

**A STUDY OF SUSTAINABLE MANUFACTURING STRATEGIES AND THEIR IMPACT
ON INDIAN FIRM COMPETITIVENESS**

Dr. Chetana M R, Associate Professor, Dept. of Commerce & Management, Seshadripuram
Academy of Business Studies, K S town, Bangalore-560060. Karnataka.

Mr. SHIVAKUMAR C S, Associate Professor, Dept. of Commerce & Management, Seshadripuram
Academy of Business Studies, K S town, Bangalore-560060. Karnataka.

ABSTRACT

Manufacturing practices and processes in sustainable manufacturing do not harm or pollute the environment. These practices are not harmful to consumers, employees, or other members of the community. Recycling processes, energy and resource conservation, waste management, water supply, environmental protection, regulatory compliance, pollution control, and so on are all part of sustainable manufacturing. Along with these, businesses are focusing on their competitiveness or their ability and performance in selling and supplying goods and services in both the local and global markets. Competitiveness and sustainability have a strong correlation, and they are receiving a lot of attention around the world. Sustainable manufacturing is based on the concept of changing manufacturing structures in order to increase manufacturing competitiveness. A sample of 190 respondents was polled to learn about the various forms of sustainable manufacturing used by businesses and their relationship to competitiveness. It is concluded that the firm employs a number of strategies, all of which have a significant correlation with the firm's competitiveness.

1. INTRODUCTION

Today's global economy is bringing significant challenges to many companies that want to meet the continuous change in the requirements of current and potential clients and customers all over the world. To compete in the market, manufacturing industries must consider several factors, including maintaining high-quality products, lowering costs and prices, shortening product cycle times, and protecting the environment (Gupta et al., 2015b). The issues that arise during sustainable manufacturing of protecting the environment and preventing pollution take into account three important manufacturing components: "technology," "energy," and "material." In sustainable manufacturing, decisions are made not only to protect the environment and use cleaning technologies but also for the complete product life cycle (PLC) in the manufacturing system. Various strategies were implemented in order to maintain product quality, reduce production costs, provide a safe and healthy working environment for the workforce, and encourage waste product recycling, among other things. According to Garbie (2014), three key pillars of sustainability (economic, social, and environmental models) are estimated and incorporated in the process for sustainable development in manufacturing processes. It is critical for manufacturing companies in India to make efforts to reduce their raw material and energy consumption levels, as well as to address the issue of waste treatment and discharge. It is encouraging that Indian manufacturing companies have recognized the benefits of sustainable manufacturing and have begun to implement proactive approaches for long-term responsiveness. To improve economic, environmental, and social performance, manufacturing companies must prioritize "leadership," "regulatory pressure," "supplier relationship management," "employee involvement," "lean production," and "agile manufacturing" in their manufacturing units.

Following the implementation of the proposed framework, the firm can benchmark the existing sustainable manufacturing practices in the companies. There are numerous initiatives and approaches that Indian manufacturing companies must take in order to achieve sustainable manufacturing, some of which include minimization of waste products and recycling them as much as possible, focusing on energy conservation, restricted use of substances and handling of chemicals, reduction of air emissions, providing an excellent environment to their workforce and the entire plant, and offering the Gupta et al. (2015a) discovered in their study that companies use some important sustainable manufacturing practices such as using sustainable products and using sustainable process designs, green supply chain,

and practicing lean production and recovering the products. These practices are also seen to play an important role in achieving sustainability in manufacturing companies.

There have been numerous studies that have demonstrated the impact and influence of various aspects of sustainable manufacturing practices on competitive benefits and advantages. Green supply chains have the potential to increase competitiveness by improving product quality while saving money. Green supply chains also lead to increased efficiency and productivity. Overall, improved sustainability performance is seen as a potential source of competitive advantage, leading to more efficient processes, improvements in productivity, and market opportunities at the local and global levels.

2. LITERATURE REVIEW

The industrial sector has a significant impact on environmental factors, and the economy and society are taking shape as a result of its sustainability awareness, and the majority of industries are now working to meet current social expectations. The manufacturing sector plays an important role in modern socioeconomic systems, but it also has an impact on the environment. Spiegel (2015) discovered that strong marketing is required for "energy," "waste," and "diversity" sustainability targets. There are numerous companies that highlight strategies that support charitable programs, which are followed by the most frequently cited sustainability strategies such as smart programming, reusing waste heat, efficient lighting systems, child care, and work time models. The study also reveals some of the most common sustainability objectives, including energy, waste, and diversity.

In recent years, the trend of globalization has pushed manufacturing companies to become more competitive than ever. Most businesses are responding to the market's rapid changes by forming a business strategic orientation, which is about the business directions and goals that are driven by the company's upper management (Hong et al., 2014). The goal of the cost leadership strategy is to understand the potential costs of any industry and to keep the industry away from flaws and waste by lowering operational and production costs. This is possible by exerting control over indirect costs such as material supply and product distribution. The company also improves capacity utilization and production capacity efficiency. The goal of the differentiation process is to provide high-quality products and services that meet the needs of customers (Herzallah et al., 2014).

This differentiated strategy entails the development of differentiated products and services offered by the company that is intended to be distinct from the products and services offered by other competitors. When the target market is large, profitable, and growing, the focus strategy focuses on the small market. Typically, the focus strategy is implemented in areas where companies understand their segments and are able to offer some competitive product offerings such as "low cost" and "uniqueness" in order to satisfy the needs in a competitive manner. The classification of these competitive strategies is done using "Porter's categorization," which frames the visions and missions of the manufacturing company and ultimately provides guidance for the development of the company's operational systems. This is used to coordinate the functional decision-making process, which includes, among other things, the selection of "technologies," "suppliers," "production plans," "control systems," "workforce," and "quality practices" (Jayaram et al., 2014).

Today, it is critical for the government and industries to follow strategic leadership that ensures their involvement at all levels in the manufacturing process and its activities, which are fraught with risk and opportunity. Roni et al. (2017) discovered in their study that the size of the company plays a significant role in moderating the relationship between strategic resources and company performance. Large firms contribute significantly more than small firms to economic development and the maintenance of competitive advantage through the use of specific resources and capabilities available to the company. This is why large companies are more likely to outperform small businesses as they gain competitiveness in green product manufacturing, marketing strategy, and product commercialization. It can be seen that in the current era, as awareness of sustainable manufacturing activities grows by the day, manufacturing industries are making decisions to implement sustainable manufacturing strategies. Manufacturing industries are now implementing various sustainable

practices to reduce their carbon footprint, remain competitive, and be able to respond to the global concern about environmental degradation. "Environmentally Conscious Manufacturing," "Lean Manufacturing," and "Green Manufacturing" are examples of such sustainable practices (Vienazindiene and Ciarniene, 2013). The emergence of the concept of sustainable manufacturing practice (SMP) in the manufacturing industries is the end result of the global development of sustainable practices whose goal is to minimize the negative environmental impacts of manufacturing process activities.

When a manufacturing company's financial situation improves, the company is more willing to develop the necessary internal skills to become an expert and self-sufficient in manufacturing technologies and system operations. The study's authors also highlighted the fact that when companies have appropriate and modern manufacturing equipment, adequate financial resources, and a flexible, intelligent, and skilled workforce, they find them to be a survival element for them and achieve success (Abu et al., 2015). It has been observed that when a company has a large source of financial resources, it is able to adapt and implement various manufacturing strategies that allow the company to serve the environment while also achieving success and profitability. It is also discovered that there is a strong link between the firm's capability, cost, and profit performance and that the resources available to the company can significantly predict the company's environmental performance. As a result, it is suggested that the tangible and intangible resources available in manufacturing companies be used properly and accessible during manufacturing activities so that they can contribute to the company's better performance, success, and profit.

India's manufacturing industries lag behind other countries in terms of implementing "Advanced Manufacturing Technologies (AMTs)" such as "Flexible Manufacturing Systems (FMSs)," "Computer Integrated Manufacturing Systems (CIMS)," "Robotics," and so on. It is commendable that there has been a noticeable increase in the adoption of Advanced Manufacturing Technologies in recent years, but India is still in its early stages in this regard. There is a significant investment required in this section, and the availability of skilled and inexpensive labor is a barrier to the process. All businesses are looking for innovative and novel methods of production and manufacturing techniques. In addition to these, they are looking for innovative techniques that can improve the level of competitiveness in the manufacturing sectors. Automation of production systems is the most effective method for increasing productivity while also significantly improving the quality of the company's products. The company's production system can be automated by incorporating modern manufacturing technologies such as AMTs, FMSs, CIMSs, and so on. According to P. K. (2019), manufacturing companies in India are still in the early stages of adapting various manufacturing technologies, but there are many special benefits and advantages provided to the Indian manufacturing industries by the government's favorable policies. Advanced Manufacturing Techniques are expected to be easily and effectively adapted in Indian manufacturing industries in the near future. It has been discovered that "Flexible Manufacturing Systems" are required in India because the efficiency of FMS to increase productivity in manufacturing operations is still inadequate. Kumar and Mohan (2015) discovered in their study that there is a positive relationship between environmental, economic, and operational performance and the long-term performance of manufacturing companies. It was discovered that the environmental performance of the company has a greater influence on the long-term performance of manufacturing companies than the economic and operational performances. Gupta et al. (2018) discovered in their study that it is critical and urgent for India's manufacturing industries to reduce their raw material and energy consumption. Along with this, it is critical to address issues concerning waste management and waste material discharge. Manufacturing companies in India are now recognizing the benefits and advantages of sustainable manufacturing strategies and practices. Indian manufacturing firms are now taking proactive approaches to sustainability responsiveness, presenting new and cutting-edge sustainable manufacturing strategies and their implementations. According to Madan et al. (2017), it is critical for the manufacturing industries to focus more on environmental-based practices in their manufacturing. It has also been discovered that implementing sustainability improves the work culture

and employee commitment to work. More research should be conducted in various manufacturing industries to compare different companies' perceptions of manufacturing sustainability.

Sustainability strategies are the road map or route for manufacturing industries to follow all of the sustainability goals and pillars at the same time, in a logical and consistent manner. In another sense, these adaptations are a method for optimizing problems using a large number of correlations.

OBJECTIVE & HYPOTHESES OF THE STUDY

- To explore different sustainable manufacturing strategies adopted by the firms for competitiveness.
 - To find the correlation between sustainable manufacturing strategies and the competitiveness of the firms.
- **H0** There is no significant correlation between sustainable manufacturing strategies and the competitiveness of the firms.
- **H1** There is a significant correlation between sustainable manufacturing strategies and the competitiveness of the firms.

3. RESEARCH METHODOLOGY

To collect primary data, a sample of 190 respondents was surveyed using a standard questionnaire. Respondents from various manufacturing firms were asked about their manufacturing strategies and the firm's competitiveness. The study is empirical in nature, with a random sampling method. Correlations between sustainable manufacturing strategies and firm competitiveness have been examined in order to obtain appropriate results.

4. FINDINGS OF THE STUDY

The demographic profile of the respondents is shown in Table 1. It can be seen that 64.7% of the 190 respondents are male and 35.3% are female. 11.1% of respondents work in a company that has been in operation for 1-5 years, 30.0% work in a company that has been in operation for 6-10 years, 22.1% work in a company that has been in operation for 11-15 years, and the rest do not. 36.8% of respondents work for a company that has been in business for more than 15 years. 31.1% of respondents work for a small firm, 35.3% work for a medium-sized firm, and 33.7% work for a large firm. 15.3% of respondents work in the food and beverage manufacturing industry, 14.2% in the electrical and electronics industry, 16.8% in the metals and machinery manufacturing industry, 11.1% in the pharmaceutical industry, 18.4% in the textile industry, 12.6% in the automobile industry, and 11.6% in other manufacturing industries.

Table 1 Demographic profile of the respondents

Variables	No. of respondents	Percentage
Gender		
Male	123	64.7%
Female	67	35.3%
Total	190	100
Age of the firm		
1-5 years	21	11.1%
6-10 years	57	30.0%
11-15 years	42	22.1%
More than 15 years	70	36.8%
Total	190	100
Size of the firm		
Small	59	31.1%
Medium	67	35.3%
Large	64	33.7%

Total	190	100
Manufacturers		
Food and beverages	29	15.3%
Electrical and electronics	27	14.2%
Metals and machinery	32	16.8%
Pharmaceuticals	21	11.1%
Textile	35	18.4%
Automobiles	24	12.6%
Others	22	11.6%
Total	190	100

Table 2 Correlation between Manufacturing Strategies and competitiveness of firms

S. No	Manufacturing Strategies	Competitiveness of firms
	Market and Demand	
	The connection between brand and customers	0.013
	Reviewing demands in the market	0.023
	A large variety of products	0.031
	Cost and production	
	Focusing on energy consumption	0.050
	Reducing the use of raw material	0.046
	Approach to investment	
	Links with capital markets	0.037
	Investing in mutual funds	0.042
	Association with financial institutes	0.029
	Links with local and global markets	
	Easy policies for large expansions	0.052
	Forming Healthy relations	0.020
	Environment for manpower	
	Providing a good and healthy environment	0.040
	Focusing on safety management	0.012
	Encouraging safe work practices	0.035
	Lean production	
	Minimizing waste during production	0.041
	Recycling the materials	0.002

Table 2 depicts the relationship between Sustainable Manufacturing Strategies and Firm Competitiveness. All of the Sustainable Manufacturing Strategies, such as connection between brand and customers, market demand review, a large variety of products, focus on energy consumption, raw material reduction, links with capital markets, investing in mutual funds, association with financial institutes, easy policies for large expansions, Forming healthy relationships, providing a good and healthy environment, emphasizing safety management, encouraging safe work practices, minimizing waste during production, and recycling materials all have a significant correlation with the firm's competitiveness.

5. CONCLUSION

At the moment, business organizations are attempting to gain a competitive advantage and improve their firm's performance by implementing various sustainable manufacturing strategies. They want to boost their competitiveness in order to compete with their competitors while also outperforming their firm's performance. They are concentrating on market demands while also attempting to reduce production costs. In addition, they are attempting to connect with global and local markets in order to increase their profitability.

The study concludes that the firm employs numerous sustainable manufacturing strategies to achieve effective competitiveness, such as reviewing market demands, focusing on energy consumption and reducing the use of raw materials, investing in mutual funds, simple policies for large expansions, providing a good and healthy environment, and encouraging Lean production. It is also observed that there is a significant correlation between almost all of the forms' sustainable manufacturing strategies and their competitiveness.

References

1. Gupta, S., Dangayach, G. S., & Singh, A. K. (2015b), Key determinants of sustainable product design and manufacturing, *Procedia CIRP*, 26, 99-102.
2. Garbie, I. H. (2014), An analytical technique to model and assess sustainable development index in manufacturing enterprises, *International Journal of Production Research*, Vol. 52(16), 4876-4915.
3. Gupta, S., Dangayach, G. S., Singh, A. K., & Rao, P. N. (2015a), Analytic hierarchy process (AHP) model for evaluating sustainable manufacturing practices in Indian electrical panel industries, *Procedia-Social and Behavioral Sciences*, 189, 208-216.
4. Spiegel, Daniella Van der; Linke, Barbara S.; Stauder, Jens; Buchholz, Steffen (2015), Sustainability strategies of manufacturing companies on corporate, business and operational level, *International Journal of Strategic Engineering Asset Management*, Vol. 2(3), 270–. doi:10.1504/ijseam.2015.072125
5. Hong, P., Yang, M.G. and Dobrzykowski, D.D. (2014), “Strategic customer service orientation, lean manufacturing practices and performance outcomes: an empirical study”, *Journal of Service Management*, Vol. 25(5), 699-723.
6. Herzallah, A.M., Gutierrez-Gutierrez, L. and Rosas, J.F.M. (2014), “Total quality management practices, competitive strategies and financial performance: the case of the Palestinian industrial SMEs”, *Total Quality Management and Business Excellence*, Vol. 25(5-6), 635-649.
7. Jayaram, J., Tan, K.C. and Laosirihongthong, T. (2014), “The contingency role of business strategy on the relationship between operations practices and performance”, *Benchmarking: An International Journal*, Vol. 21(5), 690-712.
8. Roni M, Jabar J, Muhamad MR, and Murad M (2017), Sustainable manufacturing drivers and firm performance: Moderating effect of firm size, *International Journal of Advanced and Applied Sciences*, 4(12), 243-249.
9. Vienazindiene, M. and Ciarniene, R. (2013), Lean manufacturing implementation, *Economics and Management*, Vol. 18(2), 366-373.
10. Abu F, Jabar J, and Yunus AR (2015), Modified of UTAUT theory in adoption of technology for Malaysia small medium enterprises (SMEs) in food industry, *Australian Journal of Basic and Applied Sciences*, Vol. 9(4), 104-109.
11. P. K. Manoj (2019), Competitiveness of Manufacturing Industry in India: Need for Flexible Manufacturing Systems, *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, Vol. 8(12), 3041-3047.
12. Gupta, Sumit; Dangayach, G. S.; Singh, A. K.; Meena, M. L.; Rao, P. N.; Gunasekaran, Angappa; Gunasekaran, Angappa (2018), Implementation of sustainable manufacturing practices in Indian manufacturing companies. *Benchmarking: An International Journal*, doi:10.1108/BIJ-12-2016-0186
13. Madan S., K., Kannan, D., and Udhaya, K. P. (2017), Analyzing sustainable manufacturing practices – A case study in Indian context, *Journal of Cleaner Production*, S0959652617310314–. doi:10.1016/j.jclepro.2017.05.097