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## ROLE OF INDUSTRIAL ENGINEERING IN VIKSIT BHARAT 2047

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### Abstract

*Industrial Engineering (IE) is closely linked to the objective of “VIKSIT BHARAT 2047,” which endeavors to foster the progress and success of the nation through the development of environmentally sustainable industrial practices, implementation of advanced manufacturing processes, and effective supply chain management. This article examines the significant role of Industrial Engineering in steering India towards the ambitious vision of VIKSIT BHARAT by 2047, a milestone year that will mark a century of independence. It relates the function of industrial engineering to the nation’s transition to VIKSIT BHARAT. By means of manufacturing process optimization and production system enhancement, IE guarantees increased efficiency, decreased wastage, and on-time delivery of products. By means of integrating the latest technologies and sustainability initiatives, IE positions India as a global manufacturing centre and stimulates economic growth.*

**Keywords:** VIKSIT BHARAT 2047; Industrial Engineering, Vision; Pillars; Policy-guidelines

### 1. INTRODUCTION

This article explores the fundamental aspects of India’s ambitious initiative, “VIKSIT BHARAT 2047,” which aims to bring about a significant transformation in the future of the nation. It outlines the main themes, pillars, and primary goals of this effort. VIKSIT BHARAT, which means “Developed India,” seeks to accelerate the nation’s progress by promoting holistic development across economic, social, and environmental aspects. The core of this vision revolves around the concepts of novelty, durability, inclusiveness, and advancement. Industrial engineering plays a vital role in achieving the goals of VIKSIT BHARAT. Industrial engineering provides an organized strategy for enhancing productivity, efficiency, and quality in different industries by improving systems, processes, and resources. Industrial engineering plays a crucial role in promoting innovation, improving efficiency, and enhancing competitiveness by using methods like lean manufacturing, supply chain optimization, and process re-engineering.

As India works towards its goal of becoming a worldwide economic strength by the year 2047, which is referred to as “VIKSIT BHARAT 2047,” the function of industrial engineering emerges as a critical aspect in the process of accomplishing this ambitious vision. Because of its emphasis on the optimization of complex systems and processes, industrial engineering plays a crucial part in the promotion of efficiency, innovation, and sustainability across a wide range of economic sectors (Singh et al., 2024). Industrial engineering plays a pertinent role in boosting productivity, quality, and competitiveness across a wide range of industries, including

manufacturing, healthcare, transportation, and energy. As a result, India is making faster progress towards its objective of achieving economic prosperity and growth. Within the framework of VIKSIT BHARAT 2047, this article investigates the relevance of industrial engineering. In it, the numerous ways in which industrial engineering approaches, tools, and practices might help to realize India’s goal of economic growth, social development, and technical progress are investigated in depth. The purpose of this paper is to illustrate the transformational potential of industrial engineering in influencing the future of India’s industrial landscape. This will be accomplished by evaluating important areas such as production optimization, supply chain management, infrastructure development, and technology innovation.

### 2. VIKSIT BHARAT @2047

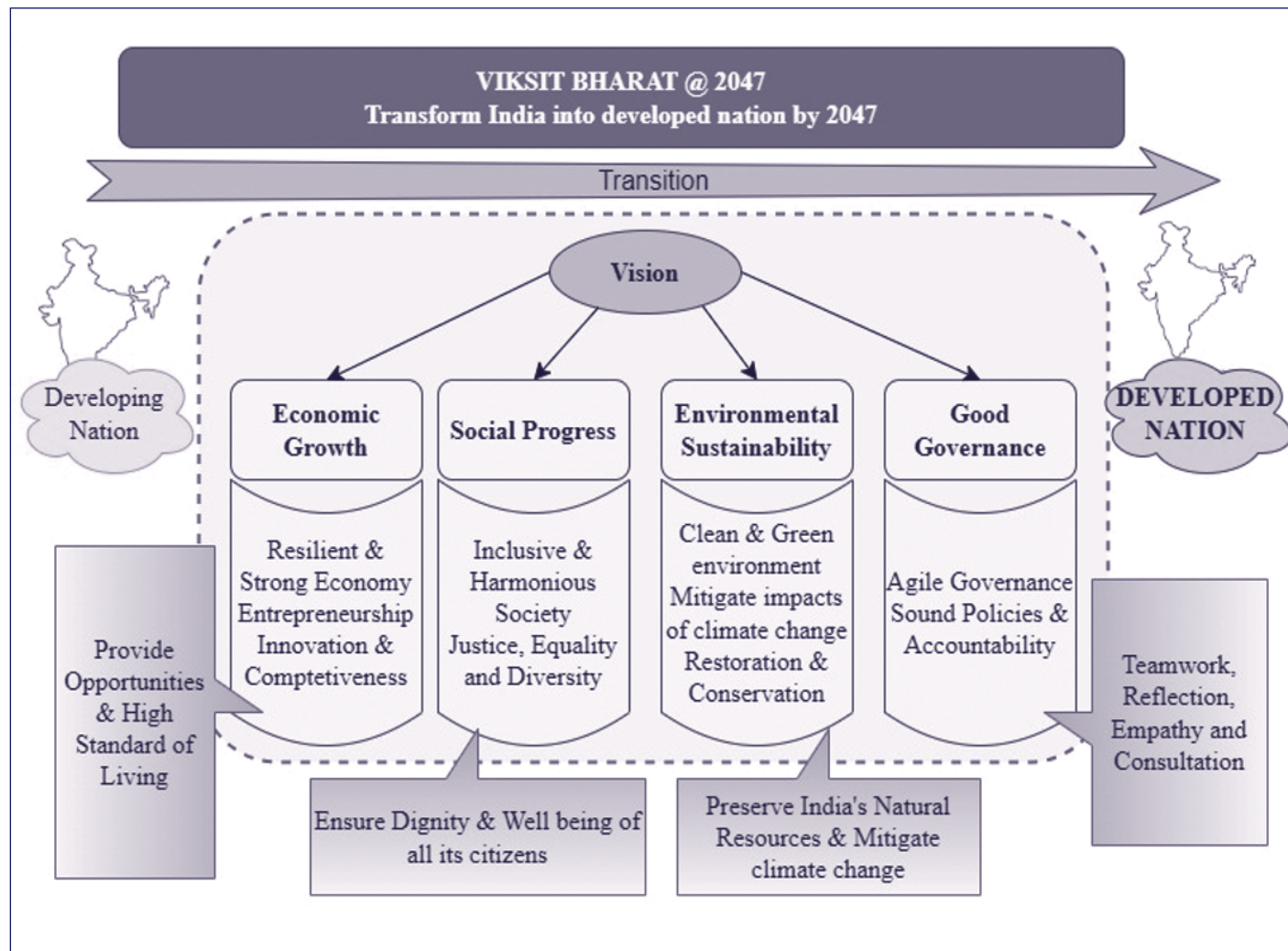
India, as one of the most extensive and most populated nations globally, has significant prospects for economic, social, and cultural advancement (Srivastava, 2023). Throughout the years, numerous kinds of initiatives, policies, and programs have been implemented with the objective of promoting economic development, alleviating poverty, and enhancing the well-being of its population. The primary objective is to convert India into a developed country that flourishes via innovation, sustainability, and inclusion. Industrial Engineering (IE) plays a crucial role in achieving the goal of VIKSIT BHARAT 2047.

**2.1 Vision of VIKSIT BHARAT:** Nirmala Sitharaman, the Minister of Finance, emphasized Prime Minister Narendra Modi’s vision for building a developed India by the year

2047 in the Interim Budget for 2024. This vision is referred to as VIKSIT BHARAT (Shown in Figure 1). In addition to highlighting the government’s dedication to inclusive development, she emphasized the active efforts that are being made to convert India into a developed country and to prioritise the empowerment of its people (Narayana, 2024). The objective of the VIKSIT BHARAT initiative is to create a prosperous India that harmoniously blends contemporary infrastructure with the

natural environment, so guaranteeing that inhabitants from all areas have equal chances to realise their full potential. In the introduction of “VIKSIT BHARAT @2047: Voice of Youth,” which took place on December 11, 2023, the Prime Minister emphasised the crucial role that educational institutions play in the formation of individuals and emphasised that a country is considered to be really developed when its people experience growth.

Figure1. Vision of VIKSIT BHARAT 2047



**2.2 Pillars of VIKSIT BHARAT:** VIKSIT BHARAT , which means “Developed India,” is the government’s aspiration to raise the nation to developed level by its 100th year of independence in 2047. The core principles of VIKSIT BHARAT are founded on four fundamental pillars: Youth (Yuva), Poverty (Garib), Women (Mahila), and Agriculture (Kisan).

**2.2.1 Yuva (Youth)**

The “Youth” pillar of VIKSIT BHARAT emphasises the crucial significance of India’s youthful population in determining the future of the country. This pillar has a primary objective of providing young people with the necessary skills and resources to succeed in a constantly changing environment by emphasising education, skill development, and job opportunities. VIKSIT BHARAT aims to harness the potential of India’s young

as catalysts for innovation, economic development, and social advancement via investments in educational reforms, vocational training programs, and entrepreneurial assistance.

**2.2.2 Garib (Poor)**

The “Poor” pillar of VIKSIT BHARAT focuses on alleviating poverty and socio-economic inequalities by providing specific aid and support to marginalised populations. This pillar focuses on prioritising the availability of fundamental needs such as sustenance, housing, medical care, and learning opportunities. Its objective is to elevate those who are poor and enhance their overall well-being. VIKSIT BHARAT aims to establish a more egalitarian society by implementing poverty alleviation schemes, social welfare programs, and efforts for cheap housing and healthcare. The goal is to provide equal opportunities for

all individuals to prosper and achieve their full potential.

### 2.2.3 Mahila (Women)

The “Women” pillar of VIKSIT BHARAT emphasises the significance of gender equality, the empowerment of women, and the advocacy for women’s rights in fostering social and economic progress. This pillar aims to provide an inclusive environment where women are afforded equal opportunity in education, work, and leadership positions by tackling challenges such as gender-based violence, discrimination, and inequality. VIKSIT BHARAT seeks to fully harness the potential of women as catalysts for societal change and advancement by implementing gender-sensitive policies, enacting legislative changes, and launching projects to improve women’s education, skills, and economic empowerment.

### 2.2.4 Kisan (Farmers)

The “Farmers” pillar of VIKSIT BHARAT prioritises the agricultural sector, acknowledging its essential role in guaranteeing food security, rural livelihoods, and sustainable development. This pillar seeks to strengthen the resilience and prosperity of rural communities by increasing agricultural output, assuring farmer welfare, and encouraging sustainable farming techniques. VIKSIT BHARAT aims to equip farmers to succeed in a highly competitive and ever-changing environment by implementing agricultural reforms, investing in irrigation and infrastructure, providing access to loans and insurance, supporting technology and market connections.

**2.3 VIKSIT BHARAT Theme:** The concepts of VIKSIT BHARAT represent a holistic vision for the future of India, covering social empowerment, economic success, and technical growth. This theme intends to accelerate India’s progress towards becoming a developed country by 2047 with a focus on empowering people, promoting innovation, and establishing a vibrant economy driven by science and technology.

**2.3.1. Empowered Indians:** The empowerment of all people of India is emphasised by topic, which ensures that every individual has access to the opportunities, resources, and rights that are important for both individual and community development. It includes programs that strive to improve education, healthcare, and social welfare in order to elevate underserved areas and provide people the ability to realize their full potential that they have. To develop inclusion, equality, and social justice in Indians is to create an environment in which every person has the sense that they are empowered to contribute to the success and prosperity of the country.

**2.3.2 Thriving and Sustainable Economy:** The development of a healthy and resilient economy that encourages prosperity, the creation of jobs, and sustainable growth is the primary emphasis of this initiative. This entails the implementation of policies and activities with the purpose of stimulating innovation, encouraging entrepreneurial endeavours, and attracting investments in order to propel economic growth. The efforts that are made to enhance major sectors of the economy, such as manufacturing, agriculture, services, and infrastructure, in order to maintain long-term prosperity and stability are

included in an economy that is flourishing and sustainable.

**2.3.3. Innovation, Science & Technology:** This theme emphasises the significance of science, technology, and innovation in fostering global competitiveness and advancement. It entails the cultivation of an innovative culture, the allocation of resources towards research and development, and the utilization of state-of-the-art technologies to tackle societal issues and stimulate economic expansion. Technological progress is widely recognized as a driving force behind transformative shifts in various industries, particularly in the domains of intelligent solutions, digital infrastructure, education, and governance. Innovation, science, and technology are pivotal factors in propelling progress in diverse sectors such as healthcare, education, agriculture, and industry. These contributions significantly contribute to India’s holistic development and its position as a global leader.

**2.3.4. Good Governance & Security:** In order to promote security and development, VIKSIT BHARAT places an emphasis on governance that is transparent and efficient in the delivery of public services. VIKSIT BHARAT endeavours to establish a resilient structure that safeguards the well-being and security of its populace through strategic investments in infrastructure, technology, and national defence, alongside inclusive citizen participation and engagement in decision-making. Cultural integration is a central theme in promoting the conservation of India’s abundant cultural legacy while capitalising on it to advance socioeconomic progress.

**2.3.5. India in the World:** By putting a focus on India’s role in influencing international events via diplomatic efforts, economic power, and cultural effect, VIKSIT BHARAT envisions India as a global leader. This vision sets an emphasis on India’s role in influencing international events. VIKSIT BHARAT is a project that aims to enhance India’s status on the world stage by placing a focus on economic development, innovation, and strategic alliances. This is the guiding principle of the initiative. Efforts to improve global development and security will benefit from this, since it will assist to foster cooperation and make a notable contribution.

## 3. Industrial Engineering Connect with VIKSIT BHARAT

Industrial engineering plays a crucial role in enhancing the efficiency, productivity, and long-term sustainability of India’s manufacturing processes, hence contributing to the achievement of the “VIKSIT BHARAT 2047” goal. Industrial engineers play a crucial role in maintaining India’s competitiveness in global industries. They focus on optimizing industrial processes, enhancing production systems, and establishing efficient supply networks. In addition, Industrial Engineering (IE) is crucial in implementing cutting-edge technologies, such as automation, robotics, and digitalization. These technologies are used to drive innovation and modernization in numerous industrial sectors (Atieh et al., 2023; Dwivedi et al., 2023; Upadhyay et al., 2023). Industrial engineers play a crucial role in promoting sustainability by creating manufacturing methods that are ecologically friendly, minimizing waste and emissions, and using green technologies. If India implements implements

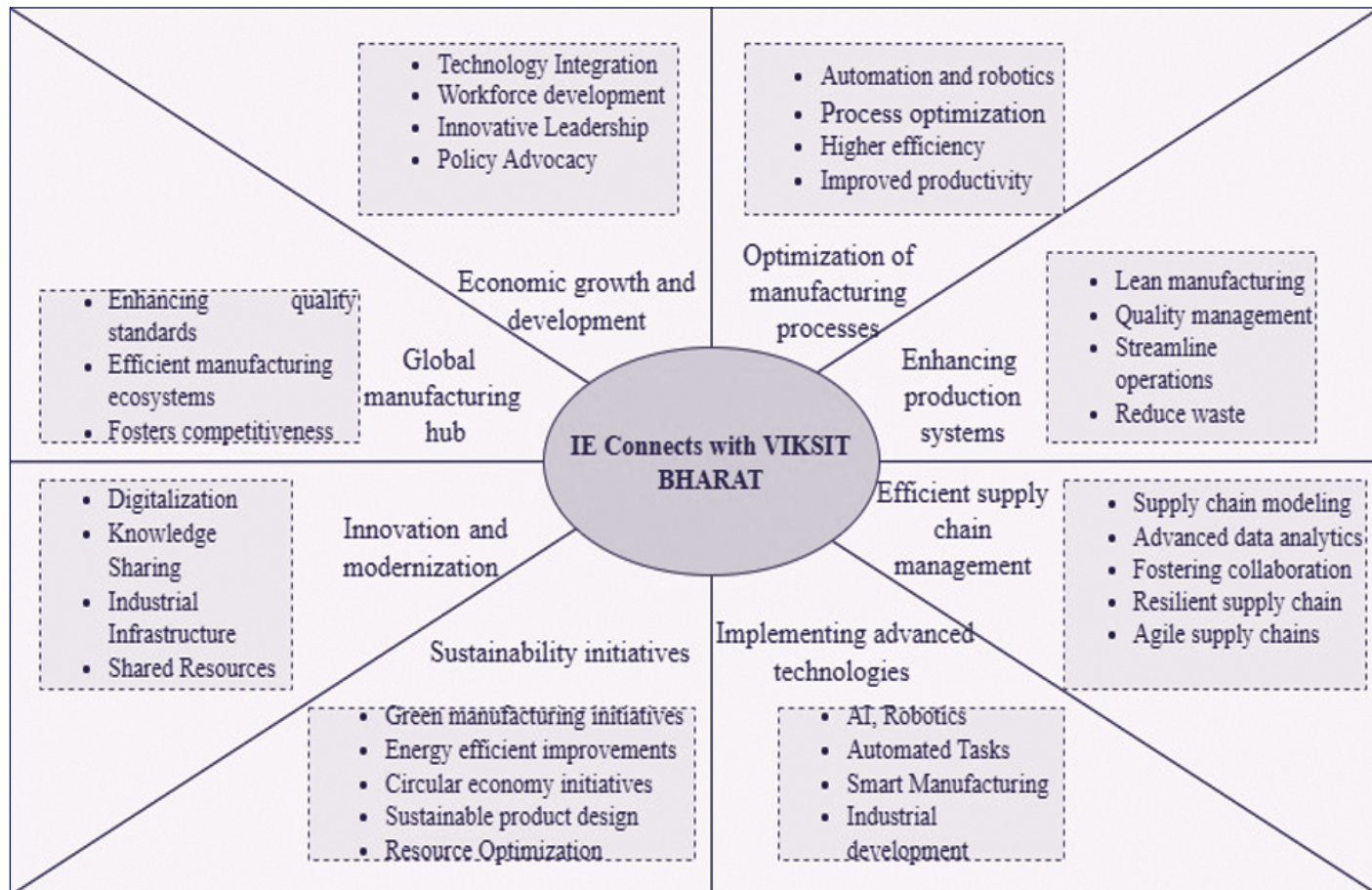
the principles of Industrial Engineering, it may successfully attain its goals of economic growth, industrial development, and becoming a global manufacturing powerhouse by 2047.

**2.3 Role of Industrial Engineering (IE)**

The various aspects of Industrial Engineering (IE) that

contribute to the achievement of the objectives established by VIKSIT BHARAT 2047 are depicted in Figure 2. By means of a multitude of strategic initiatives and interventions, IE makes a substantial contribution to advancing economic expansion, sustainability, and progress in a wide array of sectors. A further description of Figure 2 is presented below:

**Figure 2. IE Connects with VIKSIT BHARAT**



**3.1.1 Optimization of manufacturing processes:** One of the most important aspects of the vision that is defined in VIKSIT BHARAT 2047 is the optimization of manufacturing processes. This is because it is essential for increasing the efficiency and productivity of Indian industry. Industrial engineers can further improve the efficacy and accuracy of manufacturing processes by using cutting-edge technology like as automation and robots. This aligns with the modernization aims of VIKSIT BHARAT . According to Vetrivel and Mohanasundaram (2024), industrial engineers are responsible for ensuring that Indian firms achieve improved levels of efficiency and production via the optimization of manufacturing processes. As a result of this greater efficiency, larger production may be achieved with the same number of resources, which contributes to the economic development that is envisioned in VIKSIT BHARAT 2047.

**3.1.2 Enhancing production systems:** Industrial Engineering (IE) is essential for achieving the goals of VIKSIT BHARAT by optimizing industrial processes to achieve optimal efficiency and effectiveness. Industrial engineering approaches, such as process optimization, lean manufacturing, and quality

management, allow enterprises to make their operations more efficient, minimise waste, and improve productivity (Adeleke et al., 2024). By using Industrial Engineering concepts, firms may attain greater productivity with limited resources, so contributing to overall economic expansion and competitiveness. The enhanced effectiveness is in line with VIKSIT BHARAT 's objective of promoting industrial growth and economic well-being, eventually moving India towards being a globally competitive and developed country.

**3.1.3 Efficient supply chain management:** Industrial Engineering (IE) plays a crucial role in achieving VIKSIT BHARAT 's goal of effective supply chain management. It does this by incorporating essential ideas and techniques to improve the movement of products and information across the whole supply chain ecosystem. Industrial engineering approaches, such as supply chain modelling, process optimisation, and sophisticated data analytics, allow firms to discover areas of congestion, simplify processes, and optimise the use of resources. This leads to shorter waiting times, less expenses, and enhanced customer satisfaction. Wang et al.

(2024), promotes cooperation among suppliers, manufacturers, distributors, and retailers, enabling the development of robust and flexible supply chains that can quickly adjust to changing market circumstances and unforeseen obstacles. This collaboration with VIKSIT BHARAT 's goal highlights the crucial role of IE in promoting economic development, improving competitiveness, and establishing India as a worldwide leader in supply chain excellence. Optimising supply chain procedures guarantees the prompt delivery of products and services, resulting in decreased lead times and costs. Efficiency is crucial for the establishment of a strong and durable industrial environment as envisioned in VIKSIT BHARAT 2047.

**3.1.4 Implementing advanced technologies:** Industrial Engineering (IE) plays a crucial role in achieving the goal by leading the adoption of advanced technology to bring about significant and revolutionary changes in many sectors. Industrial engineering experts use state-of-the-art technologies like artificial intelligence, robots, and data analytics to improve processes, increase productivity, and promote innovation (Bhambri and Rani 2024; Peter et al., 2023). By incorporating these technologies, Industrial Engineering (IE) enables the automation of tasks, the establishment of intelligent manufacturing systems (Atieh et al., 2023; Khang et al., 2023), and the promotion of sustainable practices. This progress propels India towards its objective of becoming a globally competitive and technologically advanced nation by 2047. The strategic alignment highlights the critical role of IE in stimulating economic growth, promoting industrial development, and achieving the lofty goals of VIKSIT BHARAT 2047. Advanced technologies enhance productivity, quality, and innovation in Indian industry. This technical innovation is in line with the objective of a digitally empowered Bharat, as envisioned in VIKSIT BHARAT 2047.

**3.1.5 Sustainability initiatives:** Industrial engineers (IEs) play a critical role in spearheading sustainability initiatives that are designed to realize the overarching goal of "VIKSIT BHARAT 2047." IEs are crucial in the optimisation of processes, which enables them to maximise resource efficiency and minimise waste in manufacturing operations (Ahmed et al., 2024). By identifying inefficiencies and streamlining processes in accordance with lean manufacturing principles, they are able to decrease energy consumption, water usage, and raw material waste. Moreover, IEs promote the implementation of green manufacturing practices, including the utilisation of renewable energy sources and eco-friendly materials (Bagri et al., 2024), in order to preserve productivity and reduce environmental harm. Through the implementation of life cycle assessments, IEs evaluate the ecological impact of processes and products, thereby pinpointing potential areas for enhancement and modifications in sustainable design. Furthermore, in an effort to reduce carbon emissions and promote sustainable procuring practices, they optimise supply chains and collaborate with suppliers to ensure environmentally and ethically responsible procurement. In addition, IEs advocate for circular economy initiatives by implementing reverse logistics programmes and

designing closed-loop systems in order to maximise resource efficiency and minimise waste. IE cultivate an environment that promotes ongoing enhancement through their endeavours, which encourages collaboration and innovation in order to advance sustainability and correspond with the overarching objectives of "VIKSIT BHARAT 2047."

**3.1.6 Innovation and modernization:** Industrial Engineering (IE) plays a crucial role in driving innovation and modernization, in line with the goals of VIKSIT BHARAT 2047 to position India as a worldwide leader. IE drives innovation by optimising processes, using cutting-edge technology, and cultivating a culture of ongoing improvement across several sectors. The incorporation of advanced methods such as Industry 4.0, digitalization, and automation is facilitated by IE, which is crucial in the modernization of industrial infrastructure, the enhancement of productivity, and the promotion of economic development (Sharma et al., 2023; Xian et al., 2023). IE plays a significant role in promoting innovation and modernization, contributing to the ambitious goal of VIKSIT BHARAT 2047 and placing India as a leader in the global arena. Promoting innovation and modernization in industries stimulates development and enhances competitiveness. This is in keeping with the goal of a dynamic and internationally competitive India as expressed in VIKSIT BHARAT 2047.

**3.1.7 Economic growth and development:** Industrial Engineering (IE) plays a crucial role in achieving VIKSIT BHARAT 2047's objective of economic progress and advancement. Industrial engineering ideas and procedures are designed to improve processes, increase production, and promote efficiency in many sectors. This creates a favourable climate for long-term economic growth. IE enhances competitiveness, fosters job development, and promotes general prosperity by optimising processes, reducing waste, and maximising resource utilisation. In addition, (IE) plays a crucial role in enabling the acceptance of Industry leading technology, encouraging creativity, and supporting the modernization of industries. These factors are all integral to the success of VIKSIT BHARAT 2047. In summary, the efforts of industrial engineers in maximising processes, embracing cutting-edge technology, and advocating for sustainability contribute to economic expansion and progress. This improvement is crucial for attaining the economic prosperity envisioned in VIKSIT BHARAT 2047.

**3.1.8 Global manufacturing hub:** As a result of improvements in efficiency, innovation, and competitiveness, Indian industries have become attractive investment destinations and global participants. This transition puts India in a position to become a prominent global manufacturing hub, which is one of the primary goals of the VIKSIT BHARAT 2047 plan. Industrial Engineering (IE) is an essential component in developing India into a worldwide manufacturing hub, which is in line with the goals of the VIKSIT BHARAT 2047 initiative. Regarding manufacturing, IE helps to increase competitiveness and attractiveness for foreign investment by optimising production processes, boosting efficiency, and raising quality standards. IE concepts such as lean manufacturing, supply chain optimisation,

and sophisticated automation make it possible to construct manufacturing ecosystems that are both agile and efficient, and that are able to satisfy the needs of the global market. IE makes a substantial contribution to the realisation of VIKSIT BHARAT 2047's objective of establishing India as a dominant participant in the global manufacturing environment. This is accomplished via the organization's emphasis on boosting productivity, innovation, and technical improvement.

#### 4. POLICY GUIDELINES FOR ATTAINING THE VISION OF VIKSIT BHARAT 2047

1. Develop and implement reforms in governance and institutions with the goals of strengthening governance structures to combat corruption, reforming administrative systems to enhance efficiency and accountability, and promoting decentralization to empower local communities. This will ensure that governance is both effective and transparent.
2. Encourage economic and social policies by supporting sustainable economic growth via innovation, entrepreneurship, industrial development, infrastructure investment, job creation, and the promotion of trade partnerships and foreign investment.
3. Ensure that comprehensive education reform is implemented by giving priority to the provision of quality education to all individuals, enhancing vocational training and skill development programs to align with the changing job market, and promoting lifelong learning initiatives for the purpose of continuously upgrading skills in order to empower citizens for the workforce of the future.
4. Improve the infrastructure of healthcare, put in place social welfare programmes that combat poverty and inequality, and encourage public health efforts to achieve total well-being.
5. Give top priority to the development of integrated infrastructure, which should include the establishment of powerful transport networks, the improvement of urban and rural infrastructure, and the construction of intelligent, sustainable cities that are equipped with effective public services to encourage economic growth and improve the quality of life.
6. Formulate and implement a holistic digital transformation policy for VIKSIT BHARAT, focusing on digital literacy, technology access, innovation, and leveraging emerging technologies for economic and social progress.

#### 5. CONCLUSION

VIKSIT BHARAT 2047 is a visionary plan for India's multi-sector growth. This paper explains its themes, pillars, and ambitions. It investigates how Industrial Engineering (IE) concepts affect fulfilling its goals. There are a number of guiding principles that serve as the foundation for VIKSIT BHARAT, including sustainable development, innovation, inclusion, and technical advancement. A comprehensive growth trajectory for India may be fostered by the application

of these themes, which act as guiding principles. The pillars of VIKSIT BHARAT include economic success, social welfare, environmental sustainability, and technical advancement, all of which are essential for the advancement of the nation. The goals of VIKSIT BHARAT are turned into real things with the help of industrial engineering. By focusing on improving efficiency, streamlining processes, and combining technology, IE gives answers to many of the problems that are holding India back from progress. IE makes the economy grow and makes companies more competitive by easing output, cutting down on waste, and making better use of resources. Moreover, it is crucial to develop policies with a deep comprehension of IE techniques to guarantee that they align with the overall objectives of VIKSIT BHARAT. This involves creating a supportive atmosphere for innovation, advocating for the long-term viability of industries, and improving the abilities of workers to adjust to changing technological advancements. Ultimately, this article highlights the mutually beneficial connection between Industrial Engineering and VIKSIT BHARAT 2047. The text promotes the idea of using IE principles to shape policies and actions that would help achieve the goal of making India a developed and affluent country by 2047.

#### REFERENCES

1. Adeleke, A. K., Montero, D. J. P., Olu-lawal, K. A., & Olajiga, O. K. (2024). *Process Development in Mechanical Engineering: Innovations, Challenges, and Opportunities*. *Engineering Science & Technology Journal*, 5(3), 901-912.
2. Ahmed, H., Al Bashar, M., Taher, M. A., & Rahman, M. A. (2024). *Innovative Approaches To Sustainable Supply Chain Management In The Manufacturing Industry: A Systematic Literature Review*. *Global Mainstream Journal of Innovation, Engineering & Emerging Technology*, 3(02), 01-13.
3. Atieh, A. M., Cooke, K. O., & Osiyevskyy, O. (2023). *The role of intelligent manufacturing systems in the implementation of Industry 4.0 by small and medium enterprises in developing countries*. *Engineering Reports*, 5(3), e12578.
4. Atieh, A. M., Cooke, K. O., & Osiyevskyy, O. (2023). *The role of intelligent manufacturing systems in the implementation of Industry 4.0 by small and medium enterprises in developing countries*. *Engineering Reports*, 5(3), e12578.
5. Bagri, G. P., Garg, D., & Agarwal, A. (2024). *Analysing inhibitors of green practices implementation in Indian companies*. *International Journal of Business Information Systems*, 45(3), 375-396.
6. Bhambri, P., & Rani, S. (2024). *Challenges, Opportunities, and the Future of Industrial Engineering with IoT and AI. Integration of AI-Based Manufacturing and Industrial Engineering Systems with the Internet of Things*, 1-18.
7. Dwivedi, A., Agrawal, D., Jha, A., & Mathiyazhagan, K. (2023). *Studying the interactions among Industry 5.0 and circular supply chain: Towards attaining sustainable development*. *Computers & Industrial Engineering*, 176,

- 108927.
8. Khang, A., Rath, K. C., Satapathy, S. K., Kumar, A., Das, S. R., & Panda, M. R. (2023). *Enabling the Future of Manufacturing: Integration of Robotics and IoT to Smart Factory Infrastructure in Industry 4.0. In Handbook of Research on AI-Based Technologies and Applications in the Era of the Metaverse (pp. 50-25). IGI Global.*
  9. Narayana, J. L. (2024). *Roles of Various Stake Holders in Achieving Goals of VIKSITBHARAT by 2047. Vidhyayana-An International Multidisciplinary Peer-Reviewed E-Journal-ISSN 2454-8596, 9(si2).*
  10. Peter, O., Pradhan, A., & Mbohwa, C. (2023). *Industrial internet of things (IIoT): opportunities, challenges, and requirements in manufacturing businesses in emerging economies. Procedia Computer Science, 217, 856-865.*
  11. Sharma, M., Raut, R. D., Sehrawat, R., & Ishizaka, A. (2023). *Digitalisation of manufacturing operations: The influential role of organisational, social, environmental, and technological impediments. Expert Systems with Applications, 211, 118501.*
  12. Singh, S., Ramu, S. C., & Lalit, R. (2024, February). *India's Stake in Emerging Technology-A Review. In 2024 11th International Conference on Computing for Sustainable Global Development (INDIACom) (pp. 460-454). IEEE.*
  13. Srivastava, S. (2023). *New India in the 21st Century: 21 Visions for a Developed India by 2050. Notion Press.*
  14. Upadhyay, A., Balodi, K. C., Naz, F., Di Nardo, M., & Jraisat, L. (2023). *Implementing industry 4.0 in the manufacturing sector: Circular economy as a societal solution. Computers & Industrial Engineering, 177, 109072.*
  15. Vetrivel, S. C., & Mohanasundaram, T. (2024). *Industry 5.0 From Automation to Autonomy: Engineering the Shift. In Innovations in Engineering and Food Science (pp. -88 118). IGI Global.*
  16. Wang, Y., Shi, J., & Qu, G. (2024). *Research on Collaborative Innovation Cooperation Strategies of Manufacturing Digital Ecosystem from the Perspective of Multiple Stakeholders. Computers & Industrial Engineering, 110003.*
  17. Xian, W., Yu, K., Han, F., Fang, L., He, D., & Han, Q. L. (2023). *Advanced manufacturing in industry 5.0: A survey of key enabling technologies and future trends. IEEE Transactions on Industrial Informatics.*