The Impact of Cloud Computing on Small and Medium Enterprises: Opportunities and Challenges

DR. AMIT MISHRA

Assistant Professor, Department of Commerce, University of Lucknow, Uttar Pradesh, India

Abstract- The majority of companies located all over the globe may be classified as either "small" or "medium" in terms of their size. According to Nowotarski and Paslawski (2017), they are responsible for more than sixty percent of the gross domestic product of the European Union and seventy percent of its labor force. According to the Small Business Administration (2018), small firms are responsible for the creation of more than half of all employment in the United States. Small and medium-sized businesses (also known as SMEs) need simple access to and inexpensive information technology in order to remain competitive in their respective markets and to make lasting contributions to the economies of the nations in which they operate. By using cloud computing (CC), small and medium-sized companies (SMBs) have the potential to save both time and money. This study was a result of the growing interest shown by SMEs in cloud computing, which encouraged us to perform this research. The first of the six primary subjects that will be discussed is the inquiry, "What different kinds of data analysis are utilized?" I was curious about which cloud service providers are presently being considered for use. Find out how often and in what context this topic has been brought up before. Which hypotheses and models do they base their work on? Where would one generally be able to get research of this kind? What strategies do you have in place to persuade other individuals to assist you with this endeavor? In the past, CC reviews would seldom undertake data analysis and would instead focus on criticizing the methodologies used in the research. The purpose of this literature review was to offer potential researchers with information that would be helpful to them as they deliberate on how to approach the data gathering and analysis required for CC studies. The vast majority of economies are highly dependent on small and medium-sized firms (SMEs), which may be explained by the fact that there are so many SMEs and that they employ a significant number of people. The capacity for small and medium-sized businesses to provide new products and services is critical to the development of any economy.

Indexed Terms- Opportunities and Challenges, Cloud Computing, small and medium-sized businesses (SME)

I. INTRODUCTION

The vast majority of companies throughout the globe are classified as micro, small, or medium enterprises. Sixty percent of the EU's GDP, seventy percent of the EU's jobs, and ninety-nine percent of the EU's enterprises are generated by just one percent of the population. More than half of all jobs in the United States are provided by small firms (Small Business Administration, 2018), and small businesses make up 99 percent of all establishments in the nation. To remain competitive and make lasting contributions to the economies of the countries in which they operate, small and medium-sized businesses (also known as SMEs) require information technology that is both readily available and reasonably priced. Cloud computing (CC) provides a scalable, low-cost option for SMBs to host their data and applications on the cloud. The CC model is becoming more popular because of the various benefits it offers for allocating IT resources including personnel and hardware.[1,2] Small and medium-sized enterprises (SMEs) may benefit greatly from CC because to its inexpensive price, minimal skill need, and ability to develop bilateral links between organizations. This is possible because to the growth of bilateral ties between institutions. Thanks to innovations such as CC, companies of every size and level of IT expertise may take use of cutting-edge IT services.[3] Businesses of various sizes and types may benefit from these services since they do not need the usual investments, obstacles, or retraining of personnel. CC improves SMEs' production and competitiveness, as stated by both Khayer et al. (2020) and Wangechi (2017). Because CC encourages constant, high-quality contact

throughout all divisions, they think this is the case. The reluctance of small and medium-sized enterprises (SMEs) to adopt CC as a business model has been the focus of much study. Research in this field also often takes the form of review studies.[4,5]

In its forecast for the next several years, leading research firm Gartner predicts that "big data" will become more important. Big data has the potential to benefit all businesses, from the most well-established corporations to the most cutting-edge newcomers. However, there are a few problems that require fixing, especially in computer architectures that rely heavily on the CPU but provide few I/O choices. Saving money on hardware and software updates is a major benefit of cloud computing.[6] Potential roadblocks to big data's use, such as low fault tolerance and long processing times, may be surmounted with the help of cloud computing's tools and tactics. Recent studies have shown that cloud services are playing a bigger role in the big data industry. It may be difficult for small and medium-sized businesses to make the necessary investments in IT infrastructure to make effective use of big data. With cloud computing, small and medium-sized organizations may reap the benefits of big data without shouldering the hefty hardware and staff expenditures of larger competitors.[7,8]

II. OBJECTIVE OF THE STUDY

1. Using the Cloud for Big Data AnalysisAdvantages and Drawbacks for SMEs
2. Second, there is a need to look at SMEs (small to medium-sized enterprises).

This study helps to close a gap in the existing body of knowledge by providing current information on a number of significant topics that have been the subject of prior research. The purpose of this study is to undertake a thorough literature analysis on the adoption of cloud computing by small and medium-sized businesses (SME) between the years 2011 and 2020. Specific areas of interest include (1) data analysis methods utilized in the methodology of the studies; (2) CC services being researched; (3) publishing patterns over time and which publication outlets publish works in this research field; and (4) framework/theory application. These specific areas of interest are discussed further below. i. The methodology of data gathering and analysis is broken out in great detail in the previous paper.

Reporting of the findings may be found in Section 4, while providing analysis can be found in Section 5. The investigation's conclusions are presented in the concluding paper.[9,10]

The advantages and disadvantages of storing large amounts of data on the cloud, particularly for small and medium-sized businesses If a company analyzes its big data and draws the necessary conclusions from that investigation, there is a good chance that the company's levels of creativity, productivity, and financial success will all grow.[11]Before a company can begin to enjoy the advantages of big data technologies, it is typically required for the company to make investments in software licenses, servers, and information technology workers. Large and medium-sized organizations (SMEs) have a tougher difficulty adopting big data into their organizational culture, despite assertions that businesses with a strong online image are employing big data strategically in a number of ways.[12,13] What can be done to aid small and medium-sized enterprises (SMEs) in saving money on hardware, reducing the costs of processing, and demonstrating the value of big data via the integration of big data technologies in the cloud? It may be difficult for small and medium-sized firms (SMEs), who often have less resources at their disposal, to completely adopt and integrate new technology. Big data is now within reach of enterprises of all sizes because to the low prices and dependable infrastructure provided by cloud computing. [14,15]

The technique of storing and processing data on distant computers that can be accessed on-demand via a network is often referred to as "cloud computing," and the phrase "cloud computing" is frequently used to characterize the technology. Big data is ideally suited to the pay-as-you-go paradigm of cloud computing, which allows applications to quickly scale up or down dependent on demand.[16] This is because the processing capability required to analyze massive data sets varies with the quantity of incoming data and the kind of analysis being performed. There is no longer a need for a business to wait for the delivery of new hardware since virtual resources may be expanded rapidly and easily in either the horizontal or vertical directions to meet their requirements. In conclusion, huge cloud providers such as Amazon provide a broad range of software as a service (SaaS) big data capability that may be used for any job that is associated with

data.[17] anytime it is most convenient for them, businesses may save money without sacrificing efficiency by implementing cloud-based solutions. This can be done anytime they choose. Some clients are hesitant to use cloud computing due to their worries about its lack of reliability, performance, privacy, and security. [18,19] Recent years have seen a resurgence in interest in cloud computing as a result of growing worries around data privacy. Many consumers are reluctant to utilize cloud services because they are concerned that the companies who are responsible for the underlying infrastructure will be able to monitor their data as well as their conversations. Small and medium-sized businesses will carefully assess both the advantages and the negatives of storing and analyzing their data on the cloud before making a commitment to do so. When it comes to leveraging cloud computing for big data applications, there are several issues about the privacy and security of data.[20] The adoption of cloud computing infrastructure is being dragged down by a variety of difficulties, including a lack of expertise with service level agreements (SLAs), suspicion about service providers, and the possibility of attacks on geographically spread data centers.[21]

One of the most significant obstacles standing in the way of widespread adoption of cloud computing is the cloud's inability to detect and recover from errors without negatively impacting the output quality.[22,23] Only two of the numerous practical issues that cloud computing presents are interoperability and data portability. It may be challenging to combine the capabilities of several clouds into a single solution due to the fact that each cloud has its own proprietary APIs for establishing connections to other clouds. Past surveys have shown that respondents do not see cloud computing to be a major impediment to the implementation of big data.[24] On-premises solutions provide a greater challenge than cloud-based ones owing to a number of challenges, including a lack of expertise about big data, wrong owner expectations, and internal opposition.[25,26]

III. METHODOLOGY

This literature review was prompted by the increased interest of small and medium-sized businesses (SMEs) in cloud computing.[27,28] The research tries to address six questions related to this topic. Important information includes, third, which CC services are being reviewed, and fourth, how and where these conclusions have been made public. Where are these sorts of studies often conducted, and which factors carry the most weight in assessing whether or not a product will have widespread use? Which commonly used paradigms are considered standard.[29] Each writer has conducted a comprehensive analysis of the previous research and culled it down to the most relevant articles. Recordings were made of the techniques used for data analysis as well as the Creative Commons services that were accessed. Additionally, the location, date, and year of publication were noted. We Make Use Of Four Distinct Methodologies Or Conceptual Models Calculating the number of times each item was picked as either highly essential or not at all necessary allowed us to identify which features were the most important overall, and we also calculated the worldwide adoption rates for each feature.[30]
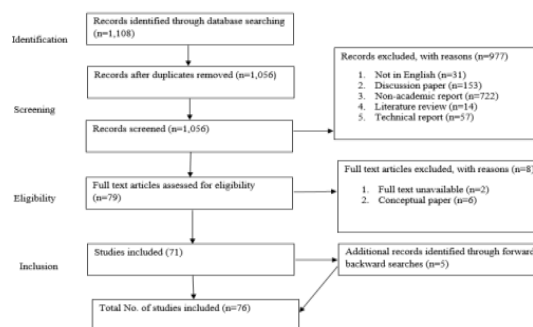

Figure 1. The Impact of Cloud Computing on Small and Medium-Sized Businesses [31]

IV. DATA / ANALYSIS

In previous critiques of CC, the actual data analysis procedures employed in the research have either been glossed over or completely ignored. We believe that this analysis is one of the few that critically assesses the procedures that are presently applied to obtain and analyze data in CC research.[32,33] As a result, it is a helpful resource for future investigations since it provides an evaluation of the approaches. The advantages of mixing qualitative and quantitative research approaches, on the other hand, have not been well investigated.

The results of the research are shown in Table 1, and it can be seen that 73.7% of them employed quantitative methods. The relative significance score and the variance analysis both came in at

3.6%. The PLS-SEM method was used in the vast majority of the investigations; nevertheless, the researchers also relied on descriptive statistics (21.4%), logistic regression (12.5%), multiple regression (3.6%), and simple regression (12.5%). DEMATEL stands for the Laboratory for Integrated Decision Making and Testing, which accounts for 1.8% of the total. In addition to that, we included both T-tests and exploratory factor analyses in the program.[34,35]The percentage of total successes attributable to quantitative methods was 1.8%. Using ANNs in conjunction with generalized linear models (GLMs) or ANNs in conjunction with PLS-SEMs (partial least squares structural equation modeling) are just two examples. There are many more. PLS-SEM has been the method of choice for assessing quantitative data in studies on SMEs' adoption of CC. This is despite the fact that CB-SEM and PLS-SEM are both classified as members of the family of methods known as structural equation modeling (SEM). Each tactic has the potential to be beneficial in a mind-boggling range of settings and circumstances.[36,37] As a result of its adaptability in modeling multivariate data and other connected factors, such as the role that CC plays in IS adoption, PLS-SEM has emerged as the preferred quantitative analysis method. This is due to the fact that it can model both independent and dependent variables simultaneously. PLS-SEM has been shown to efficiently manage both reflective and formative measurement models (Hair et al., 2014). This is due to its versatility, capacity to handle small sample sizes, usefulness in anticipating crucial driving components, independence from normalcy distribution, and other factors. This distinction may help to explain why PLS-SEM has gained greater traction than CB-SEM in recent years. According to Hair et al. (2014), despite the fact that CB-SEM could be reliable in specific situations, further research is necessary. [38,39]

In contrast to multiple or logistic regressions, descriptive statistics were heavily used in empirical papers. This was the case in contrast to the use of logistic regressions. In spite of their superior capacity for explanation compared to descriptive statistics, multiple regression and logistic regression have received a disproportionately little amount of attention. This trend is consistent with the ISM, AHP, ANOVA, and linear regression statistical techniques, which are the four most used approaches to describing occurrences using statistics. Only two of the research discussed the possibility of using a variety of quantitative approaches in order to improve the data analysis.[40,41] ANN may be used in conjunction with a variety of different methods. There is a need for more stringent data analysis approaches if we are going to enhance the level of adoption of CC among SMEs. Combining GLM and SEM is one example; other examples include combining ISM and AHP, AHP and SEM, and so on. According to Table 2, 26.3% of all studies used a qualitative research technique in some capacity. Fifty percent of the studies used a variety of research approaches, including interpretative analysis, theme analysis, content analysis, grounded theory, and others. Understanding the meaning of the qualitative data that has been gathered is the primary purpose of the vast majority of qualitative research projects. This provides the foundation for making informed choices over whether or not to use CC. In the process of assessing qualitative data, free-form questions were the method that was used the most, while theme analysis was the method that was used the second most.[42]

After that, we classified the uncovered tendencies by using a structure called the Topics of Expertise (TOE). 2013 was the year that specialists conducted a PEST and SWOT analysis in order to evaluate the effects of political, economic, social, and technical challenges.[43] Infrequently, content analysis and grounded theory were also used into the research. In contrast to grounded theory, which may be re-imagined in a variety of ways depending on the investigator, content analysis is anchored entirely on actual data.[44,45] However, if you are doing research, the grounded theory technique might be of use to you in mapping out your whole process.[46] In a similar vein, content analysis contributes to empirical research on the use of cloud computing by SMEs by bringing into focus aspects that were previously hidden. The fledgling but quickly emerging discipline of qualitative data evaluation is characterized by the combination of qualitative approaches (such as grounded theory and content analysis) in a single piece. This is a distinctive feature of the field.[47]

S/N	Analysis	No	%
1	Summary statistics (mean, standard deviation, and percentage)	11	22.3
2	PLS-SEM	17	23.2

3	Calculating the Likelihood of an Event Using a Sample	6	11.4
4	ISM	2	2.7
5	AHP	3	1.5
6	Multivariate Analysis	6	13.4
7	GLM and ANN	2	2.7
8	ANOVA	1	1.5
9	DEMATEL	2	2.7
10	RII	1	2.5
11	T-test	2	2.7
12	Analysis using	2	2.7
14	PLS-SEM and EFA-ANN	2	2.7
	Total TOTAL%=73.7%	58	92

Table 1: Techniques for quantitative research[48]

S/N	Analysis	No	%
1	Analyzing themes	2	29
2	Evaluation of Contents	1	11
3		11	51
4	Analytical interpretation	2	4
5	Methods of content analysis and grounded theory	2	4
	Total grounded theory	18	99
	Total%=26.3%		

Table 2: Methodology aids for qualitative studies[49]

- Cloud-Based Services

Table 3 reveals that whereas most research (74.2%) focuses on comprehensive CC services, only 17.1% investigates cloud-based ERP. Research conducted through SaaS accounts for 6.6% of all CC services, compared to the combined 1.3% market share represented by mobile(m)-retail applications, SaaS, Big data analytics, and CRM. In an effort to simplify the process of delivering CC services to SMEs, several studies have zeroed in on only one kind of service.[50] The different varieties of CC services each come with their own individual challenges for small and medium-sized companies (SMBs). Enterprise resource planning (ERP) solutions on the cloud are becoming less popular as businesses shift their focus to mobile commerce, big data analytics, and CRM. All of these programs are essential for any contemporary organization to function properly. A cloud-based ERP system is one way for a logistics company to streamline its human resource management, point-of-sale processes, and warehouse operations. For small and medium-sized enterprises (SMEs), m-retail software, big data analytics, and customer relationship management (CRM) are essential due to the unique challenges they confront in the management of customer data, corporate data, and retail logistics. Research on private, public, and hybrid cloud SCM has lagged significantly behind that given to more fundamental difficulties. Cloud-based SCM has been found to help small and medium-sized firms cut down on expenses connected to employee communication, so this finding comes as somewhat of a surprise.

S/N	Hosting services in the cloud	No	%
1	Basic CC Features	28	71.2
2	ERP	14	18.2
3	An App for Mobile Shopping	2	6.4
4	Big data analytics	2	5.5
5	Customer Relationship Management	2	2.1
6	(CRM) SaaS	2	2.4
	Total	50	

Table 3: Hosting services in the cloud[51]

- Initial Publication Date

In Figure 2, the papers are shown from newest to oldest. Two articles were published in 2011, three in 2012, ten in 2013, thirteen in 2014, seven in 2015, twelve in 2016, eleven in 2017, six in 2019, and eight in 2020. From 2011 to 2014, yearly book publication increased dramatically, before leveling down in the two years that followed. Growth accelerated in 2018, maintained that momentum during 2019, and is expected to keep going strong into 2020. There was a wide range in the average yearly coverage offered to SMEs by their use of CC.
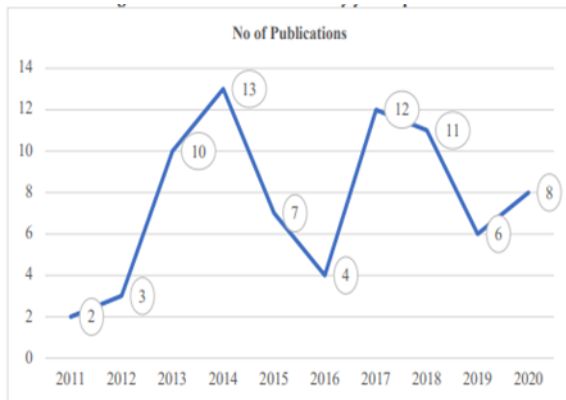
Figure 2: Articles are organized by publication year[52]

CONCLUSION

Small and medium-sized businesses (SMEs) represent the backbone of most economies, both in terms of the total number of businesses and the total number of people employed by such businesses. Because of their willingness to try new things and embrace change, the nation's small and medium-sized firms (also known as SMEs) are crucial to its economic growth. Small and medium-sized enterprises (SMEs) that wish to grow and thrive must be open to and proficient with cutting-edge technologies. Big data makes it feasible for small firms to have access to information that was previously out of their price range, which might have significant implications for their operations. On the other hand, due to its complexity, big data analytics necessitates a substantial financial outlay for the creation of a solid technical foundation and the hiring of people who have expertise in both big data analytics and data science. Each of these is essential. Outsourcing to a cloud service provider is the ideal option for many SMEs that want to incorporate big data technologies but lack the personnel and infrastructure to do it in-house. Cloud computing appeals to small and medium-sized businesses (SMEs) because it allows them to outsource the purchase and upkeep of expensive equipment to specialists. To innovate and gain a long-term strategic competitive advantage, even small and medium-sized businesses (SMEs) with limited financial resources may now exploit big data thanks to the widespread availability of cloud computing infrastructure and services. The advent of cloud computing has made this a reality. The challenges of combining these technologies and the latency that occurs when data is transiting into and out of the clouds have slowed the widespread adoption of cloud computing infrastructure for big data.

REFERENCES

[1] Lamia Youseff, Dilma M. Da Silva, Maria Butrico, and Jonathan Appavoo, Cloud Computing and Software Services Theory and Techniques, Syed Ahson and Mohammad Ilyas, Eds. Boca Raton: CRC Press, 2011.

[2] Eshrag Refaee, Shabana Parveen, Khan Mohamed Jarina Begum, Fatima Parveen, M. Chithik Raja, Shashi Kant Gupta, Santhosh Krishnan, "Secure and Scalable Healthcare Data Transmission in IoT Based on Optimized Routing Protocols for Mobile Computing Applications", Wireless Communications and Mobile Computing, vol. 2022, Article ID 5665408, 12 pages, 2022. https://doi.org/10.1155/2022/5665408

[3] Rajesh Kumar Kaushal, Rajat Bhardwaj, Naveen Kumar, Abeer A. Aljohani, Shashi Kant Gupta, Prabhdeep Singh, Nitin Purohit, "Using Mobile Computing to Provide a Smart and Secure Internet of Things (IoT) Framework for Medical Applications", Wireless Communications and Mobile Computing, vol. 2022, Article ID 8741357, 13 pages, 2022. https://doi.org/10.1155/2022/8741357

[4] Adam, I. O., & Musah, A. (2015). Small and Medium Enterprises (SMEs) in the Cloud in Developing Countries: A Synthesis of the Literature and Future Research Directions. Journal of Management and Sustainability, 5(1), 115–139

[5] Ajimoko, O. J. (2018). Considerations for the adoption of cloud-based big data analytics in small business enterprises. Electronic Journal of Information Systems Evaluation, 21, 63–79.

[6] Alkwasi, G. A., Mahmood, A. K., &Baashar, Y. M. (2015). Factors influencing the adoption of cloud computing in SME: A systematic review. 2015 Proceedings of the International Symposium on Mathematical Sciences and Computing Research 2015, (iSMSC), 220-225.

[7] Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. Journal of Enterprise Information Management, 26(3), 250–275.

[8] Aquilani, B., Silvestri, C., Ruggieri, A., &Gatti, C. (2017). A systematic literature review on total quality management critical success factors and the identification of new avenues of research. The TQM Journal, 29(1), 184-213.

[9] Bhattacherjee, A., & Park, S. C. (2014). Why end-users move to the cloud: A migration-theoretic analysis. European Journal of Information Systems, 23(3), 357–372.

[10] Jerome M. Wendt. (2011) Redefining "SMB", "SME" and "Large Enterprise". [Online].http://www.dcig.com/2011/03/redefining-smb-sme-and-largeenterprise.html

[11] Rana Dababneh and Farah Tukan, "BOOKLET OF STANDARDIZED SMALL AND MEDIUM ENTERPRISES DEFINITION," USAID/JORDAN ECONOMIC OPPORTUNITIES OFFICE, 2007.

[12] European_ Commission, "COMMISSION RECOMMENDATION of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises," *Official Journal of the European Union*, no. 124, pp. 36-41, 2003.

[13] Shifeng Shang et al., "DABGPM: a double auction Bayesian game-based pricing model in cloud market," in *NPC'10 Proceedings of the 2010 IFIP international conference on Network and parallel computing*, Berlin, 2010, pp. 155-164.

[14] Rolf Harms and Michael Yamartino, "THE ECONOMICS OF THE CLOUD," Microsoft Research, Organisational Report 2012.

[15] Edge_Strategies_Inc. (2012) 2012 Microsoft/Edge Strategies SMB Cloud Adoption Study.

[16] Navaneetha Krishnan Rajagopal, Mankeshva Saini, Rosario Huerta-Soto, Rosa Vílchez-Vásquez, J. N. V. R. Swarup Kumar, Shashi Kant Gupta, Sasikumar Perumal, "Human Resource Demand Prediction and Configuration Model Based on Grey Wolf Optimization and Recurrent Neural Network", Computational Intelligence and Neuroscience, vol. 2022, Article ID 5613407, 11 pages, 2022. https://doi.org/10.1155/2022/5613407

[17] Navaneetha Krishnan Rajagopal, Naila Iqbal Qureshi, S. Durga, Edwin Hernan Ramirez Asis, Rosario Mercedes Huerta Soto, Shashi Kant Gupta, S. Deepak, "Future of Business Culture: An Artificial Intelligence-Driven Digital Framework for Organization Decision-Making Process", Complexity, vol. 2022, Article ID 7796507, 14 pages, 2022. https://doi.org/10.1155/2022/7796507

[18] Bramah Hazela et al 2022 ECS Trans. 107 2651 https://doi.org/10.1149/10701.2651ecst

[19] Ashish Kumar Pandey et al 2022 ECS Trans. 107 2681 https://doi.org/10.1149/10701.2681ecst

[20] G. S. Jayesh et al 2022 ECS Trans. 107 2715 https://doi.org/10.1149/10701.2715ecst

[21] Shashi Kant Gupta et al 2022 ECS Trans. 107 2927 https://doi.org/10.1149/10701.2927ecst

[22] S. Saxena, D. Yagyasen, C. N. Saranya, R. S. K. Boddu, A. K. Sharma and S. K. Gupta, "Hybrid Cloud Computing for Data Security System," 2021 International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA), 2021, pp. 1-8, doi: 10.1109/ICAECA52838.2021.9675493.

[23] S. K. Gupta, B. Pattnaik, V. Agrawal, R. S. K. Boddu, A. Srivastava and B. Hazela, "Malware Detection Using Genetic Cascaded Support Vector Machine Classifier in Internet of Things," 2022 Second International Conference on Computer Science, Engineering and Applications (ICCSEA), 2022, pp. 1-6, doi: 10.1109/ICCSEA54677.2022.9936404.

[24] Natarajan, R.; Lokesh, G.H.; Flammini, F.; Premkumar, A.; Venkatesan, V.K.; Gupta, S.K. A Novel Framework on Security and Energy Enhancement Based on Internet of Medical Things for Healthcare 5.0. *Infrastructures*2023, *8*, 22. https://doi.org/10.3390/infrastructures8020022

[25] V. S. Kumar, A. Alemran, D. A. Karras, S. Kant Gupta, C. Kumar Dixit and B. Haralayya, "Natural Language Processing using Graph Neural Network for Text Classification," 2022 International Conference on Knowledge Engineering and Communication Systems (ICKES), Chickballapur, India, 2022, pp. 1-5, doi: 10.1109/ICKECS56523.2022.10060655.

[26] M. Sakthivel, S. Kant Gupta, D. A. Karras, A. Khang, C. Kumar Dixit and B. Haralayya, "Solving Vehicle Routing Problem for Intelligent Systems using Delaunay

Triangulation," 2022 International Conference on Knowledge Engineering and Communication Systems (ICKES), Chickballapur, India, 2022, pp. 1-5, doi: 10.1109/ICKECS56523.2022.10060807.

[27] S. Tahilyani, S. Saxena, D. A. Karras, S. Kant Gupta, C. Kumar Dixit and B. Haralayya, "Deployment of Autonomous Vehicles in Agricultural and using Voronoi Partitioning," 2022 International Conference on Knowledge Engineering and Communication Systems (ICKES), Chickballapur, India, 2022, pp. 1-5, doi: 10.1109/ICKECS56523.2022.10060773.

[28] V. S. Kumar, A. Alemran, S. K. Gupta, B. Hazela, C. K. Dixit and B. Haralayya, "Extraction of SIFT Features for Identifying Disaster Hit areas using Machine Learning Techniques," 2022 International Conference on Knowledge Engineering and Communication Systems (ICKES), Chickballapur, India, 2022, pp. 1-5, doi: 10.1109/ICKECS56523.2022.10060037.

[29] V. S. Kumar, M. Sakthivel, D. A. Karras, S. Kant Gupta, S. M. Parambil Gangadharan and B. Haralayya, "Drone Surveillance in Flood Affected Areas using Firefly Algorithm," 2022 International Conference on Knowledge Engineering and Communication Systems (ICKES), Chickballapur, India, 2022, pp. 1-5, doi: 10.1109/ICKECS56523.2022.10060857.

[30] Parin Somani, Sunil Kumar Vohra, Subrata Chowdhury, Shashi Kant Gupta. "Implementation of a Blockchain-based Smart Shopping System for Automated Bill Generation Using Smart Carts with Cryptographic Algorithms." CRC Press, 2022. https://doi.org/10.1201/9781003269281-11.

[31] Shivlal Mewada, Dhruva Sreenivasa Chakravarthi, S. J. Sultanuddin, Shashi Kant Gupta. "Design and Implementation of a Smart Healthcare System Using Blockchain Technology with A Dragonfly Optimization-based Blowfish Encryption Algorithm." CRC Press, 2022. https://doi.org/10.1201/9781003269281-10.

[32] Ahmed Muayad Younus, Mohanad S.S. Abumandil, Veer P. Gangwar, Shashi Kant Gupta. " AI-Based Smart Education System for a Smart City Using an Improved Self-Adaptive Leap-Frogging Algorithm." CRC Press, 2022. https://doi.org/10.1201/9781003252542-14.

[33] Rosak-Szyrocka, J., Żywiołek, J., & Shahbaz, M. (Eds.). (2023). Quality Management, Value Creation and the Digital Economy (1st ed.). Routledge. https://doi.org/10.4324/9781003404682

[34] Dr. Shashi Kant Gupta, Hayath T M., Lack of it Infrastructure for ICT Based Education as an Emerging Issue in Online Education, TTAICTE. 2022 July; 1(3): 19-24. Published online 2022 July, doi.org/10.36647/TTAICTE/01.03.A004

[35] Hayath T M., Dr. Shashi Kant Gupta, Pedagogical Principles in Learning and Its Impact on Enhancing Motivation of Students, TTAICTE. 2022 October; 1(2): 19-24. Published online 2022 July, doi.org/10.36647/TTAICTE/01.04.A004

[36] Shaily Malik, Dr. Shashi Kant Gupta, "The Importance of Text Mining for Services Management", TTIDMKD. 2022 November; 2(4): 28-33. Published online 2022 November doi.org/10.36647/TTIDMKD/02.04.A006

[37] Dr. Shashi Kant Gupta, Shaily Malik, "Application of Predictive Analytics in Agriculture", TTIDMKD. 2022 November; 2(4): 1-5. Published online 2022 November doi.org/10.36647/TTIDMKD/02.04.A001

[38] Dr. Shashi Kant Gupta, Budi Artono, "Bioengineering in the Development of Artificial Hips, Knees, and other joints. Ultrasound, MRI, and other Medical Imaging Techniques", TTIRAS. 2022 June; 2(2): 10–15. Published online 2022 June doi.org/10.36647/TTIRAS/02.02.A002

[39] Dr. Shashi Kant Gupta, Dr. A. S. A. Ferdous Alam, "Concept of E Business Standardization and its Overall Process" TJAEE 2022 August; 1(3): 1–8. Published online 2022 August

[40] A. Kishore Kumar, A. Alemran, D. A. Karras, S. Kant Gupta, C. Kumar Dixit and B. Haralayya, "An Enhanced Genetic Algorithm for Solving Trajectory Planning of Autonomous Robots," 2023 IEEE International Conference on Integrated Circuits and Communication Systems (ICICACS), Raichur, India, 2023, pp. 1-6, doi: 10.1109/ICICACS57338.2023.10099994

[41] S. K. Gupta, V. S. Kumar, A. Khang, B. Hazela, N. T and B. Haralayya, "Detection of Lung Tumor using an efficient Quadratic Discriminant Analysis Model," 2023

International Conference on Recent Trends in Electronics and Communication (ICRTEC), Mysore, India, 2023, pp. 1-6, doi: 10.1109/ICRTEC56977.2023.10111903.

[42] S. K. Gupta, A. Alemran, P. Singh, A. Khang, C. K. Dixit and B. Haralayya, "Image Segmentation on Gabor Filtered images using Projective Transformation," 2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC), Mysore, India, 2023, pp. 1-6, doi: 10.1109/ICRTEC56977.2023.10111885.

[43] S. K. Gupta, S. Saxena, A. Khang, B. Hazela, C. K. Dixit and B. Haralayya, "Detection of Number Plate in Vehicles using Deep Learning based Image Labeler Model," 2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC), Mysore, India, 2023, pp. 1-6, doi: 10.1109/ICRTEC56977.2023.10111862.

[44] S. K. Gupta, W. Ahmad, D. A. Karras, A. Khang, C. K. Dixit and B. Haralayya, "Solving Roulette Wheel Selection Method using Swarm Intelligence for Trajectory Planning of Intelligent Systems," 2023 International Conference on Recent Trends in Electronics and Communication (ICRTEC), Mysore, India, 2023, pp. 1-5, doi: 10.1109/ICRTEC56977.2023.10111861.

[45] Shashi Kant Gupta, Olena Hrybiuk, NL Sowjanya Cherukupalli, Arvind Kumar Shukla (2023). Big Data Analytics Tools, Challenges and Its Applications (1st Ed.), CRC Press. ISBN 9781032451114

[46] Shobhna Jeet, Shashi Kant Gupta, Olena Hrybiuk, Nupur Soni (2023). Detection of Cyber Attacks in IoT-based Smart Cities using Integrated Chain Based Multi-Class Support Vector Machine (1st Ed.), CRC Press. ISBN 9781032451114

[47] Parin Somani, Shashi Kant Gupta, Chandra Kumar Dixit, Anchal Pathak (2023). AI-based Competency Model and Design in the Workforce Development System (1st Ed.), CRC Press. https://doi.org/10.1201/9781003357070

[48] Shashi Kant Gupta, Alex Khang, Parin Somani, Chandra Kumar Dixit, Anchal Pathak (2023). Data Mining Processes and Decision-Making Models in Personnel Management System (1st Ed.), CRC Press. https://doi.org/10.1201/9781003357070

[49] Alex Khang, Shashi Kant Gupta, Chandra Kumar Dixit, Parin Somani (2023). Data-driven Application of Human Capital Management Databases, Big Data, and Data Mining (1st Ed.), CRC Press. https://doi.org/10.1201/9781003357070

[50] Chandra Kumar Dixit, Parin Somani, Shashi Kant Gupta, Anchal Pathak (2023). Data-centric Predictive Modelling of Turnover Rate and New Hire in Workforce Management System (1st Ed.), CRC Press. https://doi.org/10.1201/9781003357070

[51] Anchal Pathak, Chandra Kumar Dixit, Parin Somani, Shashi Kant Gupta (2023). Prediction of Employee's Performance Using Machine Learning (ML) Techniques (1st Ed.), CRC Press. https://doi.org/10.1201/9781003357070

[52] Worakamol Wisetsri, Varinder Kumar, Shashi Kant Gupta, "Managerial Autonomy and Relationship Influence on Service Quality and Human Resource Performance", Turkish Journal of Physiotherapy and Rehabilitation, Vol. 32, pp2, 2021.