



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 3, March 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com



A Review on Smart Technologies in Manufacturing Industry

Neha Sharma

Lecturer, Department of Mechanical Engineering, Govt. Polytechnic College, Alwar, Rajasthan, India

ABSTRACT: The field of information and communication technology is experiencing rapid growth, with several technologies emerging. These include cloud computing, Internet of things (IoT), big data and artificial intelligence (AI). Adaptation to these technologies is a critical aspect for industries, presenting numerous opportunities and challenges. They provide potential for economic growth. The paper discusses a review on smart technologies in manufacturing industries.

KEYWORDS: Smart Technologies, Artificial Intelligence, Industries

I. INTRODUCTION

Due to growing pressure on manufacturing industries, they are transforming themselves towards digitization and adopting smart technologies. Moreover, with the help of Internet of things (IOT), Artificial Intelligence (AI) and machine learning (ML) techniques manufacturing sectors have been transforming by incorporating better visibility, flexibility and operational competence in the supply chain process (Dhanabalan, 2018). These technologies are permeating the manufacturing industry and make it smart and capable of addressing current challenges, such as increasingly customized requirements, improved quality, and reduced time to market (Rittinghouse, 2016). Smart manufacturing (SM), a term originated in the United States but increasingly used globally, has gained significant momentum in industry and academia in recent years (Mittal, 2019). Smart manufacturing is a transformative concept that integrates cutting-edge technologies to enhance efficiency, adaptability and productivity within factories and across the entire manufacturing supply chain. Smart manufacturing aims to convert data acquired across the product lifecycle into manufacturing intelligence in order to yield positive impacts on all aspects of manufacturing (Zheng, 2017). Smart manufacturing rely on interconnected digital-physical systems. These systems include intelligent robots and machines capable of self-diagnosis and early failure warnings.

II. SMART MANUFACTURING SYSTEMS

A variety of characteristics, technology and enabling factors are associated with smart manufacturing. These systems are connected to achieving a reliable and adaptive process or system (Abubakr, 2020). Figure 1 presents the framework of smart manufacturing.

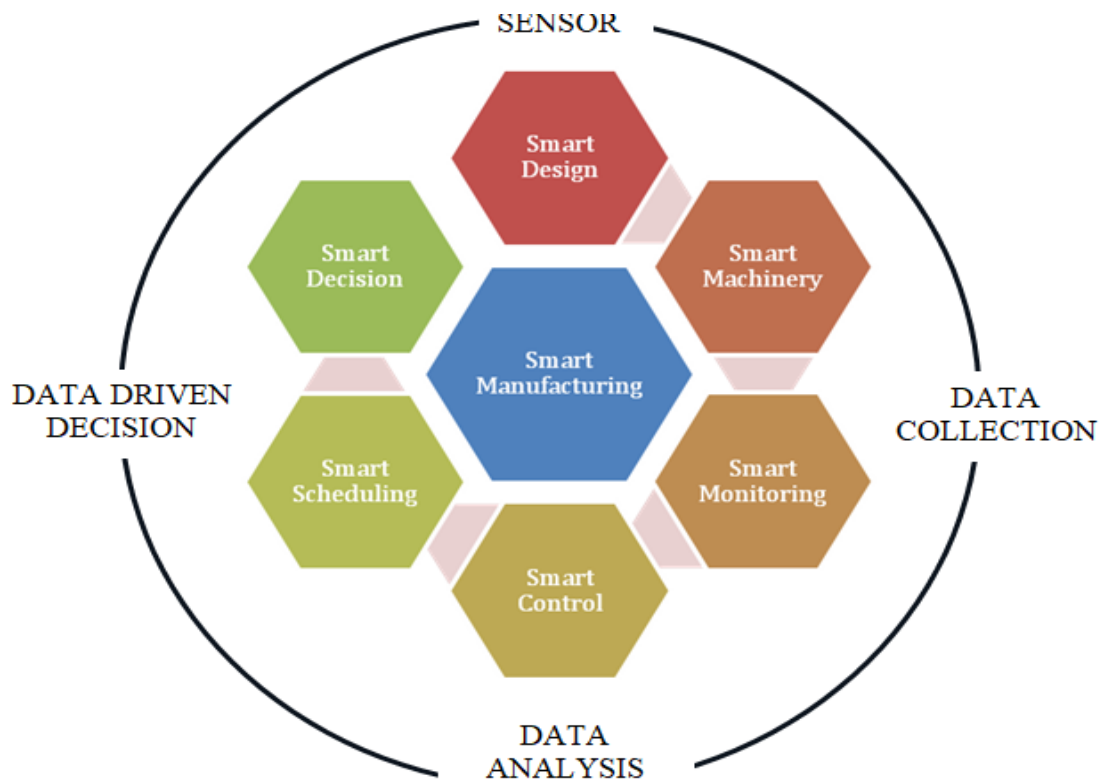


Figure 1: Framework of smart manufacturing

1. **Smart design:** Traditional designs have been upgraded and have become smart. Designs that were initially on paper have been digitized and are now becoming even smarter with virtual reality and augmented technologies. Design software, such as computer-aided design (CAD) and computer-aided manufacturing (CAM), can now interact with smart physical prototype systems in real time via 3D printing integrated (Kolarevic, 2004)
2. **Smart machinery:** It not only optimize production processes but also monitor their own health, enabling proactive maintenance. This machinery empowers machine operators, line supervisors, engineers to make informed decisions based on real-time data. Some of the key examples of smart manufacturing are: Advanced robotics, 3D printing, integration of artificial intelligence.
3. **Smart monitoring:** Monitoring is an important aspect in the operation, maintenance, and optimal scheduling of manufacturing systems (Janak, 2015). The widespread deployment of various sensors has made smart monitoring possible. For example, data on various manufacturing objects, such as temperature, electricity consumption, vibrations, and speed, can be obtained in real time. Smart monitoring provides not only a graphical visualization of these data but also alerts when abnormality occurs in machines or tools (Zheng, 2017). The data is often captured by sensors or devise connected to manufacturing equipment. The information gathered can then be analyzed to improve efficiencies and optimize production. By leveraging real-time insights, manufacturers can enhance decision-making and proactively address issues, ultimately driving innovation and productivity in the manufacturing industry.
4. **Smart control:** In industry smart control refers to using real-time data and technology to enhance control and decision-making within production processes. Smart control is mainly executed to manage various smart machines or tools physically through a cloud-enabled platform (Makarov, 2014). Example, end users can switch off a machine or robot via their smart phones (Wang, 2013). When conditions change (demand, material variation), smart control adapts production parameters. Smart controls empower manufacturers to make informed decisions and optimize production. Decisions can then be timely reflected in frontline manufacturing sites, such as robot-based assembly lines or smart machines (Zheng, 2017)

5. **Smart scheduling:** Smart scheduling primarily relies on sophisticated models and algorithms to extract insights from sensor-captured data. Utilizing data-driven techniques and advanced decision-making frameworks facilitates the implementation of intelligent scheduling. One instance is the deployment of distributed smart models with a hierarchical interactive structure for dependable real-time scheduling and execution (Marzband, 2016). This approach enables automatic and efficient execution of production behaviors and processes due to well-established frameworks and services. Feedback on output resolutions is then provided to relevant parties through various data input mechanisms.
6. **Smart decision-making:** Intelligent decision-making is pivotal in manufacturing Industry, with the primary objective being the implementation of extensive sensor networks to enable informed decision-making through comprehensive data acquisition. Achieving intelligent decision-making necessitates real-time information exchange and collaborative efforts. Big data and its analytics hold significant importance in tasks related to intelligent decision-making, encompassing data-driven modeling and predictive maintenance enabled by data. Various technologies, such as Cyber-Physical Systems (CPS), big data analytics, cloud computing, modeling, and simulation, collectively contributes to the realization of intelligent decision-making.

III. CONCLUSION

In summary smart processes at each stage of manufacturing represent a shift toward data-driven, adaptable and interconnected production systems. Some of the benefits of smart manufacturing are streamlined processes, competitive edge and preparedness for the future. As technology continues to evolve, smart manufacturing will play a pivotal role in shaping the future of industry. Advanced sensor technologies are used widely in manufacturing systems to increase information visibility and system controllability. With the help of faster computers, smarter machines, smaller sensors, cheaper data storage and transmission could make machines and products smarter to communicate with each and learn from each other. Smart technologies are also emerging towards robotic technology to reduce the involvement of human machines and human workload.

REFERENCES

1. Abubakr M, Abbas AT, Tomaz I, Soliman MS, Luqman M, Hegab H. Sustainable and smart manufacturing: an integrated approach. Sustainability. 2020 Mar 14;12(6):2280.
2. Dhanabalan T, Sathish A, Transforming Indian Industries Through Artificial Intelligence and Robotics in Industry4.0., International Journal of Mechanical Engineering and Technology, 9(10), 2018, pp. 835–845
3. Janak L, Hadas Z. Machine tool health and usage monitoringsystem: An initial analyses. MM Science Journal, 2015, 2015(4):794–798
4. Kolarevic B. Architecture in the digital age: Design and manufacturing. Abingdon: Taylor & Francis, 2004
5. Makarov O, Langmann R, Nesteresko S, et al. Problems of the timedeterministic in applications for process control from the cloud.International Journal of Online Engineering, 2014, 10(4): 70–73
6. Marzband M, Parhizi N, Savaghebi M, et al. Distributed smartdecision-making for a multimicrogrid system based on a hierarchicalinteractive architecture. IEEE Transactions on Energy Conversion , 2016, 31(2): 637–648
7. Mittal S, Khan MA, Romero D, Wuest T. Smart manufacturing: Characteristics, technologies and enabling factors. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture. 2019 Apr; 233(5):1342-61.
- 8.Rittinghouse J W, Ransome J F. Cloud Computing: Implementation,Management, and Security. Boca Raton: CRC Press, 2016
- 9.Tao F, Qi Q, Liu A, Kusiak A, Data-driven smart manufacturing. Journal of Manufacturing Systems, 2018
- 10.Wang L H. Machine availability monitoring and machining process planning towards cloud manufacturing. CIRP Journal of Manufacturing Science and Technology, 2013, 6(4): 263–273
- 11.Zheng P, Wang H, Sang Z, Zhong RY, Liu Y, Liu C, Mubarak K, Yu S, Xu X. Smart manufacturing systems for Industry 4.0: Conceptual framework, scenarios, and future perspectives. Frontiers of Mechanical Engineering. 2018 Jun; 13:137-50.
- 12.Hui Yang, Soundar Kumara, Satish T.S. Bukkapatnam, Fugee Tsun: The Internet of Things for Smart Manufacturing: A Review, January 2019IIE Transactions
13. Sameer Mittal Muztoba Ahmad Khan David Romero Thorsten Wuest Smart Manufacturing: Characteristics, Technologies and Enabling Factors April 2019 Proceedings of the Institution of Mechanical Engineers Part B Journal of Engineering Manufacture 233(5):1342-1361
14. Mohammed Saqlain INDUSTRY 4.0 -A technology of the future world at a glimpse December 2019



**Impact Factor:
7.512**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details