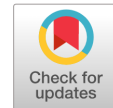**Chapter 11**

Industry 5.0 Contribution to Sustainable Development: A Roadmap for Environmental Sustainability

Ashish Saxena [1*] (iD) **Deepak Bansal** [2] (iD) **Sadhana Tiwari** [3] (iD)

Abstract: There is an evaluation of the industry of 5.0 on the sustainability development procedure as much as possible. There is industrial development in evaluating the sustainability procedure. **Material and methods**: Survey analysis is properly determined in the primary qualitative methods with 85 responses. **Significance of the study**: There is an evaluation of some crucial importance of the development of industry 5.0 in the sustainability approach where the crucial development is defined appropriately. **Findings**: The significance of the study on the evolution of the growth of industry 5.0 in the sustainable development in the management working aspects in a proper way. **Conclusion**: There is the development process of sustainability in industry 5.0 is actually organized on the factors which are developed on maintaining a basic implication process.

Keywords: Industry 5.0, Environmental sustainability, Sustainable Development

[1,2,3], Sharda School of Business studies, Sharda University, Greater Noida
[*]Corresponding Author ✉ ashish.saxena2@sharda.ac.in

11.1   Introduction

Industry 5.0 mainly focuses on the valuation processes that are performed in the industry in order to achieve the success of the business (Mittal P ,2020). Along with this, there are different ways present in industry 5.0 that help to lead industry 5.0 towards sustainable development in the different business organizations (Tiwari et al., 2022). Moreover, in this research project, different research objectives and research questions are developed which also help to achieve the research aim that is developed by the researcher (Tiwari et al., 2021).

11.2   Aim of the Paper

The aim of the research project is to find out the different ways that help to lead industry 5.0 towards sustainable development.

11.3   Objectives

The objectives of the research project are based on the aim of the research project. Therefore the research objectives are as follows:

1. To identify different ways that are present in the development of Industry 5.0

2. To estimate the compatibility between industry 5.0 and the suitable development

3. To find out the effect of industry 5.0 on the sustainable development of the business organization

4. To analyze the energy sectors of industry 5.0 in terms of sustainable development

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11.4 Literature Review

Different ways present in the development of industry 5.0

In terms of developing the approaches that are used in industry 5.0, the organization needs to find out the ways that help to improve industry 5.0. Moreover, these ways also help to improve the technology that is mainly adopted in industry 5.0 (Asif et al., 2023). With the help of this innovative technology, the collaboration process that is performed in industry 5.0 is getting better that the existing one.

Figure 11.1: Different ways present in the development of industry 5.0

Figure 11.1 describes the different ways that are present in industry 5.0. Therefore these ways are human capital and technologies, institutional framework, research, and development theory the economical scale of the industry 5.0, digitalization and implementation of technology, ESG regulation, and sustainable development (Broo et al., 2022; Cillo et al. 2022).

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The leading process of industry 5.0 toward the sustainable development

In order to incorporate sustainable development industry 5.0 needs to follow a process. The process is used in order to incorporate sustainable development in the different aspects of industry 5.0.
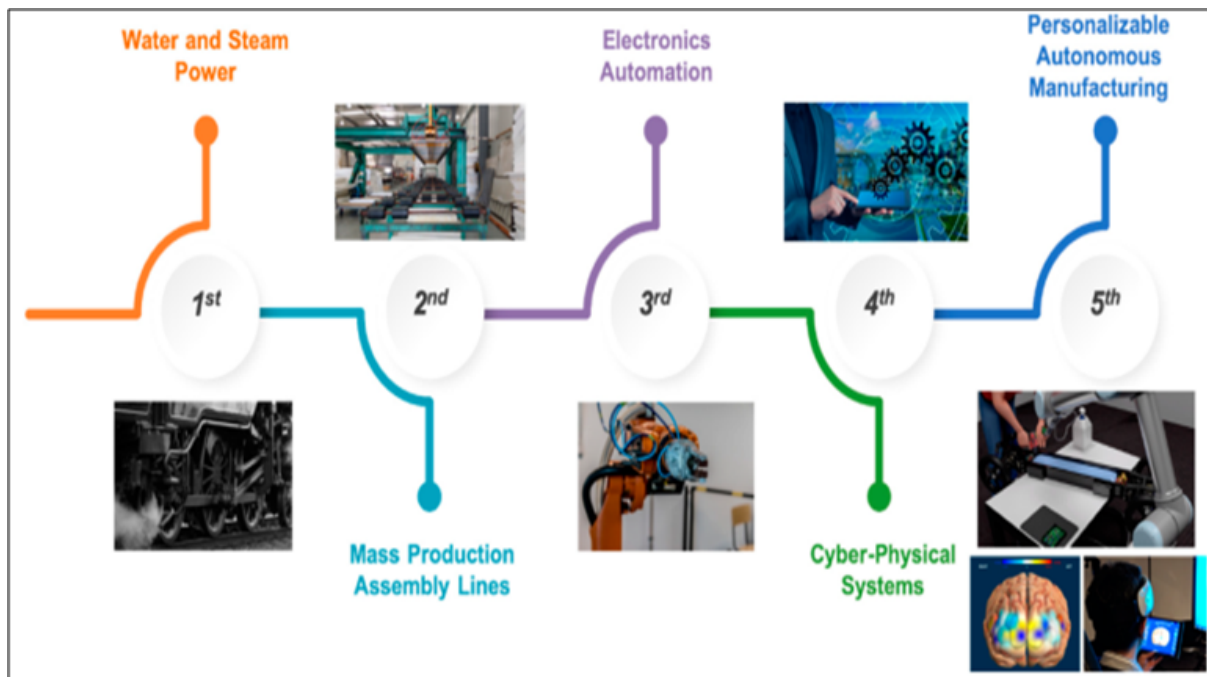

Figure 11.2: The leading process of industry 5.0 toward the sustainable development

Figure 11.2 shows the five different process that is used in industry 5.0 in order to incorporate sustainable development in the internal sector of industry 5.0. Water and steam power need to be maintained in order to promote sustainable development (ElFar et al., 2021). Mass production needs to be monitored in order to assess the sustainable development approach. Moreover, the electric automation process needs to be incorporated in order to produce sustainable development. Cyber-physical system and autonomous manufacturing process needs to be developed in order to incorporate development in industry 5.0 (Madsen et al., 2021; Doyle-Kent et al., 2022).

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Key factors of industry 5.0

The key factors of industry 5.0 help to achieve the goal that is developed in industry 5.0. The goals of industry 5.0 are related to the collaboration of technology with human creativity that are observed in the industry as well as in society (Golovianko et al. 2023). Therefore it can be stated that factors of industry 5.0 also promote the approach where the industry can be able to contribute the improvement of society.
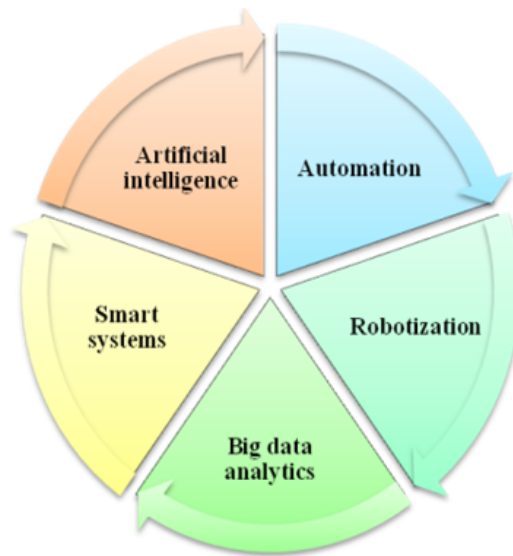

Figure 11.3: Key factors of industry 5.0

Figure 11.3 describes the key factors that are necessary for the promotion of the improvement process of industry 5.0. The key factors are AI, automation, robotization, data analysis, smart system,

11.4.1 Literature gap

The literature gap of this conducted research project is based on the area that is remain uncover by the researcher while collecting different types of relevant information and data. It has been observed that the researcher cannot be able to collect the data on the basis of the advantages of

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incorporating sustainable development in industry 5.0 and along with this the issues faced in the incorporation process of sustainable development in industry 5.0.

11.5   Theoretical framework

Sustainable development model

The term sustainable development model is developed on the basis of three different types of pillars. These three pillars are developed on the basis of economic factors, social factors, and ecological factors. Each of the factors are connected with the others.
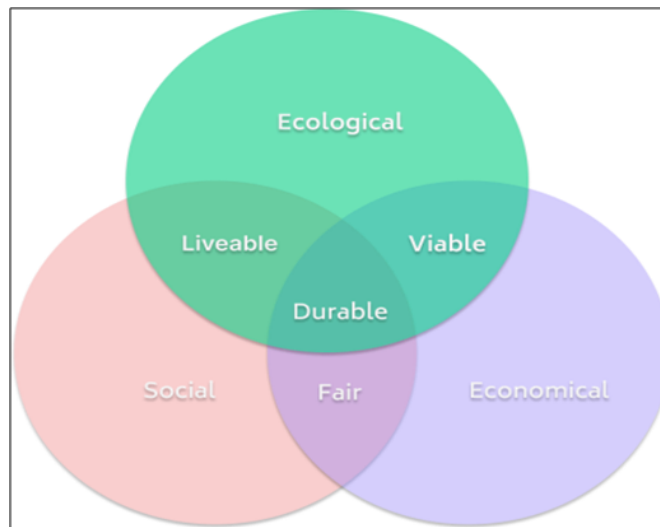

Figure 11.4: Three pillars of sustainable development

Figure 11.4 represents different pillars of sustainable development that are mainly responsible for achieving all the goals that are required to promote the sustainable development approach in the internal sector of the organizations of industry 5.0.
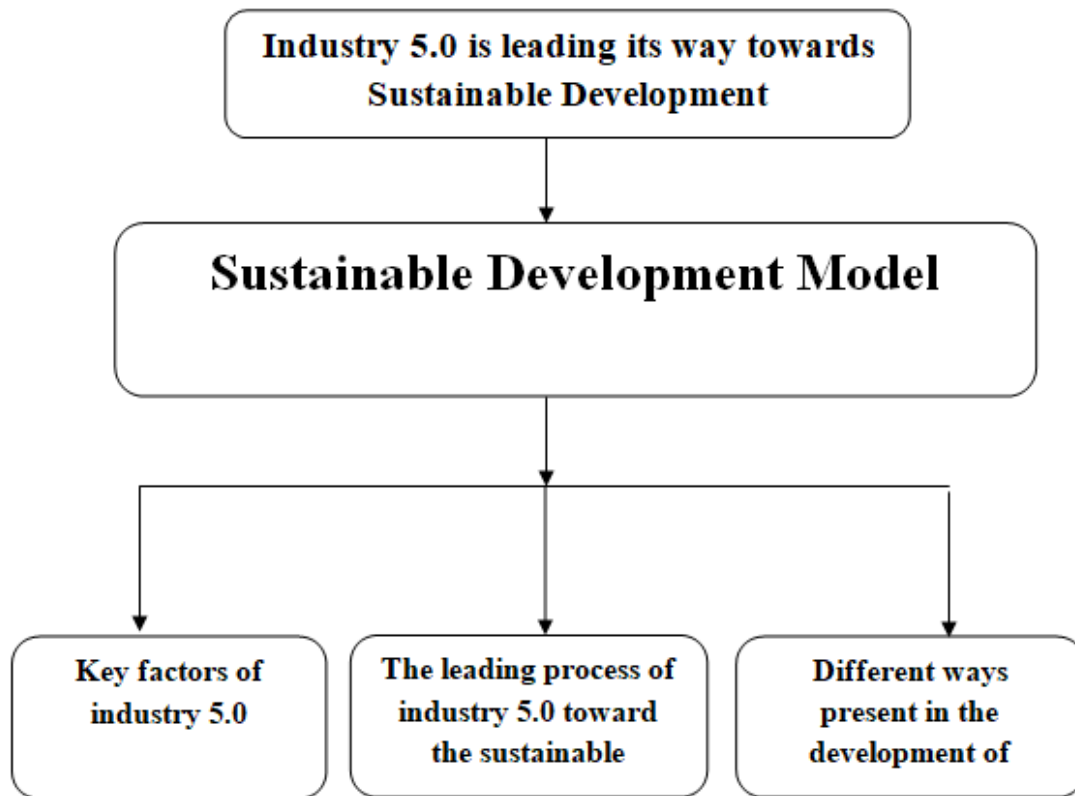
Figure 11.5: Conceptual schema

Conceptual framework

11.6   Hypothesis

- **H1**: There is a link, present between the energy sectors and the key factors of industry 5.0

- **H0**:There is no link is present between the energy sectors and the key factors of the industry 5.0

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- **H2**: There is a strong connection has been observed between industry 5.0 and the sustainable development process

- **H0**: There is no strong connection has been observed between industry 5.0 and the sustainable development process

11.7 Research methodology

Data collection

Data collection is the process that is utilized in the research project in the methodology section in order to improve the quality of the research project. Therefore, it can be stated that with the help of the data collection method, the researcher can be able to collect the data as well as the relevant information from different sources. Hence, it can be clearly noticed that in this research project, the researcher choose the primary quantitative data collection method in order to gather the information from different sources for conducting this research project. Researcher needs to perform the survey analysis process. In order to perform the survey analysis process the researcher selected 85 participants as a sample size for this research project and those 85 participants are going to participate in the survey analysis process. Furthermore, the researcher collects the responses from the participants of the survey analysis process.

Data analysis

The data analysis process is performed by the researcher in order to analyze the are also collected by the researcher in order to conduct this research project. It has been observed that with the help of this data analysis process, the researcher can be able to develop the result and the final findings of the research project. In order to analyze the data the researcher needs to perform the SPSS software where the researcher needs to run different tests such as reliability, validity, and correlation ad so many others. Therefore it can be stated that in this research project, the researcher needs to analyze the statistical data that is collected from the responses of the 85 participants who took part in the survey analysis process.

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	Frequency	Percentage	Valid Percentage	Cumulative Valid Percentage
Female	49	57.6	57.6	57.6
Male	20	23.5	23.5	81.2
Prefer not to say	16	18.8	18.8	100
Total	85	100	100	

Table 11.1: Gender

11.8   Results and Findings

11.8.1   Demographic Data

Table 11.1 shows that the highest number of percentage has been received by the female partic-
ipants and the lowest number of percentage has been received by the participants who are not
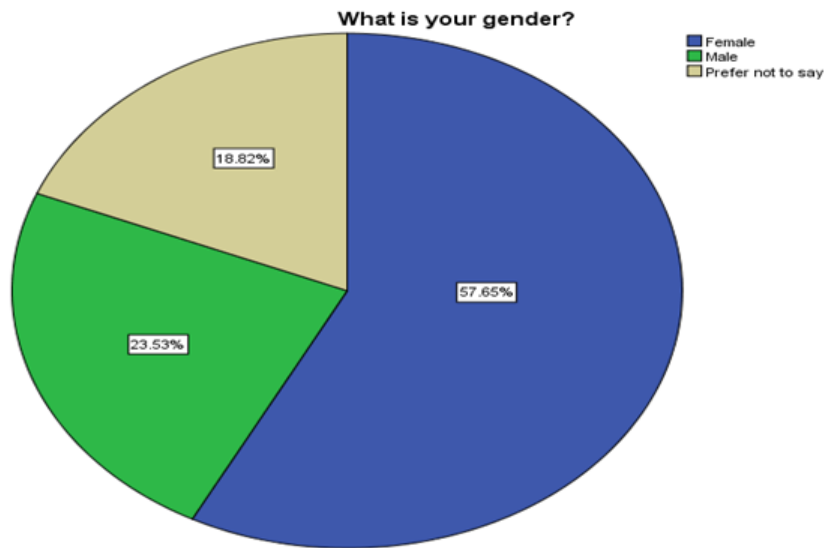interested to provide their information about gender.

Figure 11.6: Gender

Figure 11.6 observed that female participants are given the most number of responses in
the survey analysis process, and on the hand, it has been noticed that the lowest number of

	Frequency	Percent	Valid Percent	Cumulative Valid Percent
Between 20 to 25 years	5	5.9	5.9	5.9
Between 25 to 30 years	40	47.1	47.1 5	2.9
Between 35 to 40 years	40	47.1	47.1	100.0
Total	85	100.0	100.0	

Table 11.2: Age group

responses are collected for the participants who are not interested to provide their information
about gender.

Age Group

Table 11.2 shows that the highest number of percentage has been received by the participants
who belong to the 25 to 30 years of age group and the lowest number of percentage has been
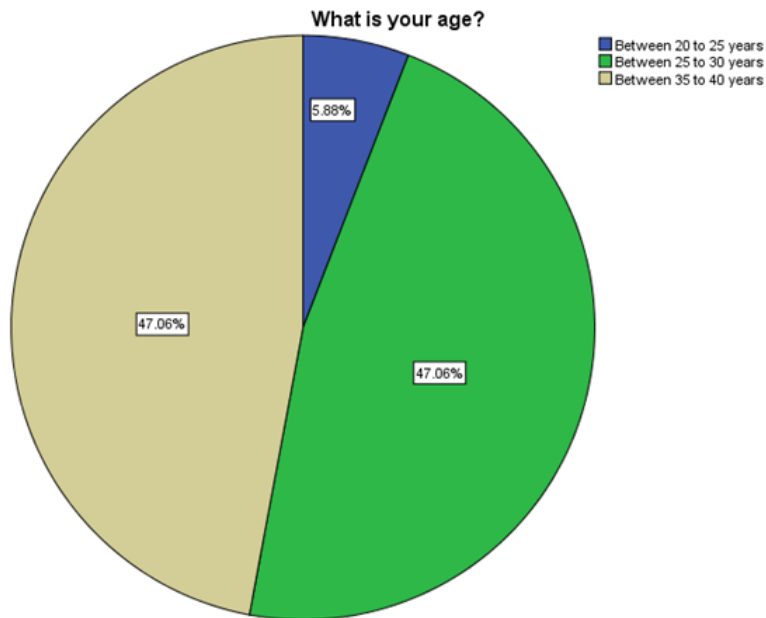received by the participants who belong to the 20 to 25 years of age group.

Figure 11.7: Age group

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	Frequency	Percent	Valid Percent	Valid Cumulative Percent
Above Rs. 60000	24	28.2	28.2	28.2
Between Rs. 25000 to Rs. 35000	6	7.1	7.1	35.3
Between Rs. 35000 to Rs. 45000	17	20.0	20.0	55.3
Between Rs. 45000 to Rs. 60000	38	44.7	44.7	100.0
Total	85	100.0	100.0	

Table 11.3: Income Level

	Min	Max	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Stats	Std. Error	Stats	Std. Error
IV	5.00	25.00	10.8824	3.89570	15.176	1.151	.261 2.146	.517
DV	2.00	10.00	360.00	4.2353	1.60836	2.587	1.188	.261

Table 11.4: Descriptive Data Analysis

Figure 11.7 represents a graphical presentation of the participants who belong to the 25 to 30 years of age group are given the most number of responses in the survey analysis process, and on the hand, it has been noticed that the lowest number of responses are collected for the participants who belong to the 20 to 25 years of age group.

Income

Table 11.3 shows that the highest number of percentage has been received by the participants who belong to the income level of 45000 to 60000 Rs and the lowest number of percentage has been received by the participants who belong to the income level of 25000/- to 35000 Rs.

Figure 11.8 where a graphical presentation has been developed. In this graphical presentation, it has been observed that participants who belong to the income level of 45000 to 60000 are given the most number of responses in the survey analysis process, and on the hand, it has been noticed that the lowest number of responses are collected for the participants who belong to the income level of Rs. 25000 to 35000.
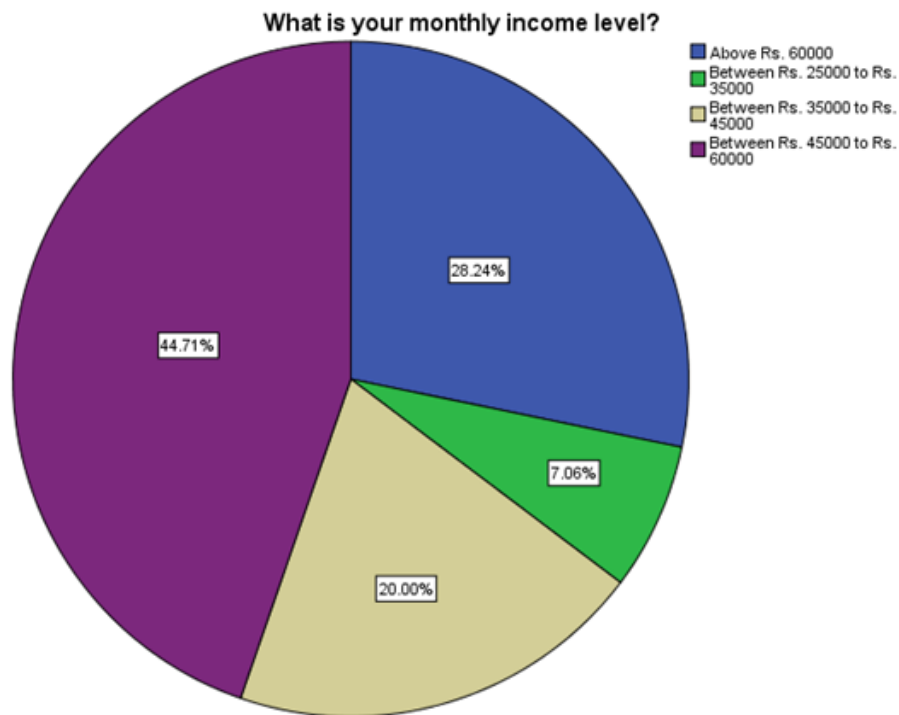
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Figure 11.8: Income Level

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.639a	.408	.401	1.24451

Table 11.5: Model summary

Descriptive Data Analysis

Table 11.4 shows that the mean value ranges from 4.23 to 10.88 and the standard deviation value ranges from 1.60 to 3.89. Table 11.5 describes model summary test in which it has been noticed that the obtaining R square value is 0.408.

a. Dependent Variable: DV

Table 11.7 contains the result of the coefficient test, therefore the obtaining beta value of the coefficient test is 0.639.

The test result of the reliability test is described above in the shown table. With the help of

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Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	88.744	1	88.744	57.299	.000b
Residual	128.550	83	1.549		
Total	217.294	84			

Table 11.6: ANOVA

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B Std.	Error			
(Constant)	1.364	.403	3.388	.001	
IV	.264	.035	.639	7.570	.000

Table 11.7: Coefficients

performing Cronbach's Alpha test, the obtaining value is 0.782.

Validity Test

With the help of KMO and Bartlett's test the validity, the test is performed in this conducted research project. Along with this, it has been noted that the Sig value of the validity that is obtained from the above-discussed table is 43.307.

Correlation Test

With the help of a correlation test , the Pearson correlation value can be obtained. Table 11.10 obtains Pearson correlation value is 0.639.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.621	.780	2

Table 11.8: Reliability Test

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KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	43.307
	df	1
	Sig.	.000

Figure 11.9: Validity Test

Correlations

		IV	DV
IV	Pearson Correlation	1	.639**
	Sig. (2-tailed)		.000
	N	85	85
DV	Pearson Correlation	.639**	1
	Sig. (2-tailed)	.000	
	N	85	85

Figure 11.10: Correlation Test

11.9   Discussion

In this section, a discussion has been developed which is based on the different key aspects that are present in the development process of the internal sector of the organization which is present in industry 5.0. Moreover, it has been observed that as per the survey result the key factors present in industry 5.0 help to perform the process that leads to the industry towards the incorporation of sustainable development in industry 5.0 (Mittal et al., 2021). . Along with this different processes are discussed that also help to promote sustainable development in industry 5.0.

11.10   Conclusion

Thus it can be concluded that in this research project, the researcher select a topic that is based on industry 5.0 and the incorporation process of sustainable development in industry 5.0. Therefore it can be stated in order to conduct the research project in a good manner the researcher needs to collect different types of relevant data and information which help to perform the other task that is required for the further improvement of the conducted research project (Gupta & Tiwari, 2023). Along with this different key factors and ways are indemnified and described in a brief way which is present in the development process of industry 5.0.

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