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A REVIEW ON INDUSTRY FRAMEWORK 4.0 MATURITY MODELS FOR SME INDUSTRY

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Abstract:

This study magnifies "Industry 4.0 Maturity Model" benefits for SME industries. It includes improved productivity through reducing costs. SMEs in India can improve their business structure through this model. SMEs of India magnify the facilities from Industry 4.0 technologies. Advanced machines and systems are involved in the industrial growth that manipulates manufacturing progress. This study has concluded that SME industries need to improve their system errors through the use of the industry 4.0 framework. It modifies the manufacturing system, which delivers huge effectiveness.

Keywords: Industry 4.0 Maturity Model, SMEs, Productivity, Transformation, financial instruments

1. Introduction

Industry 4.0 is an innovation in the organization and focuses on technology transformation in the business process. Smart technologies such as the industrial Internet of Things (IIoT) and cyber-physical systems are involved in business processes to develop the efficiency and productivity of the organization. This model involves decreasing errors and non-value-added manipulation of business data through the development of value-added services in the organization. This research includes an overview of Industry 4.0, its models, issues, and opportunities in the industry, especially in the SME industry.

The industry 4.0 framework considers smart processes and the connection of smart technologies with the production systems of the organization. This model considers human-like assumptions to predict physical interaction and support decision-making activity in the organization. This framework considers a list of technological applications such as the

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Internet of Things (IoT), smart manufacturing, cognitive computing, the industrial Internet of Things (IIoT), connected manufacturing, cloud computing, smart factories, and artificial intelligence. The three effective processes are the reactive technology stage, the aspiration stage, and the proactive technology stage to continue the revolution in the business process.

This paper gives an overview of Industry 4.0, and the purposes and features of this technology. This includes the advantages and disadvantages of this framework in terms of business continuation. Different types of dimensions of this framework are also included in this research to justify the advancement of this technology in achieving large productivity and revenue for the organization. This research also considers the analysis of a total of 9 different kinds of literature to show different factors of industry framework 4.0. In addition, this research aims to deliver the concept of the industry 4.0 framework and the impact of this framework on developing the performance of SMEs.

The rest of the paper is as follows. Section 2 illustrates the literature survey in which financial instruments are defined. Section 3 shows the analysis of Industry 4.0. Finally, discussion and conclusion are drawn in Section 4-5.

2. Literature Survey

According to Amaral and Peças (2021), the industrial revolution occurred in the past century as industries considered three degradations in the industry version. This century introduces the industry 4.0 framework to develop technology and processes. The purpose of this framework is to support the knowledge-based systemization process in the organization. The design principles of this framework are informational transparency, technical assistance, decentralized decisions, and interconnections between different processes of the organization. The decision-making activities get effective support through this technology, and organizations can consider specific implementations to improve efficiency and results. As opined by Sony and Aithal (2020), this industry framework develops long-term relationships between local communities, nature, value chains, humans, and organizations. The development of efficiency and product design can continue in the organization as per business requirements.

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According to Sony and Aithal (2020), Indian engineering industries include six dimensions in industry 4.0 models, and those dimensions deliver a unique approach in the business process to achieve goals through developing the competitiveness of the organization. The six dimensions are organizational strategy readiness, digitization level and digitization of supply chain, smart products level, employee adaptability, leadership, and top management support in the Indian engineering industry. This entire dimension contributes to developing resource allocation, the simplicity of the model, the utilization of the risk analysis framework, employee skills, and the implementation process in the organization. As opined by Amaral and Peças (2021), different sub-dimensions of this model are present in aspects of technology such as digital modeling, IT security, equipment infrastructure, and cloud usage. Another sub-dimension is present in aspects of products such as data storage functionalities, product connectivity, product individualization, and production data collection and processing.

A list of challenges can occur in this industrial revolution, such as development requirements present in different business processes to achieve overall performance and reengineering requirements in existing models of the organization. This technology can face issues due to the competitive pressure present in the transformation process, and finding effective technologies can be difficult. In addition, controlling financial and operational KPIs and tactical strategies can present another issue in this process (Machado *et al.* 2019). This framework can face a lack of digital skills and workforce availability in terms of age criteria to be suitable for this business process. However, opportunities are also present through adapting this industrial framework for SMEs. This technology can contribute to developing resource allocation in the business process and can share effective information regarding business models with the entire top and middle management levels of the organization. Through adapting this framework, the organization can continue risk analysis and identify issues present in the business process. This technology supports continuing decision-making activity by developing solutions to mitigate issues in the organization (Sony and Aithal, 2020). The present and future model analysis of the organization can complete through this framework. This analysis can consider the comparison of different data of the business process and identify issues and requirements to implement effective solutions and strategies to continue long-term development in the organization.

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3. Analysis of the Industry Framework 4.0

In this section, we have studied and analysed the industry framework 4.0 based on the various factors are taken under consideration in Table 1.

Table 1 Analysis of the Industry Framework 4.0

Reference	Industry Framework 4.0	Factors	Analysis
Kumar *et al.* 2020	Data collection and access to develop strategies	Big data analytics, cloud computing, augmented reality and cyber-physical systems	Big data analytics involves collecting data from different devices that are IoT based and analysing those data to collect information. Those data also consider in the programming and optimisation of resources in the business process (Kumar *et al.* 2020). This can develop CE integration and sustainability of the organisation. Cloud computing involves maintaining data transparency and supply chain activities of the organisation. Augmented reality involves developing versatility, efficiency, resources, speed and ethical sustainability of the organisation (Kumar *et al.* 2020). Cyber-physical systems involve developing data utilisation on machine tools and influencing overall performance to achieve human-machine interaction through developing sustainability in the organisation.

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Safar *et al.* 2020	Industry 4.0 focus on spurring the manufacturing sector	Indian government initiatives such as ***"Make in India", "Digital India" and "Skill India"***	These entire initiatives focus on developing skills of people to make efficient in their relevant working areas (Safar *et al.* 2020). This development considers the transformation of people's activities and skills in rural and urban areas to develop value-added services in the working sectors of the country.
Kumar *et al.* 2020	Industry 4.0 technologies contribute to mitigating issues due to the Covid-19 pandemic through developing solutions in SMEs.	Supporting technologies are blockchain technology, IoT, the cloud of things and AI	A list of issues such as lack of flexibility, government support, communication, security and safety, employee shortage, consumer behaviour and supply-demand issues can present in the supply chain and organisational process in SMEs (Kumar *et al.* 2020). These issues can get effective support from blockchain technology, IoT, the cloud of things and AI technology through developing transparency, communication influence, training and skills development and flexibility in the supply chain process of SMEs.
Matt *et al.* 2020	This includes smart manufacturing and logistics processes in SMEs.	Information and communication technology (ICT) network communications	ICT involves in digitalisation of information and integration of product creation and utilisation of supply chain and logistics processes in SMEs (Matt *et al.* 2020). Network communications include internet and wireless technologies to continue products and services manufacturing and suppliers' activities in SMEs.

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Kumar *et al.* 2020	This frame captures advantages among previous industrial technology versions in aspects of different factors	"Samarth Udyog and Samarth Udyog Bharat 4.0"	This initiative involves creating an ecosystem of technologies to develop the efficiency of the organisation (Kumar *et al.* 2020). This initiative involves the facilitation of the technology ecosystem in manufacturing industries to continue the sustainable development of the organisation in India.
Dutta *et al.* 2021	This involves developing value chain activity through R&D and waste management activity	ISO 9001:2015, PDCA cycle	ISO 9001:2015 involves continuing a quality management approach by developing standards in the business process (Dutta *et al.* 2021). PDCA cycle includes risk identification and resource allocation activities to develop flexibility and standards for SMEs in India.
Kumar *et al.* 2021	This framework faces a list of barriers when implemented in SMEs.	Poor integration of value chain process, cyber-security issues, uncertain economic advantages, lack of skills, infrastructure issues, job disruptions and transformation issues	Implementation of IoT can face these types of issues in the business process. In addition, interpretive structural modelling (ISM) involves developing an analysis of barriers to developing solutions in the business process (Kumar *et al.* 2021). This can deliver effective support in the sustainable development of the organisation.
Krishnan *et al.* 2021	Involve in the Indian automobile industry	14.0 technology named IoT and massive Machine Type Communication (MTC)	14.0 technologies involve developing top management activity and the future viability of the organization through implementing IOT, AI and other technologies in the business process (Krishnan *et al.* 2021). The R&D activity and environmental factor

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			development to meet sustainability can achieve through continuing the industry 4.0 framework in the automobile industry.
Elhusseiny and Crispim, 2022	Barriers in this framework can decrease the efficiency and productivity of SMEs.	A list of barriers such as technical barriers, legal barriers, technological barriers and organisational barriers	Technical barriers include issues in the infrastructure of information communication technology and the lack of skills of employees and managers in the organisation. Legal barriers can present in aspects of lack of integration and collaboration between managers, privacy concerns and departments (Elhusseiny and Crispim, 2022). Technological barriers can present due to a lack of information and knowledge of the utilisation of advanced technologies and the complexity of usage and maintenance of technologies. Organisational barriers can occur due to the lack of management support, financial support, R&D infrastructure and a lower ability to continue transformations in the organisation.

4. Discussion

According to Amaral and Peças (2021), I4.0 technologies include maturity models in aspects of sustainability in the business process. Modern technologies contribute to decreasing negative impacts on the business process to develop 3Ps such as people, profit, and planet. A list of sub-dimensions in aspects of technology and products such as digital modeling, equipment infrastructure, cloud utilization, IT security, data storage functionalities, product connectivity, product individualization, and production data collection and processing activities can continue through this maturity model of Industry 4.0. The maturity model

focuses on developing capacities and capabilities to achieve long-term advantages for the organization (Sony and Aithal, 2020). A list of factors such as product, process, technology, and supply chain processes is included in this maturity model to develop the effectiveness of Industry 4.0. This technology can deliver effective support for continuing the sustainable development of the organization.

5. Conclusion

The industry 4.0 framework considers the development of technologies and automation in the business process to continue the business process and the development of productivity in the organization. A list of technologies such as IoT, blockchain, cloud, robotics applications, and AI contributes to developing the efficiency and flexibility of SMEs. This research includes the analysis of the different factors and activities of Industry 4.0 and identifies the key points present in this technology. However, diversification of advantages attracts organizations to implement them in the business process to develop revenue from the business process.

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