

Sustainable Manufacturing- Need to shift in Paradigm of Indian Manufacturing Sector in Micro, Small & Medium Enterprises (MSME's)

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Abstract: “What we are producing today should be manufactured by sustainable manufacturing process. It should not impact our future generation.” Rapid industrialization & economic growth of 7.5%, continues to improve living standard but it may not continue for future generation. Modern manufacturing system, typically in Indian MSME's consumes a large amount of resources, generates waste and pollutes the environment. Some of Raw material and energy is consumed to make the product and maximum amount of resources are wasted.

There is a paradigm shift required in manufacturing sector from traditional manufacturing model, in which environmental activities in a business were seen only on cost; natural resources are viewed as freely available. For manufacturer; sustainability has been emerging as a new competitive requirement to achieve differentiation in market. The current proposed work is based on development of sustainable manufacturing model for Indian manufacturing MSME's and proposed a framework for improving the performance to make them more sustainable. However, developing and maintaining a focus on sustainable manufacturing is new and difficult challenge for Indian MSME's. Industries are predominantly of Micro, small and medium enterprises, having little experiences in environmental issues as most of business is family owned business and being run by single owners.

Keywords: Manufacturing Model, MSME's, Sustainable Manufacturing, Business strategies.

Introduction

After World War II, the manufacturers were struggling to survive with very limited resources. This has led many organizations to implement the Toyota Production System (TPS), otherwise known as lean manufacturing. Competing and winning today in manufacturing requires a vision that includes Environmental Sustainability (Green) with enterprise-wide practical strategies that deliver clear, measurable, and rapid returns. Today's winning companies are combining Lean and Green strategies and tactics to spot and eliminate many wastes that are often overlooked. The current definition of Green has contained the notion of “helping to sustain the environment for future generations.” Returns like positive cash flow, reduced energy, material, and operating costs can make or break a company today. The emerging working definition of Lean as “The elimination of waste everywhere while adding value for customers” is bringing Lean and Green together at last. The reason being is that Green does this elegantly by following the wisdom of the natural world which is both truly efficient and effective in creating value and that produces no waste at all.

Centuries ago, when natural resources were abundant and labour was scarce, industries strived to find ways to increase labour efficiency through introducing diverse manufacturing strategies and technologies. Strategies ranged from job flexibility, shift-work, time-and-motion study and mass production to lean production, while technologies ranged from machine tools, engines, and automated devices to robots and automated lines; all these were designed and used to increase labour productivity in order to meet customer demand. Modern manufacturing consumes large amounts of resources, generates waste, and pollutes the natural environment. So, a question has been asked as to whether continued industrial expansion and manufacturing production in the current manner would be sustainable in the long term.

Literature Review

Efforts made by researchers from as early as the 1960s promoted ‘pollution prevention’ (Dales 1968) and the IPAT equation [the multiplicative contribution of population {P}, affluence {A} and technology {T} to environmental impact {I}] (Ehrlich and Holdren 1971, Commoner 1972, Holdren and Ehrlich 1974 as cited by Fischer-Kowalski and

Amman 2001). In 1987, the Brundtland report popularised the concept of sustainable development which it defined as 'meets the needs of the present without compromising the ability for future generations to meet their own needs'.

However, it was not until the 'wake-up call' in 1992 at the Earth Summit in Rio de Janeiro, when nations met to discuss problems due to pollution that they agreed to the need for actions toward sustainable development. While no agreement between nations was reached at the summit on the issue of pollution, the consensus on there being limits to what we could put into nature (in the form of pollution) as well as what we could take out of nature (in the form of raw materials) did result in industries and organisations starting to work towards practicing sustainable material/resource strategies such as resource efficiency, eco-efficiency and sustainable development. The connection between lean and green manufacturing has been well documented in recent literature (Angel, Kalssen, 1999; Sawheny, Teparakuland Li 2007) green or sustainable manufacturing is defined by Allwood (2009) as method to "develop technologies to transform material without emission of greenhouse gases, use of non renewable energy or without generation of toxic waste. Notably the green wastes are very different from lean waste. Lean seeks to eliminate traditional waste like cost, time, production (Bergman, Hermann Stehr, & Sebastian 2007) while green is concerned with impact the environment (Bergmiller & Mcwright, 2009).

For industry, a widely-used and basic strategy to increase the efficiency with which we use available resources is to concentrate efforts on recovery of products or materials at the end of their useful life [which includes re-use, re-manufacturing, re-cycling and energy recovery and is termed the waste hierarchy (Jackson 1996)]. Schmidt- Bleek (1995) pointed out that less than 20% of all materials originally moved (disturbed and extracted) end up in products and infrastructure. This makes the overall recycling capacity very limited. Lovins (2003) suggests that from the 100% of natural capital extracted to make a product in the United States, commonly only 7% of materials become products that we end users see or use, meaning 93% becomes waste within industrial processes (this includes extractive and manufacturing waste). Out of the 7%, 1% becomes durable and 6% becomes waste from customer first use. Going further, of these 1% consumer durables, only 0.02% is recycled or remanufactured and the balance of 0.98% becomes persistent waste from disposal (typically landfill).

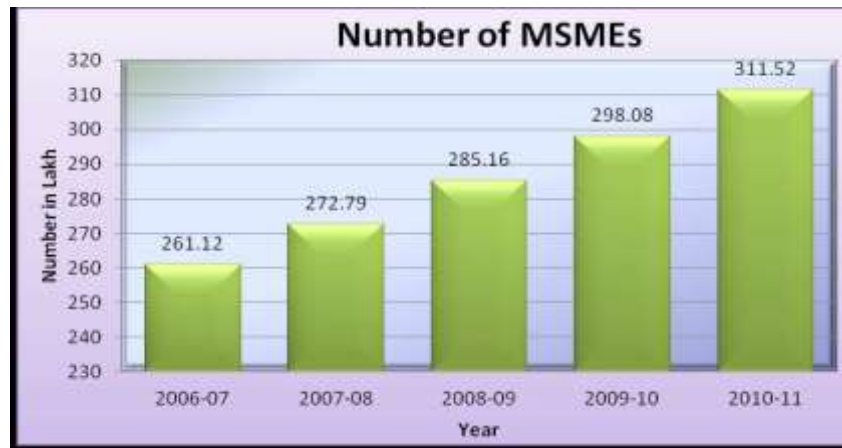
The Brundtland Commission defined sustainable development in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). Sustainable manufacturing refers to developing and practicing technologies to transform materials into finished products with reduction in each of; energy consumption, emission of greenhouse gases, generation of waste, use of non-renewable or toxic materials (Madu 2001). While practicing environmentally friendly manufacturing, the business must remain economically viable and socially beneficial. Hence, the Triple Bottom Line (TBL), i.e., people, planet, and profit for assessing a Company's performance.

Sawheny, Teparakul, Aruna, and Li (2007) show the connection between lean manufacturing and the environmental movement stating that "it is natural that the lean concept, its inherent value-stream view and its focus on the systematic elimination of waste, fits with the overall strategy of protecting the environment", which they call Environmental Lean (En-Lean). Typical metrics for measuring environmental performance include scrap or non-product output, materials use, hazardous materials use, energy use, water use, air emissions, hazardous waste, and water pollution (EPA 2005). None of these is directly optimized in a typical lean implementation, so it is difficult to know whether a lean process is operating at optimal environmental performance. To help address this question, Simons and Mason (2002) developed sustainable value stream mapping by adding a sustainability metric (supply chain carbon dioxide divided by market weight of product) to the conventional value stream mapping process. Similarly, Karp (2005) advocates adding environmental aspects to value stream maps.

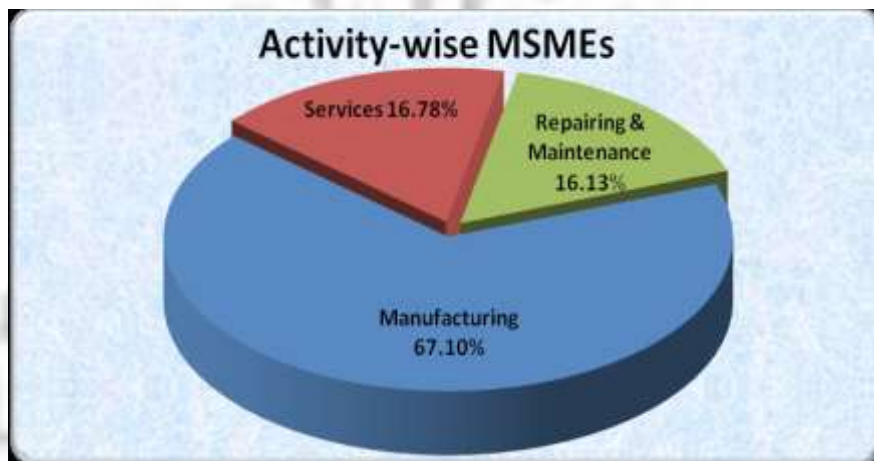
Moreover, it is unclear how an optimal future state map would be developed for Micro, Small & Medium enterprises. However, developing and maintaining a focus on sustainable manufacturing is new and difficult challenge for Indian MSME's. Industries are predominantly of Micro, Small and Medium enterprises, having little experiences in environmental issues as most of business is family owned business and being run by single owners. In addition to eliminate the wastes, there is need for fundamental shift in business model. The business that first makes the changes will have competitive advantages. Those that don't make efforts won't be a problem because ultimately they won't be around.

MSME's Status in India

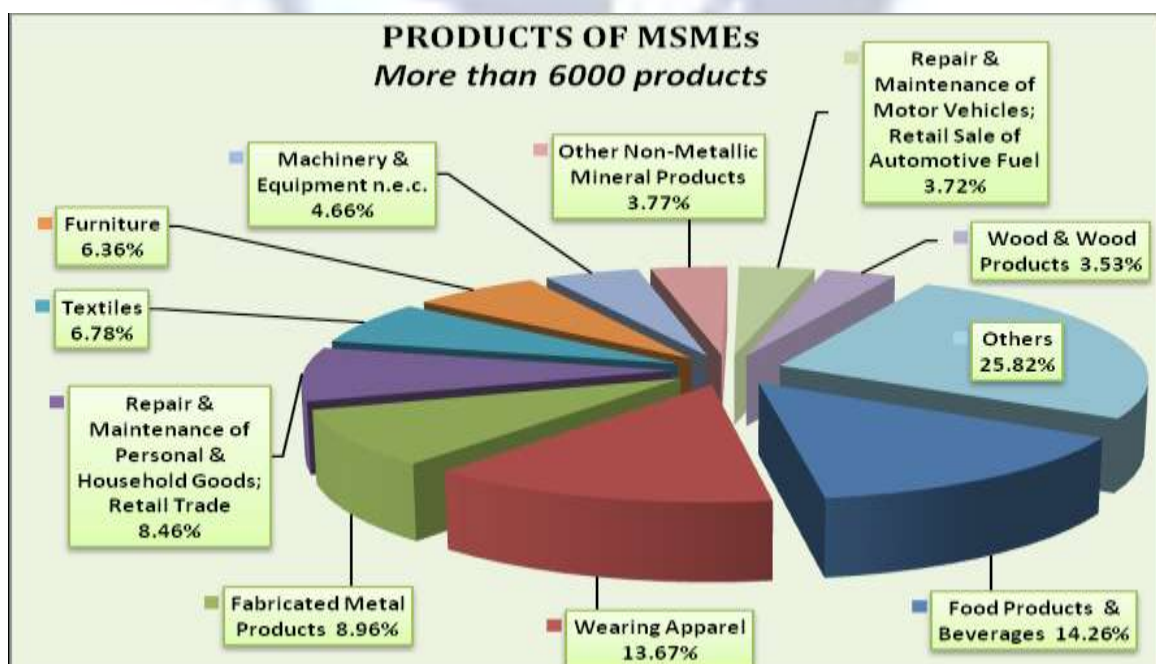
It is estimated that there are 311 lakhs MSME's are working India (shown in fig 1) and in terms of value the MSME sector account 45% manufacturing output and 40% of total export of country. MSME's contributes around 8.2% of GDP. In all the MSME's approximate 732 lakhs people are employed.



Out of total registered MSMEs, approximate 94.9% are Micro industry, 4.8% are small and 0.2% are medium enterprises. 67% industries are manufacturing industry as shown in fig 2.



90% of the MSMEs are proprietary firms and being run by a single owner. The focus in proposed research will be manufacturing sector as it contributes in maximum. There are over 6000 products ranging from traditional to high-tech items, which are being manufactured by MSMEs as shown in fig no. 3



Source: - Final Report of the Fourth All India Census of Micro, Small & Medium Enterprises: Registered Sector.

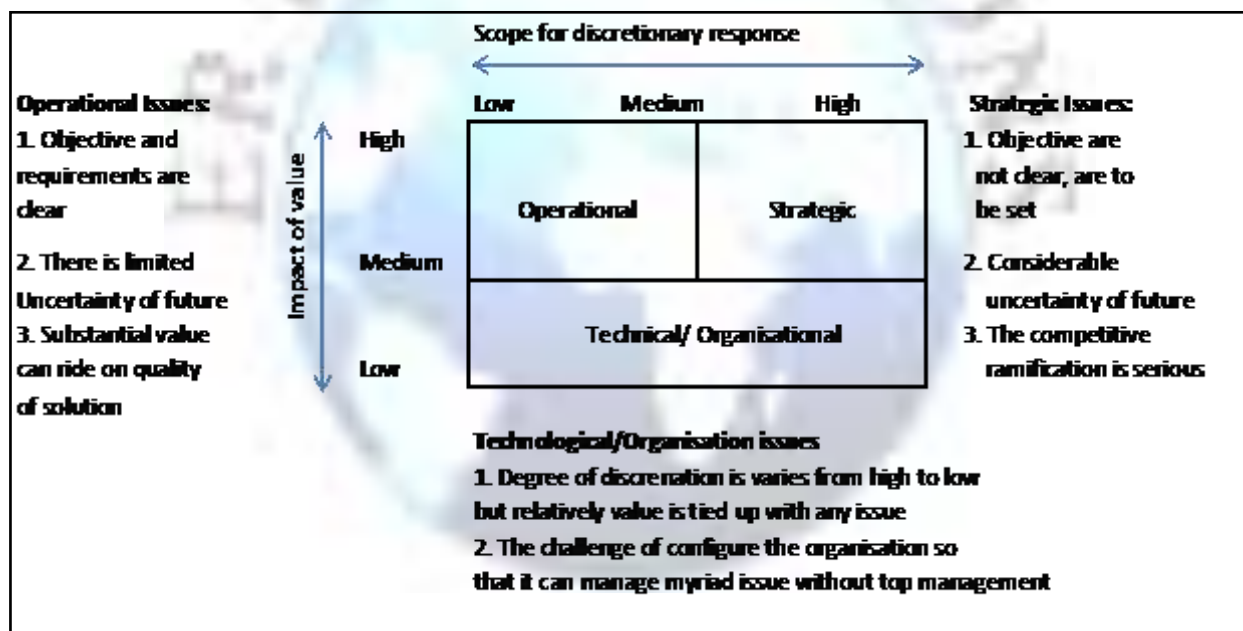
Approaches for building environment in business thinking of MSME's

The below five approaches that managers/ entrepreneurs can take to identify those circumstances and integrate environment in to business thinking. The five approaches are as follows:

1. Differentiate the product: - The idea behind environmental product differentiation is straightforward: MSME's create products or employ process that offer great environmental benefits.
2. Managing your competitors:-Not all companies will be able to increase their profits through environmental product differentiation. But some may be able to derive environmental and business benefits by changing the rules of game so that playing fields change in their favour.
3. Saving cost: - Third approach is focusing not only environmental issues but also reduce internal cost. Some organisations are able to cut cost and improve environmental performance simultaneously.
4. Managing Environmental risk: - For many organisations Environmental management means risk management. Most of the cost like close out, accidents, and law suits are being taken care directly by environmental management.
5. Redefining Markets: - Some companies can follows several approaches and in the process the redefine the markets through remanufacturing.

The path of pragmatism for MSME's

MSME's must focus on "trade- off zone" where environmental benefits are weighed judiciously against value destruction. Only focus on value rather than compliance, emission or quarterly cost can provide entrepreneurs with information to set priorities and develop business responses. Entrepreneurs must set clear priorities based on potential impact on shareholder values. Within this frame work, environmental issues can be broken in three broad categories: Strategic, Operational and Technical as shown in below fig 4.



Beyond Greening – Strategies for Sustainable Manufacturing in MSME's:

30 years ago environmentalist Paul Ehrlich made a power full observation about sustainable development. i.e.

Environmental Burden (EB) = Population (P) X Affluence (A) X Technology (T)

Achieving sustainability will require stabilizing or reducing the environmental burden. That can be done by lowering the population, lowering the consumption or changing the technology to create wealth. Controlling the population is beyond feasibility at this stage and controlling the consumption will even worsen the situation. That leaves only the third option i.e. changing in technology to create wealth for them and society both. MSME's need to have clear vision at this stage to guide them through three stages for environmental strategy:

Stage one: Pollution prevention:

This stage is governed by principal "Prevention is better than cure". Pollution control means cleaning up waste after it has been generated. Pollution prevention focuses on minimising or eliminates the waste before it created. MSME's need to build the prevention in manufacturing model at the stage of inception.

Stage two – Product Stewardship

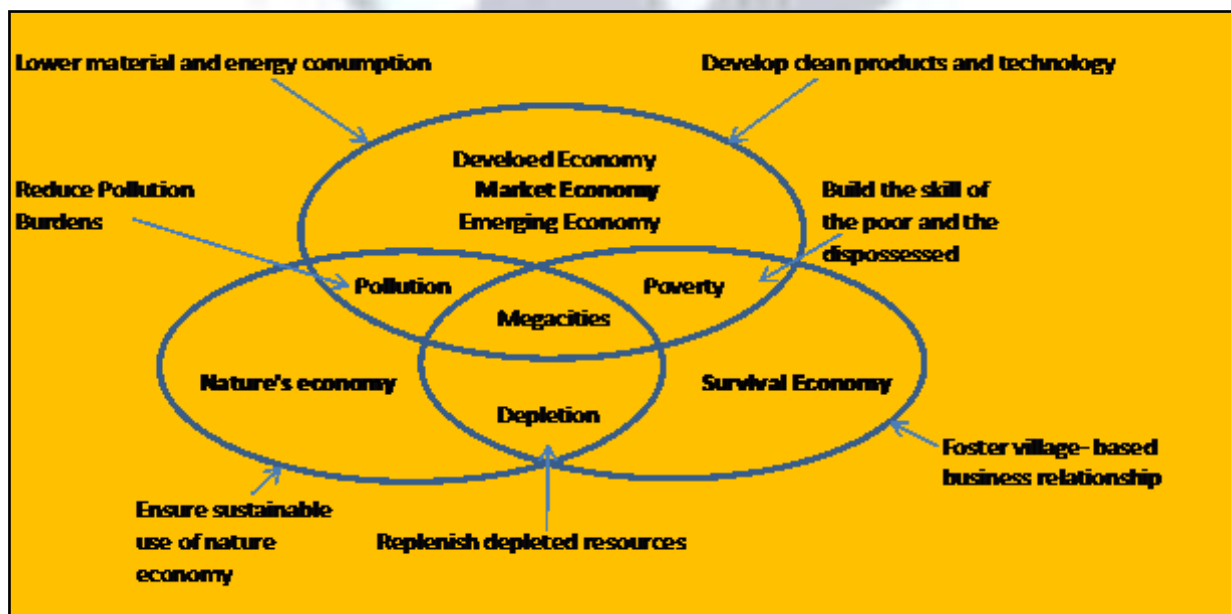
Product stewardship focuses on minimising not only the pollution from manufacturing but also all environmental impact associated with full of life cycle of a products. The organisation's need to look for Design for Environment (DFE), a tool for creating products that are easier to recover, reuse, or recycle is becoming increasingly important. Cradle to cradle analysis begins and ends outside the boundaries of company's operation. By reducing material and energy consumption, DFE can be highly profitable.

Stage three – Clean technology

MSME's with their eyes on future can begin to plan for and invest in tomorrow's technologies. The simple fact is that existing technology base in many industries is not environmentally sustainable. Cleaner technologies are desperately needed in Micro Small and Medium Enterprises. The sustainability portfolio analysis for MSME's is shown in fig 5.

	Internal	External
Tomorrow	Clean technology 1. Is the environmental performance of our products limited by our existing competency base? 2. Is there potential to realize major improvement through new technology?	Sustainability vision 1. Does our corporate vision direct us towards the solution of social and environmental problems? 2. Does our vision guide the development of new technologies markets, products and processes
Today	Pollution Prevention 1. Where are the most significant waste and emission streams from our current operation? 2. Can we lower costs and risks by eliminating waste at source or by using it as a useful input?	Product stewardship 1. What are the implication for products design and development if we assume responsibility for a product's entire lifecycle. 2. Can we add value or lower costs while simultaneously reducing the impact of our products

A clear and fully integrated environmental strategy should not only guide competency development, it should also shape the company's relationship to customers, suppliers, other companies, policy makers, and all stake holders. Companies can and must change the way customers think by creating preferences for products and services consistent with sustainability. The rapid growth in emerging economies cannot sustain in face of mounting environmental deterioration, poverty and resources depletion. See Building sustainable business strategies in fig 6.



Benefit of Sustainable Manufacturing for MSME's

Process benefits:

Material saving resulting from more substitution, reuse or recycling of production inputs.

- Better utilisation of by-products, conversion of waste into valuable forms.
- Lower energy consumption during production process.
- Reduce material storage and handling cost.
- Elimination of cost of activities involved in discharge or waste handling, transportation and disposal.

Product benefits:

- Higher quality, more consistent products and lower products cost (Material substitution).
- Lower packaging cost, more efficient use of resources by products.
- Lower net cost of products disposal to customer.
- Higher product resale and scrap value.

Conclusion

The new world of sustainable technologies and business strategies is undoubtedly a challenging and exciting emerging reality for the manufacturing industries. Key drivers of compliance, community expectations, risks, costs and market competition will ensure that those who don't adapt will be left behind. The role that manufacturing will play in creating and shaping this world is significant and will require steadfast commitment and effective strategies that embrace the full extent of sustainable possibilities. A sustainable organisation will take a broad perspective of sustainability that includes environmental, social and economic criteria and engages the entire stakeholder community. Critical elements will be in skills development, new, sustainable technologies and lean and efficient manufacturing practices. In this paper we have identified problems managers experience when trying to make their organizations more sustainable. Some of these problems are due to managers addressing sustainability as an operational rather than as a strategic issue.

Hence, sustainability is the "ingredient" that has been missing from these organizations' strategies. We have argued that for organizations to become more sustainable, managers must address the different dimensions of sustainability at the strategic level, both during the strategic decision-making process and as part of the strategy content at the corporate, business and functional levels. Managers and scholars can use the framework we have provided to assess the degree to which organizations have strategically addressed sustainability and to identify opportunities for further improvement. Although we have analyzed each individual element of the framework separately, it is important to recognize that all elements are interconnected and significantly influence each other. Developing an organization that regards sustainability as a cornerstone for doing business requires a strategic approach that integrates economic, environmental and social considerations in all aspects of business.

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