Educational Administration: Theory and Practice
2024, 30(3), 2762-2769
ISSN: 2148-2403
https://kuey.net/

Research Article

Big Data-Driven Actions And Team Skill Sets: A Framework For Sustainable Business Development

Dhruvitkumar Patel[1*], Priyam Vaghasia[2]

[1*,2]Staten Island Performing Provider System, Mondrian collection, pateldhruvit2407@gmail.com, priyamvaghasia57@gmail.com

Citation: Dhruvitkumar Patel, et al. (2024), Big Data-Driven Actions And Team Skill Sets: A Framework For Sustainable Business Development, *Educational Administration: Theory and Practice*, 30(3), 2762-2769
Doi: 10.53555/kuey.v30i3.8100

ARTICLE INFO

ABSTRACT

In the modern context of the active growth of digitalization, the use of big data in the framework of business development has become the key to success. This paper provides a systematic representation of how big data actions correspond to the core competencies that teams need to enjoy sustained business advancement. It also highlight the importance of data analytics, machine learning and predictive modelling in developing and implementing strategies that are in concordance with sustainable development goals. It also underlines a need of encouraging a data culture within the organizations that implies development of the staff's necessary competencies that would allow to analyze intricate data and extract valuable information. This way, one is able to relate the technical know-how to the strategic use by enhancing business competitiveness and in the process, promoting ecological and social sustainability. This paper also effectively highlights the problems of collecting and analysing big data; the issue of anonymizing data; and the question of ethical use of big data information. In this paper the author provide a real life examples and cases of how companies from different sectors can harness big data to deliver sustainable results. Finally, the framework provides a roadmap for organisations who want to leverage big data in the quest for innovation, the enhancement of business processes, and sustainable performance in a new economy characterised by the proliferation of data.

Keywords: Big Data, Sustainable Development, Data-Driven Actions, Team Skillsets, Business Growth.

1. INTRODUCTION

Big data has therefore become one of the significant keys to future sustainability in the context of today's fast-changing business climate. All kinds of companies within every industry are beginning to prize knowledge-based actions in developing their strategic management plans. Big data is also important when it comes to sustainable business development and this introduction highlights key skills needed in teams for harnessing the big data resource.

1.1 The Role of Big Data in Modern Business

Another form of data that has revolutionized how companies work through insight on the customer, market and operations is big data. As global organisations shifted to digital environment that resulted in massive data collection, organisations currently get data from sundry sources inclusive but not limited to social media platforms, IoT tools, and transactional databases. The torrent of information in this format when appropriately analyzed, helps companies to decode fresh patterns and trends that were 'hidden'. And with the knowledge of these dynamics, more products and services can be made to fit the needs and wants of customers; resulting in higher satisfaction and therefore more loyalty.

On the same note, big data is used in managing the business as it is used in enhancing the customer-oriented approach. Hence, data analysis allows the organization to organize processes, minimize resources, and enhance productivity in general. For instance, big data that has been incorporated in predictive maintenance can anticipate equipment breakdowns without the need for actual occurrence of the vices as a result, cutting

down on both the cost and time that could have been expended on a machine which in most cases is not available due to a breakdown. Big data being used in supply chain management will enable a firm to manage its inventory and delivery chain efficiently and in a way that reduces wastage of resources besides cutting down the time it takes to deliver a certain product to its intended consumer. In integrating big data into the companies' day-to-day operations, organizations then enhance their current outcomes while preparing for disruption to enter their companies in the future.

In 2001, Rubenstein-Montano et al. , state that a framework have to be specified and built for KM to provide a medium for managing organizational knowledge, although they presented the details in theirs table 1, for reference please see Fig 1. In developing this framework there is recognition of the fact that different approaches to knowledge management will be used in different organisations and in different projects and so the proposed framework must be general and capable of being implemented within the context of the different approaches to knowledge management across organisations and in different projects. Because of the general design of these requirements, it leads to a systematic gathering, storage and use of knowledge within organizations, hence making them gain the capacity to make the right decisions for the future development. Combining this kind of approach with big data solutions additionally enhances an organisation's ability to translate data into insights, which can become one of the critical activities in contemporary businesses.

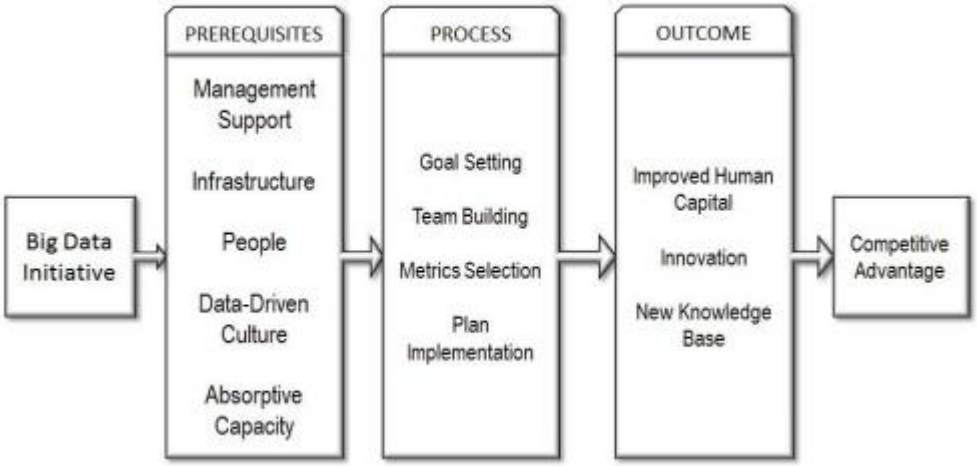

Figure 1: Big data strategy framework

1.2 The Intersection of Big Data and Sustainability

Concern for sustainable development has gone from a marginal consideration to one that is strategic, given the trend toward awareness of the environment as well as pressures of legislation. Big Data an important component of the Fourth Industrial Revolution has a crucial role to fulfill the SDG by helping businesses to monitor their footprint. For example, in manufacturing, data analytics can be applied in managing energy use to make it cheaper while at the same time being environmental friendly. Likewise, big data increases supply chain dynamics, which results in the decreased utilization of resources thus an improvement in the supply chain utilization and hence lesser emissions and waste disposal. In the same way, data enable firms to track resource consumption, and make corrections in order to reduce the effects on environment. Thus, absorbing big data into sustainability processes allows organizations to adapt their activities to the global goals of an environmental nature, striving for the company's positive impact on society and its profitability.

Furthermore, it enables the companies to enhance the sustainability strategies by offering the sophisticated information about the results of their activities. For instance, it is possible to monitor environmental sensors to evaluate measures of pollution control and come up with better solutions that will be informed by data. Further, big data makes it possible to monitor sustainability performance indicators in the supply chain right from acquisition of the inputs to disposal of the final output. Such a perspective allows organisations to see what more they can do to decrease their negative impact on the environment and thus, to set even more challenging goals in the sphere of sustainability. Additionally, using big data, firms can report their sustainability advancements credibility to stakeholders and, therefore, improve companies' image. By the same token, big data is not only an enabler of sustainable business operations but also sustains the process of learning and improvement in the effort toward sustainability.

1.3 The Importance of Data-Driven Actions

In the current world, most of which is blanketed with humongous amounts of data, it is not adequate to make decisions based on snippets of the gut feel or past practices. Actions with the focus on usage of big data, which

imply decision making through the data analysis, are a critical factor affecting the success of the modern business. When employed in big data, decision-making gains the valuable insights that reveal the essence of the organisation's circumstances and thus enhances its efficacy. For example, using predictive analytics, one can predict the trends in the market, and therefore can make preparations for change before they occur. It is especially important for organisations that operate in fields where customer fickle and innovative solutions can quickly become the new norm. Gaining consumers' insights also improves customer interaction through marketing by segmenting demographics, products, and services and improvement in innovations. While integrating data analytical activities in strategic management planning, organisations not only solve current managerial problems but also may think about the compañía's sustainable development.

Performing automated process adds up a lot more to operational effectiveness as compared to non-automated performance as you are more likely to repeat what has been done, eliminating any form of wastage. Huge amounts of data reveal organizational problems and help to solve them using data analysis methods. For instance, in manufacturing, it will be easy to identify areas that slow down the production process, giving ways for organizations to work more efficiently. In supply chain, those insights can predict the most effective routes to carry goods to the intended destinations in an organization, hence saving fuel and transporting at a lesser cost. Also, by data-driven actions, key performance metrics are improved in real-time while keeping them aligned with the organization's strategic plan. When the foundation of an organisational environment promotes the use of data and information in decision making, then the organisations can enhance its processes, introduce innovative changes to its operations and thus exhibiting long-term organisational adaptation in the face of global competition. Datamation defines data-driven decision making as involving six steps, which can be referred to in figure 2 below.

Figure 2: 6 steps Data driven Decision-Making

1.4 Essential Team Skillsets for Big Data Utilization

In his view, big data is best harnessed by cultivating teams with displant and overlapping competencies. Some of these include data analysts who are responsible for making valuable insights out of large volumes of data, data scientists and the machine learning engineers. General data analysts are responsible for processing minified data and spotting patterns, whereas data scientists are able to employ scientific techniques and learn algorithms, computer models to assess potential and discover concealed patterns. While machine learning engineers are the specialists coming up with models that can train themselves on data, and make decisions on their own, which greatly increases the possibilities of data-driven approaches as far as scalability is concerned. Aside from these technical positions, there is a need for professionals with an understanding in data visualization that aims to make derivative figures that are useful for management analysis. These skills combine to provide organisations with a comprehensive suite that empowers them to leverage on big data for business strategies.

Technique is just as important as the ability to think and work in terms of data at every level of the organization. This entails promoting among employees a culture of curiosity and learning, which will help them inquire and discover answers form the data available. Knowing that big data projects require multi-disciplinary effort it is important that teams consist of members from different backgrounds, thus the collaboration will foster development of innovative ideas that will be required to make big data projects work. For instance, integrating the working of marketing personnel with data analysts contributes to the formulation of better marketing strategies. Also, having all employees with the basic data literacy skills helps make the use of data a natural aspect at the workplace with juniors; instead of only a few specialists, not everyone making decisions based on the data collected. Together, it means that organisations will be able to create structures that support efficient use of big data to foster sustainable business performance.

1.5 Challenges in Implementing Big Data Strategies

Despite the prospects of big data being enormous, adopting effective big data solutions is accompanied by a number of issues. It could be argued that one of the biggest issues is data protection as big data makes ethical questions more palpable and attracts regulatory attention. There are numerous rules and regulations aimed at data protection in organizations, for instance GDPR in Europe that gives certain restriction on the collection, storing, processing, and transferring of data. Compliance to these regulations also demand stringent and sound data governance frameworks that enhance the security of the data and retain the customers. Also, organizations have to solve the problem of security as big data systems are rather vulnerable to cyber threats. This remains crucial in data protection and quality since the actions taken depend on data, which if corrupted with, may be lethal. Addressing these issues sums up to the centrality of big data for organisations to harness for ethical and sustainable business purposes.

The fourth problem is the incorporation of big data into the current business processes and structures. The problem of big data is the high number of records and their nature which can be easily beyond the scope of classical IT architectures. As such, organizations may perhaps be compelled to employ a range of suitable big data management technologies such as, cloud, distributed databases, and real-time analysis. Further, the application of big data in decision-making entails various cultural and organisational adjustments and the training of employees in the effective use of tools and technologies. These challenges can sometimes manifest as resource-demanding, that is, demand time and fund input significantly. But the outcome of effective big data strategy—improved organizational performance, superior decisions, and long-run company success, is justified these efforts. Meeting these challenges head on will ensure organisations develop a solid foundation from which they can leverage on big data for growth and market differentiation.

2. REVIEW OF WORKS

From the reviewed works on big data actions and team skillsets for sustainable business development the global approach to how advanced technologies and analytical methods differently redesign the modern manufacturing and business activity can be seen. This review seeks to analyse big data analytics, IoT, CPS and additive manufacturing technologies with emphasis on sustainable and enhanced operations. This paper aims to focus on the current frameworks, methodologies, and issues in the applications of big data in manufacturing: A review by summarizing the recent study and development in these domains. It also presents the future research directions that is intended to elicit new solutions for the existing issues and to enhance the effectiveness of big data for sustainable development. By adopting synthesis of literature in this review, the paper aims at providing correlated findings of how technological advancement can be embraced to enhance sustainable practices and business performances among the various businesses.

2.1 Big Data Analytics in Sustainable Smart Manufacturing

The integration of big data analytics in different stages of the product life cycle has become an important strategy that forms the centerpiece for improving smart manufacturing for sustainability. Ren et al. (2019) offer a survey paper that discusses the big data analytics across product development in different stages of the product and provides information on the framework of BDA, the challenges, as well as suggestions for future research. The study also stresses the importance of timely processing of the data and performing predictive analysis with regard to manufacturing processes and the usage of resources. Along the same line, Cui, Zhao, and Qiu (2020) present the creation of a manufacturing big data ecosystem where the authors provide a literature review of the existing studies and outline the major issues that should be overcome to enhance the usage of big data in manufacturing.

It has also established that big data-driven approaches are essential in decision-making processes especially in cases of sustainable manufacturing. Zhang et al. (2017) and Zhong and others authors (2015) clearly pointed out on the importance of big data application into the cleaner production processes where application of advanced analytics would help in decreasing the environmental impact from manufacturing activities. These findings indicate that there is a need to advance the scope and sophistication of modelling and algorithmic research so as to enhance the capability of predicting and orchestrating resource utilisation so that future manufacturing systems are more sustainable.

2.2 Internet of Things (IoT) and Cyber-Physical Systems (CPS) in Manufacturing

Hereby the Internet of Things (IoT) and Cyber-Physical Systems (CPS) are seen to play a crucial role in enhancing the smart manufacturing, especially if linked with big data analysis. Owing to the advent of IoT, Liu, Yang, and Dong (2019 posit an IoT-enhanced dynamic optimisation scheme for optimizing smart vehicles and logistics tasks in the manufacturing firms. It also facilitates continuous observation and management of the production procedures hence increasing resource utilization and reduction of wastage. Wang et al. (2020) extend from this by proposing a proactive material handling that enhances CPS-enabled shop floors; in proving how IoT and CPS can be used to design manufacturing systems that are more pro-active and sensitive.

The integration of the Internet of Things and Cyber-Physical Systems with big data analytics presents a lot of possibilities for the improvement of manufacturing systems especially in terms of operations performance and productivity. Several researchers importantly explain the nature of Cyber-Physical Systems in Industry 4. 0 based manufacturing system by elaborating on how these systems enable the integration or data at almost all levels of manufacturing. It is essential for creating smarter and self-governed or self-optimized decision-making frameworks to enhance productivity and sustainability criteria in the manufacturing system.

2.3. Additive Manufacturing and Sustainability

The manufacturing process that has received a lot of attention due to its ability to overcome established norms of manufacturing and enable sustainability is Additive Manufacturing also known as 3D printing. Peng et al. (2018) offer a background on energy demand and the environmental footprint of AM, and citing benefits from using AM because of its less requirement for raw material and energy use than the traditional manufacturing . Thus, the study underlines the need to improve the AM processes in order to capitalise on the sustainability potential of the technology (especially with regard to the CO2 emissions associated with production activities).

The sustainability of additive manufacturing is examined by another source by Ford and Despeisse (2016) to provided an exploratory account of the opportunities of and the difficulties presented by the technology. They state that while regarding to additive, manufacturing, it can offer a huge potential for waste and resource minimization, there are still several barriers that should be overcome such as high energy intensity of some of the processes and requirement for more environmentally friendly materials. Bechmann (2014) shares these views stated that future of AM would depend on the innovation of new material and technologies for better sustainability perspective.

2.4 Energy Management and Environmental Impact in Manufacturing

Energy management is the key factor for attaining sustainability of manufacturing especially in the big data and IoT systems. According to Shrouf, Ordieres and Miragliotta (2015), on the IOT-enabling of energy management practices in production management, there is the following framework for adoption. It is a sophisticated system that can be used for time-bound energy control and efficient reduction of the environmental footprint of manufacturing processes. Importantly, the research emphasizes the prospects of IoT-based EMS as the tool that can help achieve a raised level of energy efficiency with Big Data support.

Manufacturing processes and their sustainability footprint is an important area of research and several prior have investigated on the application of big data and advanced analytics for the same. Zhou, Fu, and Yang (2016) expostulate on energy big data analysis in relation to analyzing behaviour of global household energy consumption and provides insights that are plausible in the manufacturing domain. From the analysis of large datasets of the energy use, the manufactures can determine the pattern and trends hence reducing energy wastage which is environmentally sensitive.

Despite the huge opportunities that big data analytics presents there are several barriers that needs to be overcome to unlock the potential of the technologies in enhancing manufacturing practices. In a survey of big data application and PLM, Ren et al. (2019) have categorized the following eight challenges: Security – Data Integration – Scalability – More intelligent – Integration with other application systems. These challenges show that more research and development should be conducted on this area to make it possible to implement big data driven strategies in manufacturing industry.

Some of such perspectives on future research directions in big data-aided manufacturing are also mentioned by several of the authors in as much as they stress on the continued research and development and interdisciplinary knowledge-sharing of ideas. In the same way, Zhang et al. (2017) put forward a PLM framework for big data analysis and indicate that there is a greater potential for deeper study on the advanced models and algorithms for forecast of resources. Scholars Zhong, Xu, and Klotz (2015) also calls for further research to address a much more socially integrated implementation of big data analytics, IoT and CPS for contributing to sustainable manufacturing.

3. PROPOSED METHODOLOGY

By using a systematic literature synthesis method, this present review aims at analysing the existing knowledge in the literature on big data-driven actions and team skills for sustainable business development. The method helps to organize an extensive analysis of the studies that address the IT ecosystem and technologies' integration, such as Big Data Analytics, IoT, CPS, and Additive Manufacturing. As one can see, each stage of the synthesis is designed to offer an evenly skilled and comprehensive evaluation.

The survey involved articles, journals, and conference papers only in the last ten years only. There are phrases like 'Big Data Analytics', 'Internet of Things', 'Cyber Physical Systems', 'Additive Manufacturing' were used as

search terms within various academic databases. This approach helped in attaining a wide and the most diverse array of the appropriate literature.

3.1 Criteria used in selecting and evaluating of studies

The criteria adopted for the selection of the relevant studies involved an analysis to determine how each of the incorporated technologies is integrated within the manufacturing and business context for sustainability. In the light of these investigations, the review discussed issues of efficiency and innovation in sustainable practices. An appraisal of the findings that were presented in all the studies made it possible to determine major developments and advancements.

3.2 Data Sorting and Integration

The collected data were put in an orderly manner and organized so as to enable comparison of different findings on the selected research works. It consisted in analyzing similarity and difference of the given phenomena, comparison of approaches, and understanding the application of different technologies. This ensured there was integration of result hence increased ability to compare from one data to another.

3.3 Trend Analysis and knowledge of Existential holes

The last stage of the given methodology was to recognize new trends in the given field of study and existing research gaps. Due to the comparison of the results of various studies, the overview reveals the research gaps, as well as the gaps in the current state of knowledge. This step is important for the definition of research agendas in the future.

4. RESULTS AND DISCUSSION

4.1 Enhanced Manufacturing Efficiency through Big Data Analytics

It can be underscored that big data analytics has greatly enhanced efficiency in manufacturing by allowing monitoring and prediction of equipment failure. Big data tools in the integration facilitates production analysis processes because it produces detailed information hence betters decision making. Kaplan, as well as work of Ren et al. (2019) illustrate that the frameworks also enable definition of the areas of inefficiency and potential for failures beforehand. This kind of real-time prediction capability assists in avoiding losses of time, less waste production and overall enhancement of efficiency. Optimization of resources as well as making right decisions, with the help of massive amount of data from different sources brings cost reductions as well as improvements in the operating performance of manufacture companies.

4.2 Advancements in IoT and CPS Integration

Internetworking of IoT and CPS has revolutionized manufacturing with smart connected devices and systems. Liu, Yang, and Dong (2019) and Wang and et al. (2020) give a concept on how IoT-based systems achieved dynamic optimal resource and material flow on smart shop floors. These technologies enable a smooth transition of data between physical and virtual systems hence make the manufacturing processes to be more responsive and elastic. The data collected by the IoT sensors and CPS components in real-time improves the visibility and management of the production processes and leads to optimisation and sustainability.

4.3 Sustainability Benefits of Additive Manufacturing

By saving the material and allowing the production to be done on demand, the AM has numerous sustainability advantages. AM technologies help solve the problem of environmental sustainability according to Peng et al. (2018), and the same is echoed by Ford and Despeisse (2016) and their views on the impact of AM technologies. The feature of manufacturing that allows for producing parts on demand decreases stocks and decreases the general environmental impact of creation processes. Further, the latest achievements in AM material and methods bring more benefits for the AM processes as being energy-efficient and sustainable manufacturing process.

However, there is not lack of challenges when integrating and analyzing big data. Ren et al. (2019), Zhang et al. (2017) mention such challenges as security of data, problems associated with integration, and require higher level of analytical capabilities. The following are some of the challenges that may reduce the efficiency of use of big data in manufacturing: Data privacy is something that must be properly addressed, as well as the problem of how different systems should interact with each other, which is also related to the improvement of the companies' analytical capabilities. Solving these problems is crucial to the potential of big data to maximise the efficiency and sustainability of manufacturing.

Also, future work on the big data implementation in the manufacturing sector is concerned with existing gaps and new opportunities for development. New directions are seen in the enhancement of the big data and presage rituals for data processing and reducing the IoT and CPS integration, as well as a consideration of new materials and approaches to the AM technology. Dang et al (2016) and many more scholars including Zhong,

Xu, and Klotz, (2015) confirm that there is a need to advance innovation as a way of mitigating the present hitches with the objective of enhancing the application of big data in manufacturing systematically. New research will probably be directed on refining of analytical decision of the supply network, integration of system of systems, and progression of sustainable production through technology.

5. CONCLUSION

In summary, one is inclined to state that the reshaping of big data analytics, IoT, CPS, and additive manufacturing is a new connotation of sustainability in business advancement. As it has been noted in the review, there are large advances in the actual manufacturing process, advances in sustainability and issues regarding data integration and analysis. Data mining has been seen to enhance operation productivity through identification of failures in equipment and through the IoT and CPS, dynamic and interconnected manufacturing resources are enhanced. Manufacturing of part and products contributes to sustainability because Additive manufacturing has the ability to reduce material usage.

However, there are challenges such as; security and safeguard of data, complexity of integrated systems and the need to analyse more intricate systems. These challenges have to be addressed to allow big-data benefits to be achieved for manufacturing as well as for overall achievement of sustainable development goals. More investigations should be focused at managing these limitations, the new ideas and an enhanced integration of the new technologies to enhance the manufacturing and eco-effectiveness. This review has unveiled the fact that the quest to enhance the level of technology in all the SO business sectors will be helpful in achieving efficient management of the environment and improved organizational objectives. As it is mentioned in the given article, the opportunities of big data usage in business actions is discussed at the present, though, undoubtedly, more efforts at the level of R&D will help to increase the effectiveness of the given actions and to increase the sustainability of business development.

REFERENCES

[1]. Ren, S., Zhang, Y., Liu, Y., Sakao, T., Huisingh, D., & Almeida, C. M. V. B. (2019). A comprehensive review of big data analytics throughout product lifecycle to support sustainable smart manufacturing: A framework, challenges and future research directions. *Journal of Cleaner Production, 210,* 1343-1365.

[2]. Liu, S., Yang, M., & Dong, Y. (2019). An 'Internet of Things' enabled dynamic optimization method for smart vehicles and logistics tasks. *Journal of Cleaner Production, 214,* 175-184.

[3]. Wang, W., Ding, Y., Sun, J., Bi, Z., & Xu, P. (2020). A proactive material handling method for CPS enabled shop-floor. *Robotics and Computer-Integrated Manufacturing, 63,* 101891.

[4]. Cui, Y., Zhao, Y., & Qiu, J. (2020). Manufacturing big data ecosystem: A systematic literature review. *Robotics and Computer-Integrated Manufacturing, 66,* 101972.

[5]. Lu, Y., Xu, X., & Xu, J. (2020). Digital Twin-driven smart manufacturing: Connotation, reference model, applications and research issues. *Robotics and Computer-Integrated Manufacturing, 61,* 101837.

[6]. Li, S., Xu, L. D., & Zhao, S. (2018). Internet of Things: A survey. *Journal of Industrial Information Integration, 2,* 1-9.

[7]. Liu, B., Zhang, Y., Zheng, R., Li, C., Xu, Y., & Xu, Z. (2019). Edge-cloud orchestration driven industrial smart product-service systems solution design based on CPS and IIoT. *Advanced Engineering Informatics, 42,* 100973.

[8]. Peng, T., Kellens, K., Tang, R., Chen, C., & Chen, G. (2018). Sustainability of additive manufacturing: An overview on its energy demand and environmental impact. *Additive Manufacturing, 21,* 694-704.

[9]. Urhal, P., Kulkarni, V., & Joshi, S. (2019). Robot assisted additive manufacturing: A review. *Robotics and Computer-Integrated Manufacturing, 58,* 69-80.

[10]. Jakkani, Anil Kumar, Premkumar Reddy, and Jayesh Jhurani. "Design of a Novel Deep Learning Methodology for IOT Botnet based Attack Detection." International Journal on Recent and Innovation Trends in Computing and Communication Design 11 (2023): 4922-4927.

[11]. Michel, F., Thiel, J., & Stein, M. (2019). A modular path planning solution for Wire + Arc Additive manufacturing. *Robotics and Computer-Integrated Manufacturing, 60,* 23-34.

[12]. Dutta, B., & Froes, F. H. (2016). Additive manufacturing technology. In Froes, F. H., & Dutta, B. (Eds.), *Additive manufacturing of titanium alloys* (pp. 11-30). Butterworth-Heinemann.

[13]. Srivastava, P. K., and Anil Kumar Jakkani. "Non-linear Modified Energy Detector (NMED) for Random Signals in Gaussian Noise of Cognitive Radio." International Conference on Emerging Trends and Advances in Electrical Engineering and Renewable Energy. Singapore: Springer Nature Singapore, 2020.

[14]. Li, Z., Zhang, Z., & Ding, S. (2019). Prediction of surface roughness in extrusion-based additive manufacturing with machine learning. *Robotics and Computer-Integrated Manufacturing, 57,* 488-495.

[15]. Xiong, J., Zhang, G., & Guo, Y. (2019). Increasing stability in robotic GTA-based additive manufacturing through optical measurement and feedback control. *Robotics and Computer-Integrated Manufacturing, 59,* 406-414.
[16]. Srivastava, Pankaj Kumar, and Anil Kumar Jakkani. "FPGA Implementation of Pipelined 8× 8 2-D DCT and IDCT Structure for H. 264 Protocol." 2018 3rd International Conference for Convergence in Technology (I2CT). IEEE, 2018.
[17]. Ngo, T. D., Kashani, A., Imbalzano, G., Nguyen, K. T. Q., & Hui, D. (2018). Additive manufacturing (3D printing): A review of materials, methods, applications and challenges. *Composites Part B: Engineering, 143,* 172-196.
[18]. Srivastava DP. Prof. Anil Kumar Jakkani,"Android Controlled Smart Notice Board using IOT". International Journal of Pure and Applied Mathematics.;120(6).
[19]. Sugavaneswaran, M., & Arumaikkannu, G. (2014). Modelling for randomly oriented multi-material additive manufacturing component and its fabrication. *Materials & Design, 54,* 779-785.
[20]. Wits, W. W., & Becker, H. (2016). How Additive Manufacturing Enables more Sustainable End-user Maintenance, Repair and Overhaul (MRO) Strategies. *Procedia CIRP, 55,* 360-365.
[21]. Racharla, Mr Sathya Prakash, Mr Kontham Sridhar Babu, and Anil Kumar Jakkani. "An Iterative approach for the Restoration of Motion Blurred Images."
[22]. Bechmann, F. (2014). Changing the future of additive manufacturing. *Metal Powder Report, 69*(1), 12-16.
[23]. Qian, C., Zhang, J., Song, S., Lu, J., & Liu, Y. (2020). A real-time data-driven collaborative mechanism in fixed-position assembly systems for smart manufacturing. *Robotics and Computer-Integrated Manufacturing, 62,* 101866.
[24]. Jiang, J., Lan, Y., & Ding, L. (2019). Optimization of process planning for reducing material waste in extrusion based additive manufacturing. *Robotics and Computer-Integrated Manufacturing, 57,* 78-88.
[25]. Mahajan, Lavish, Rizwan Ahmed, Raj Kumar Gupta, Anil Kumar Jakkani, and Sitaram Longani. "DESIGN OF WIRELESS DATA ACQUISITION AND CONTROL SYSTEM USING LEGO TECHNIQUE." International Journal of Advance Research in Engineering, Science & Technology 2, no. 5 (2015): 352-356.
[26]. Brundage, M. P., Sexton, T., & Morris, K. C. (2018). Analyzing environmental sustainability methods for use earlier in the product lifecycle. *Journal of Cleaner Production, 187,* 877-892.