effect of social network analysis on customer service.

2.3.1 Big Data Analytics Applications in Customer Service delivery

Elkmash, Abdel-Kader, & El Din, (2022: 51) described the employment of big data analytics to be an improved way for the company uses to examine unstructured data from its clients as it reduces the expenses required by the company to analyze and evaluate the

data of the clients, and assist in solving the client's issues quickly. Moreover, big data analytics decreases the time that was used to extract the performance reports of the clients of the company and conceals the vital information related to the clients.

To get insight into customer behavior, decision-making, satisfaction, and other challenges, big data analytics assist researchers and practitioners in overcoming sampling bias and sample size issues. (Lee et al., 2021: 2118). By enabling clients to access and buy a wide variety of travel packages online in a user-friendly, affordable, and customized way, OTAs are consistently improving the perceived values of products and changing the way that travel agencies do their conventional business. This is accomplished by using data mining tools to gather vast amounts of competitor price data and consumer online shopping behavior data, as well as by using big data analytics tools to analyze customer behavior and forecast their purchasing behavior. (Wong & Wei, 2018: 407)

A novel integrated data analytics model on customer segmentation, competitors' price change data mining, and customer behavior prediction are developed to improve customer segmentation and behavior prediction for customizing the product packages. This model has a positive impact on the delivery of customer service. (Wong & Wei, 2018: 418).

Data is now regarded as the fourth production component, alongside land, labor, and capital, and is as vital to enterprises as oil once was. As a result, big data has taken the lead in driving institutions that depend on the value generated to raise customer happiness and deliver more individualized services. (Soubra, 2021: 3)

Big data may be used by banks to identify a client's mobility and offer him the appropriate products, such as if a client who previously worked close to a branch has created an account there. The bank should be proactive and suggest to the consumer a credit card or an account denominated in the currency of the country the customer is relocating to; because, his business relocated him to another country, and he purchased a ticket with his credit card. Also, the bank must continue to follow the customer's movement and continually provide him with a suitable solution customized to his changing circumstances.

As a result, the client's experience will be improved, and customer loyalty and retention will increase. (Soubra, 2021: 9)

2.3.2 The Usage of Artificial Intelligence in Customer Service Delivery

Frontline employees (FLEs), clients, and technology are being used increasingly in hospitality businesses like restaurants. Service robots that execute sophisticated frontline jobs requiring social contact with clients by interacting with them and providing meals are increasingly supporting FLEs. The first restaurant in India that utilizes robots to serve customers opened its doors in 2017. This restaurant is called "Robot." More recently, a facility in China that houses the world's first robot restaurant employs over 40 robots that can prepare and serve over 200 different dishes, while robot waiters take orders from clients. Robots now have a larger platform thanks to the need to reduce human-to-human interaction during the COVID-19 pandemic in 2020–2021. The fast-casual Asian restaurant Dadawan introduced service robots to deliver dishes in Europe (the Netherlands) to assist human FLEs in maintaining a safe distance when serving clients (Odekerken-Schröder et al., 2021: 247).

Therefore, Customers are likely to find value and/or satisfaction in their interactions with service robots in the context of customer service. Service robots' hedonic value is related to enjoyment and amusement, while utilitarian value says that clients will have more faith in the correctness and consistency of the service given (Odekerken-Schröder et al., 2021: 265-266).

In addition, the owner may experience cost savings and increased efficiency. Service robots might help reduce the chance of the virus spreading, particularly in the socially distancing COVID-19 pandemic. In addition, using service robots may help ensure that there are always enough employees on duty to provide reliable service. (Odekerken-Schröder et al., 2021: 281)

Another artificial intelligent tool for delivering customer service is a chatbot. It is a communicative interface that acts as a communication link between organizations and their clients nowadays. Human-computer interaction systems, sometimes referred to as chatbots or conversational agents, assist the evolution of communication. With unmatched business potential, chatbots are a popular new technology driven by artificial intelligence (AI) and machine learning. One of the most current trends in managing interactions with customers and communication settings is the use of chatbots. They enable communication with people by using a conversational interface and natural language. The advantage of using a chatbot is remote and online customer care. Many companies prioritized digitization during the epidemic to install chatbots to automate repetitive chores and enhance customer support (Cordero, Barba-Guaman, & Guamán, 2022: 1).

The AI chatbot application improves service effectiveness by being forceful, efficient, and quick, as well as by operating with agility, availability, and accessibility without hindrance. By automating, standardizing, and optimizing services and processes, such as customer support, AI chatbot adoption results in convenience, simplicity, and considerable advantages by lowering costs and boosting operational effectiveness (De Andrade & Tumelero, 2022: 239).

2.3.3 The Effect of Social Network Analysis on Customers Service

Tajvidi & Karami, (2021: 1 - 2) tackled the impact of analyzing the clients' information using social networks because by implementing this method in analysis the customers are enabled to access a variety of shared information about the opinion and experiences of other customers and their recommendations about the products or services the company offers and this enhance the relationship and the trust between the consumers and the firm. Involving social networks in customer service adds to the value of business concerning marketing, sales growth, e-commerce, social commerce, and operations.

Moving on, He, et al., (2018:153-154) demonstrated that social network analytics provides the chance for companies to gain the knowledge they need from the customers to improve their comprehension of their competitors in the market because social networks

include millions of people's interactions, thoughts, and ideas and the customers to guarantee business excellence that satisfies the demands of certain market segments.

The main focus of social network analytics as explained by He, et al., (2018:153-154) is constructing and testing informatics frameworks and tools for gathering, monitoring, summarising, and visualizing social media data to support interactions and dialogues and extracting insightful patterns, and collecting information from social media sites and using that information to inform business choices.

There are four separate phases of the social media analytics process including data discovery, gathering, preparation, and analysis so businesses must build the capacity to gather information and useful knowledge, store, and analyze social media data for forecasting and decision-making and for conducting competitive marketing analysis (He, et al., 2018:153-154).

Retailers may also combine their customer data with other sorts of data, such as social media data, to provide insights that are even more insightful. To combine information about social interactions with more conventional kinds of consumer data, such as order data, social CRM relies on big data. This makes it possible for businesses to use CRM tactics that are relevant to customer interactions and preferences. Such information may be categorized as part of the marketing mix, enabling tasks like consumer segmentation and profile creation as well as the development of marketing strategies (Duang-Ek-Anong, 2019: 2).

By utilizing social media data, such as Facebook comments, Pinterest pins, Twitter tweets, and LinkedIn shares, Walmart can identify the top-trending goods to be launched in its shops throughout the world. Developed by WalmartLabs, Social Genome is a big data analytics tool that examines the merged public data from the web, social media data, and private data like contact information and email addresses. It looks through Facebook posts, tweets, YouTube videos, blog posts, and similar content to help Walmart connect with consumers or friends of customers who mention Walmart items on social media and alert them about things they may be interested in, and offer them exclusive discounts (Grover et al., 2018: 407).

Customers have the option to share online their reviews, opinions, satisfaction, or dissatisfaction with many factors, such as product quality or customer service, on platforms like Facebook, Instagram, Twitter, and LinkedIn. Additionally, they enable businesses to communicate with a huge number of potential clients to share information about their processes and their goods and services (Del Vecchio et al., 2020: 801).

The majority of MSME enterprises use social media channels to market their goods and offer chatbot-based customer support. Social media and chatbots have a significant impact on how MSME enterprises interact with clients. Chatbots could use social media as a center for quick consumer responses (Cordero, Barba-Guaman, & Guamán, 2022: 2).

2.4 Research Gap

After viewing the five above-mentioned research gaps, this research aims to fill the gap proposed by He, Zhang, Tian, Tao, and Akula (2018). This particular gap was chosen because according to research done in the field, it appears that social media helps organizations in delivering good customer service as it makes it easier for them to analyze customers' data. Social media has become one of the most successful ways for businesses to reach out to customers and get their feedback. Businesses need to transform social media data into customer knowledge to achieve their strategic goals. Social media user data can develop into a valuable organizational resource that businesses can use to their advantage, increasing marketing strategies, strengthening brands, and developing customer loyalty. Effective social media analytics are required to generate business insights and knowledge because the volume of social media data is enormous and manually analyzing such large amounts of information is time-consuming. This study suggests that social media analytics has great potential for generating insightful and helpful knowledge from and about customers using social media data (He et al., 2018). Therefore, This paper aims to answer the following research question: **"**How can social media analytics be used to support product delivery to customers?".

3. Methodology

3.1 Methods and description

This paper's methodology is data science methodolgy with CRISP-DM framework since the research is an explanatory casual research with the independent variable "data analytics" and the dependent variable "customer service delievery" and the purpose of this paper is to explore the effectviness of data analaytics in delivering a good customer service. I will be using CRISP-DM methodology as it answers the research question and because it reduces the cost, increase the reliability, repeatability, manageability, and efficiency of large data mining operations (Wirth & Hipp, 2000: 30).

3.2 Instrument

The CRISP-DM framework involves six phases which are Business Understanding, Data Understanding, Data Preperation, Model Building, Testing and Evaluation, and Deployment which will be discussed in the next sections.

3.2.1 Business Understanding

This first stage focuses on understanding the project's requirements and goals from a business standpoint. Based on this understanding, a data mining problem definition and a rough project schedule are then created (Wirth & Hipp, 2000: 33).

3.2.2 Data Understanding

The initial data collection is the first step in the data understanding phase, which then includes activities to familiarise with the data, identify issues with its quality, gain preliminary understanding of the data, or identify intriguing subsets to generate theories about hidden information.

Business understanding and data understanding are closely related concepts. A basic comprehension of the available data is necessary for the creation of the data mining challenge and the project plan (Wirth & Hipp, 2000: 33).

3.2.3 Data Preperation

Data preparation is the process of creating the final dataset (the data that will be used to enter into the modelling tools) from the first raw data. The steps involved in data preparation will probably be taken more than once and not necessarily in that order. Table, record, and attribute selection, data cleansing, the creation of new attributes, and data transformation for modelling tools are among the tasks (Wirth & Hipp, 2000: 33-34).

3.2.4 Model Building

Various modelling techniques are chosen and used during this phase, and their parameters are calibrated to ideal values. Usually, the same data mining problem type can be solved using a number of different strategies. Specific data formats are required by some processes. Modeling and Data Preparation are closely related. While modelling, one frequently becomes aware of data issues or has ideas for creating additional data (Wirth & Hipp, 2000: 34).

3.2.5 Testing and Evaluation

Before moving forward with the model's final deployment, it's crucial to perform a more thorough evaluation of the model and assess the procedures taken to build the model in order to make sure it correctly achieves the business objectives. Identifying any significant business issues that have not been appropriately taken into account is one of the main goals. A choice on the application of the data mining results should be made at the conclusion of this stage (Wirth & Hipp, 2000: 34).

3.2.6 Deployment

In most cases, the project doesn't finish with the creation of the model. The acquired knowledge typically has to be arranged and presented so that the client may make use of it. The deployment step can range in complexity from establishing a repeatable data mining process to something as simple as producing a report, depending on the objectives. Across several situations, the user will perform the deployment stages rather than the data analyst. In

any case, it's critical to be aware of the steps that must be taken in advance in order to apply the developed models effectively (Wirth & Hipp, 2000: 35).

3.3 Procedures

In this section, The six phases of CRISP-DM methodology will be described and discussed with the respect of the procedures followed in developing this paper's purpose.

3.3.1 Business Understanding

This phase focuses on the business objectives of this research paper, which is to enhance customer service delievery. Moreover, the goal of data mining project developed is discovering the effect of social media analytics in delivering a good customer service.

3.3.2 Data Understanding

Dataset used in this paper contains data collected from social media platforms. The data collected using customer relationship manager systems and big data. Moreover, It was discovered that the datasets lacked variety and good integration. The quality of the datasets may require authentications since the data extracted from twitter and other social media platforms were only in English.

3.3.3 Data Preperation

Data that is collected will be prepared according to the discovery which is that the datasets lacked variety and haven't a good integration by using cleaning and transformation techniques to get rid of the redundant data and have a good integration to create the final dataset.

3.3.4 Model Building

A novel integrated data analytics model will be used in this phase. This model uses customer segmentation, competitors' price change data mining, and customer behavior prediction to improve customer segmentation and behavior prediction for customizing the product packages. This model has a positive impact on the delivery of customer service.

3.3.5 Testing and Evaluation

In this phase, the model is tested and evaluated to ensure that it attains the aim of this paper, which is enhancing customer service deleivery using big data analytics. Therefore, to deliver precise calculations and the required analysis, the datasets of the same type and the model are monitored.

3.3.6 Deployment

Finally in this phase, the research question of this paper, which is the usage of social media analytics to enhance customer service delievery will be tested and the results of the test will be reported in a document. This is done after monitoring and analyzing the data and the output generated while ensuring their reliability.

4. References

Adam, M., Wessel, M., & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. *Electronic Markets*, *31*(2), 427-445.

Capurro, R., Fiorentino, R., Garzella, S., & Giudici, A. (2021). Big data analytics in innovation processes: which forms of dynamic capabilities should be developed and how to embrace digitization?. European Journal of Innovation Management, 25(6), 273-294.

Chen, L., Hsieh, J. J., & Rai, A. (2021). How Does Employee Infusion Use of CRM Systems Drive Customer Satisfaction? Mechanism Differences Between Face-to-Face and Virtual Channels. *Mechanism Differences between Face-to-Face and Virtual Channels (Jun 1, 2021). Liwei Chen, JJ Po-An Hsieh, and Arun Rai," How does Intelligent System Empowerment Yield Payoff: Uncovering the Adaptive Mechanisms and the Contingency Role of Work Experience" Information Systems Research (A*),(forthcoming)*.

Cordero, J., Barba-Guaman, L., & Guamán, F. (2022). Use of chatbots for customer service in MSMEs. Applied Computing and Informatics, (ahead-of-print).

Cusin, J., & Flacandji, M. (2022). How can organizational tolerance toward frontline employees' errors help service recovery?. Journal of Personal Selling & Sales Management, 42(2), 91-106.

De Andrade, I. M., & Tumelero, C. (2022). Increasing customer service efficiency through artificial intelligence chatbot. Revista de Gestão, 29(3), 238-251

Del Vecchio, P., Mele, G., Passiante, G., Vrontis, D., & Fanuli, C. (2020). Detecting customers knowledge from social media big data: toward an integrated methodological framework based on netnography and business analytics. Journal of Knowledge Management, 24(4), 799-821.

Duang-Ek-Anong, S. (2019). Organizational Success Factors in the Implementation of Big Data Analytics for Customer Relationship Management. International Journal of Simulation--Systems, Science & Technology, 20(5), 1-7

Elkmash, M. R. M., Abdel-Kader, M. G., & El Din, B. B. (2021). An experimental investigation of the impact of using big data analytics on customers' performance measurement. *Accounting Research Journal*, 35(1), 37-54.

Grover, V., Chiang, R. H., Liang, T. P., & Zhang, D. (2018). Creating strategic business value from big data analytics: A research framework. *Journal of management information systems*, *35*(2), 388-423.

Gunarathne, P., Rui, H., & Seidmann, A. (2018). When social media delivers customer service: Differential customer treatment in the airline industry. MIS quarterly, 42(2), 489-520.

He, W., Zhang, W., Tian, X., Tao, R., & Akula, V. (2018). Identifying customer knowledge on social media through data analytics. Journal of Enterprise Information Management, 32(1), 152-169.

Janahi, M. A., & Al Mubarak, M. M. S. (2017). The impact of customer service quality on customer satisfaction in Islamic banking. *Journal of Islamic Marketing*.

Ledro, C., Nosella, A., & Vinelli, A. (2022). Artificial intelligence in customer relationship management: literature review and future research directions. Journal of Business & Industrial Marketing, 37(13), 48-63.

Lee, M., Kwon, W., & Back, K. J. (2021). Artificial intelligence for hospitality big data analytics: developing a prediction model of restaurant review helpfulness for customer decision-making. International Journal of Contemporary Hospitality Management, 33(6), 2117-2136.

Miraldo, C., Monken, S. F., Motta, L., & Ribeiro, A. F. (2019). Innovation in health-care companies: a strategy to increase customer service productivity. Innovation & Management Review, 16(4), 357-374.

Odekerken-Schröder, G., Mennens, K., Steins, M., & Mahr, D. (2021). The service triad: an empirical study of service robots, customers and frontline employees. Journal of Service Management, 33(2), 246-292

Soubra, L. (2021). BIG DATA, CUSTOMER CENTRICITY AND SUSTAINABILITY IN THE BANKING INDUSTRY. *BAU Journal-Creative Sustainable Development*, *3*(1), 11.

Tajvidi, R., & Karami, A. (2021). The effect of social media on firm performance. *Computers in Human Behavior*, *115*, 105174.

Wong, E., & Wei, Y. (2018). Customer online shopping experience data analytics: Integrated customer segmentation and customised services prediction model. International Journal of Retail & Distribution Management.

Wright, L. T., Robin, R., Stone, M., & Aravopoulou, D. E. (2019). Adoption of big data technology for innovation in B2B marketing. Journal of Business-to-Business Marketing, 26(3-4), 281-293.

Yerpude, S. (2020). Real-Time Data Analytics–A Contemporary Approach Toward Customer Relationship Management. In *Data Science and Analytics*. Emerald Publishing Limited. 103-116

Zhou, S., Qiao, Z., Du, Q., Wang, G. A., Fan, W., & Yan, X. (2018). Measuring customer agility from online reviews using big data text analytics. *Journal of Management Information Systems*, *35*(2), 510-539.

Wirth, R., & Hipp, J. (2000, April). CRISP-DM: Towards a standard process model for data mining. In *Proceedings of the 4th international conference on the practical applications of knowledge discovery and data mining* (Vol. 1, pp. 29-39).