

# RECENT TRENDS IN MANUFACTURING

**Abstract:** The purpose of this paper is to present an interpretation of recent progress in manufacturing systems from the perspective of control. We believe that this community has a vocabulary and a view of systems that can be helpful in this area. However, in order for this group to make that impact, it is essential that they learn the problems and terminology and become familiar with recent research directions. This paper is intended to present certain issues in manufacturing management in a way that will facilitate in this direction by providing actions to be taken by the concerned enablers.

**Keywords:** Manufacturing Trends, Lean Manufacturing, Demand Flow Manufacturing, Just-in-Time, Agile Manufacturing, Rapid Manufacturing, Flexible Manufacturing System, Advanced Planning and Scheduling, Capability Analysis.

## 1. Introduction:

Manufacturing is the use of machines, tools and labour to move things for use or sale the term refers to the range of human activity from handicraft to high-tech but it is most commonly applied to industrial production, in which raw materials are transformed into finished goods on a large scale. The increased integration of technology, operating and quality models, and integrated business models will be essential to helping the US manufacturing sector survive and remain competitive in the global economy. But which

are the best methods, systems and practices to employ and how they can most effectively be implemented? — What is the business strengths required for sustainable competitive advantage? — What are the current business weaknesses, and how are they corrected? — What is the value that each process and system delivers?

— What are the risks? — Do the systems driving each process deliver the appropriate information for optimal process and business performance? — How do these processes and systems interact and what are their interdependencies – both internally and externally? — What processes and systems need to be improved or abandoned? — What skills are required to support each process and system? — Who has business ownership and accountability for each process?

## 2. Literature Review:

**Current Manufacturing Trend and its lack of Competence:** Currently manufacturing “Leaders” are looking to more effectively integrate their shop floor control systems, production demand management and execution systems, and Enterprise Resource Planning (ERP) systems. Manufacturing “Followers” are still in the Manufacturing Execution System (MES) and production demand management system implementation level of maturity, while the “laggards” are still struggling with implementation and effective utilization of basic Lean Manufacturing and ERP principles. In spite of all the improvements made over the past two plus decades, some of the same issues continue to plague the manufacturing sector [5]: — Increased global competition — Increasing market demand for high quality products at lower cost — Escalating costs — Increasingly dynamic market changes and patterns of customer demand — Shortage of appropriately skilled resources

Need for new Manufacturing Trends: Some more recent dynamics that have created more pressure manufacturers include the increased global demand for raw materials and other resources, as well as the wildly fluctuating currency markets. All of these issues drive the need to: — Reduce operating costs, while maximizing long-term profitability and increasing product quality — Improve ability to quickly respond to market changes and customer demand — Improve supply chain efficiency — Improve demand planning scope and accuracy — Improve availability and visibility of key information needs — Close functional gaps and increase integration between back-office and shop floor systems.

Globally Emerging Manufacturing Practices: The increased use of technology and best-in-class operational and quality methodologies has resulted in a slight increase in the U.S. share of global manufacturing since 1980. But there are many commonly known practices used today that facilitate cost reduction, quality improvement and flexibility in the manufacturing environment. Some examples of these are: (a) Lean Manufacturing (b) Demand Flow Manufacturing (c) Just-in-Time (d) Agile Manufacturing (e) Rapid Manufacturing (f) Flexible Manufacturing System (e) Advanced Planning and Scheduling Each of these practices has its unique focus, strengths and inherent weaknesses. In addition, many of these practices and their supporting technologies are implemented, with limited integration between each other, ERP systems and external demand planning systems. For example, Lean Manufacturing focuses on elimination of waste. Lean practices are inherently less flexible than Agile Manufacturing practices, performing best when there is a stable demand pattern. Conversely, Agile

Manufacturing tends to create more waste. Demand Flow Management combines the best of Lean and Agile, but requires the ability to manufacture based on real demand and product delivery within customer specified time frames. Just in Time focuses on strict management of delivery schedules, reduction of inventory, and related carrying costs, but calls for upstream suppliers to carry much of the burden of these tighter requirements. Today's manufacturing environment is one of highly variable demand, demand for consistently high quality product, and rapid market response. Adaptive Manufacturing focuses on enabling a convergence of Lean and Six Sigma principles for early identification of exceptions and rapid response, resulting in continuous quality improvement. All of these practices require strong operational discipline and controls, efficient processes and effective information management. None of these manufacturing practices is ideal for every manufacturing company and none are most effective when implemented in a "purist" manner. The specific qualities of the company's customer base, demand stability, geographical location, supply chain characteristics, strategic direction, etc. must all be considered when determining the appropriate practices to implement and how they should be implemented to achieve maximum results and bring sustainable value to the company. In order to optimize the response to global pressures, manufacturers need to use a hybrid model for implementing and integrating available systems, tools and methodologies, based on their specific market, customer, financial and regulatory pressures, as well as internal constraints and strategic imperatives.

(a) Lean Manufacturing: Lean manufacturing or lean productions, which is often known simply as "Lean", is a production practice that considers the expenditure of resources for any goal other than the

creation of value for the end customer to be wasteful, and thus a target for elimination. Basically, lean is centred on preserving value with less work. Lean manufacturing is a generic process management philosophy derived mostly from the Toyota Production System (TPS) (hence the term Toyotism is also prevalent) and identified as "Lean" only in the 1990s. It is renowned for its focus on reduction of the original Toyota Seven wastes to improve overall customer value, but there are varying perspectives on how this is best achieved. The steady growth of Toyota, from a small company to the world's largest automaker, has focused attention on how it has this [4] [2].

(b) Demand Flow Manufacturing: The most value and variation is created here: both in the product and the service of supply. Demand Flow Manufacturing starts with the method for combining demand and releasing orders into production. It works to optimise the allocation of asset capacity and inventory to the required service level to the customer. The paradigm aim is a daily order release of the exact product mix and volume according to customer demand.

(c) Just-in-time (JIT): This is an inventory strategy that strives to improve a business's return on investment by reducing in-process inventory and associated carrying costs. To meet JIT objectives, the process relies on signals or Kanban between different points in the process, which tell production when to make the next part. Kanban are usually 'tickets' but can be simple visual signals, such as the presence or absence of a part on a shelf. Implemented correctly, JIT can improve a manufacturing organization's return on investment, quality, and efficiency.

(d) Agile Manufacturing: It is a term of light to an organisation that has created the processes, tools and training to enable it to respond quickly to customer and market changes by still controlling cost and quality. Agile manufacturing is seen as the next step after learning the evolution of production and methodical.

(e) Rapid Manufacturing: It is an additive fabrication technique for manufacturing solid objects by the sequential delivery of energy and materials to specify points in space to produce that part. Crane practice is to control the manufacturing process by computer using a mathematical model created with the aid of computer.

(f) Flexible Manufacturing System: Flexible manufacturing is a manufacturing system in which there is some amount of flexibility that allows the system to react to the case of changes, whether predicted or unpredicted. This flexibility generally considered in two categories: □ Machine Flexibility: It covers the system ability to be changed to produce new products type and ability to change the order of operations executed on a part. □ Routine Flexibility: Which consists the ability to use multiple machine to perform same operations on a part, as well as the system ability to absorb large scale changes, such as in volume capacity or capability.

(g) Advanced Planning and Scheduling: This is also referred to as APS and advanced manufacturing where there is a manufacturing management process by which raw materials and production capacity

are optimally allocated to meet demand. APS is especially well-suited to environments where simpler planning methods cannot adequately address complex trade-offs between competing priorities. Production scheduling is intrinsically very difficult due to the (approximately) factorial dependence of the size of the solution space on the number of items/products to be manufactured. Traditional planning and scheduling systems (such as Manufacturing resource planning) utilize a stepwise procedure to allocate material and production capacity. This approach is simple but cumbersome, and does not readily adapt to changes in demand, resource capacity or material availability. Materials and capacity are planned separately, and many systems do not consider limited material availability or capacity constraints. Thus, this approach often results in plans that cannot be executed. However, despite attempts to shift to the new system, attempts have not always been successful, which has called for the combination of management philosophy with manufacturing

4. Conclusion: Choices must be made about which manufacturing sectors will be more important for inclusive and sustainable growth of India in the next 25 years. Choices must also be made about the best ways to stimulate that growth. Improving the physical infrastructure for manufacturing must be an essential element of the strategy. Here top policymakers must make choices. □ We have described a framework for many of the important problems in manufacturing

systems that need the attention of people trained in control and systems theory. □ We have shown how existing practical methods solve those problems, and where they fall short. □ We have also shown how recent and on-going research fits into that framework. An important goal of this effort has been to encourage control theorists to make the modelling and

analysis efforts that will lead to substantial progress in this very important field. □ The selection of manufacturing sectors that should get higher priority is not a trivial exercise because there are linkages between industrial sectors and also linkages with overall economic needs for inclusion and sustainability. □ A country's competitive ability lies in the capability of the collaborative process between producers and policymakers to produce effective strategies and policies.

5. Future Implications in India: There is concern with the relatively poor performance of the manufacturing sector. A principal concern is with the need to create more jobs in which the manufacturing sector should have a larger role to play at our stage of development. It is estimated that an additional 200 million Indians will enter the job market by 2025, with overall population growth and the large numbers of young people who will be joining the workforce [6]. In summary, growth numbers suggest that the panoply of reforms so far has been better for the overall economy than for manufacturing. The country needs a strategy for manufacturing to become a powerful engine for inclusive and sustainable double-digit economic growth.



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