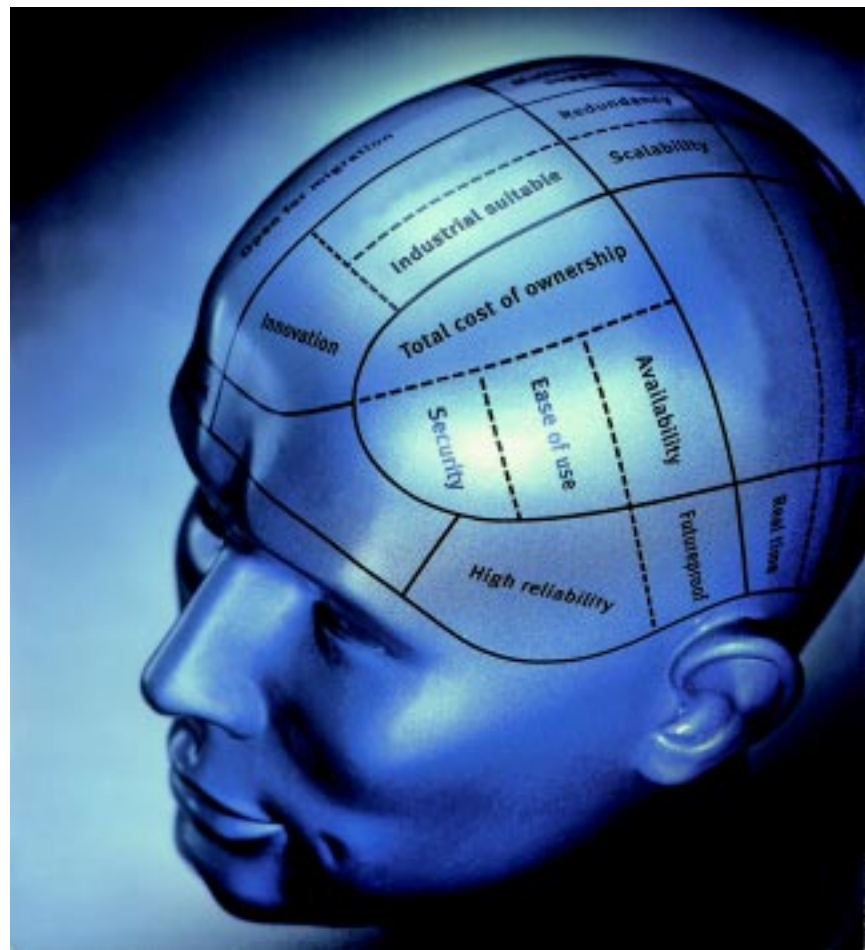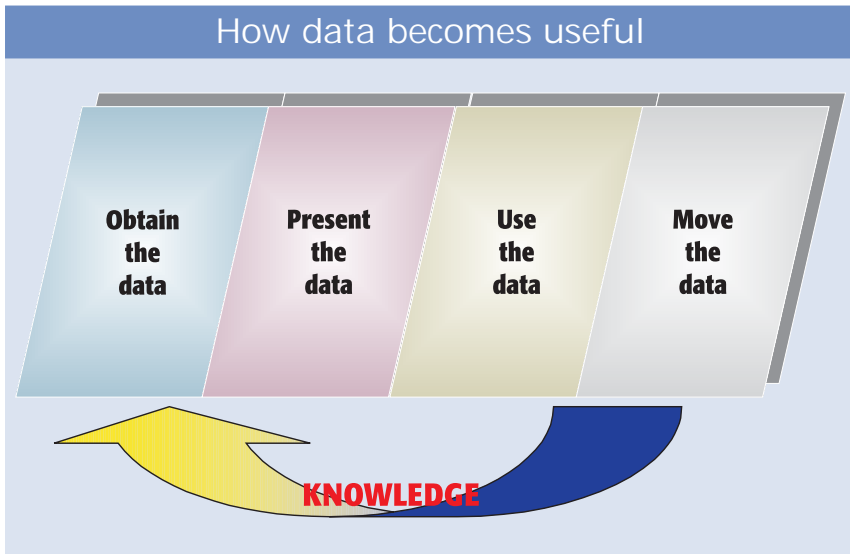# Manufacturing
Intelligence

BY **VAIDEE SAMPATHKUMAR**

Today, Indian manufacturers are in a very unique position. There is growing demand, and need for high quality, low cost products. Having interacted with Japanese consultants and quality gurus, our manufacturers have mastered the art of quality improvement, defect reduction etc and have created excellent quality control processes. The quality journey is ongoing and is part of the culture of most successful manufacturing organisations. Now, manufacturers need to understand the business side and exploit the technological advances in Information Technology(IT) to be part of the value chain of any industry. They have to be flexible to changes in demand and be able to supply just-in-time to their customers. They also need to be prepared to changes in design, release of new products and are expected to work directly in their customer's design team. Customers rate their suppliers based on their processes, level of manufacturing visibility, ability to quickly react to changes, level of technology used, information systems usage etc. Highest level of quality is assumed and may not be spoken about while lowest price is required.

The consumers in India and abroad are very fussy and it is difficult to predict their behaviour. MNCs want to sell in India and often, also set up manufacturing facilities in India. The cell phone market and automobile market is increasing exponentially in India. The result is that the entire supply chain of a particular product is also expanding. Original Equipment Manufacturers (OEMs)are producing for local as well as overseas market. OEMs have now developed a good supply base in India, usually located close to their manufacturing assembly plants. Tier -1 suppliers to Maruti and Hyundai may be the same company but they may open dedicated facilities close to

How data becomes useful

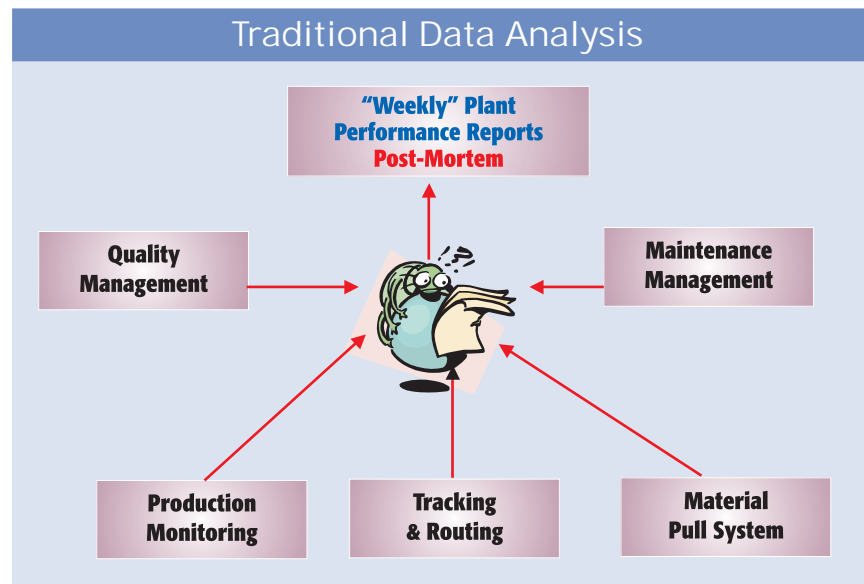| Obtain the data | Present the data | Use the data | Move the data |

KNOWLEDGE

their customers or have dedicated different lines in the same facility. OEMs in developed nations are looking to outsource more and more components from India to reduce cost.

The suppliers, who were earlier catering to the Indian market, are becoming global suppliers and are increasing their capacity. For example, a particular Tier 1 suppliers' group comprises 18 companies spread in eight states of the country. The group has also built up a sizeable export market, currently about 17 per cent of the total sales of existing products, targeted to reach 30 per cent in the next few years.
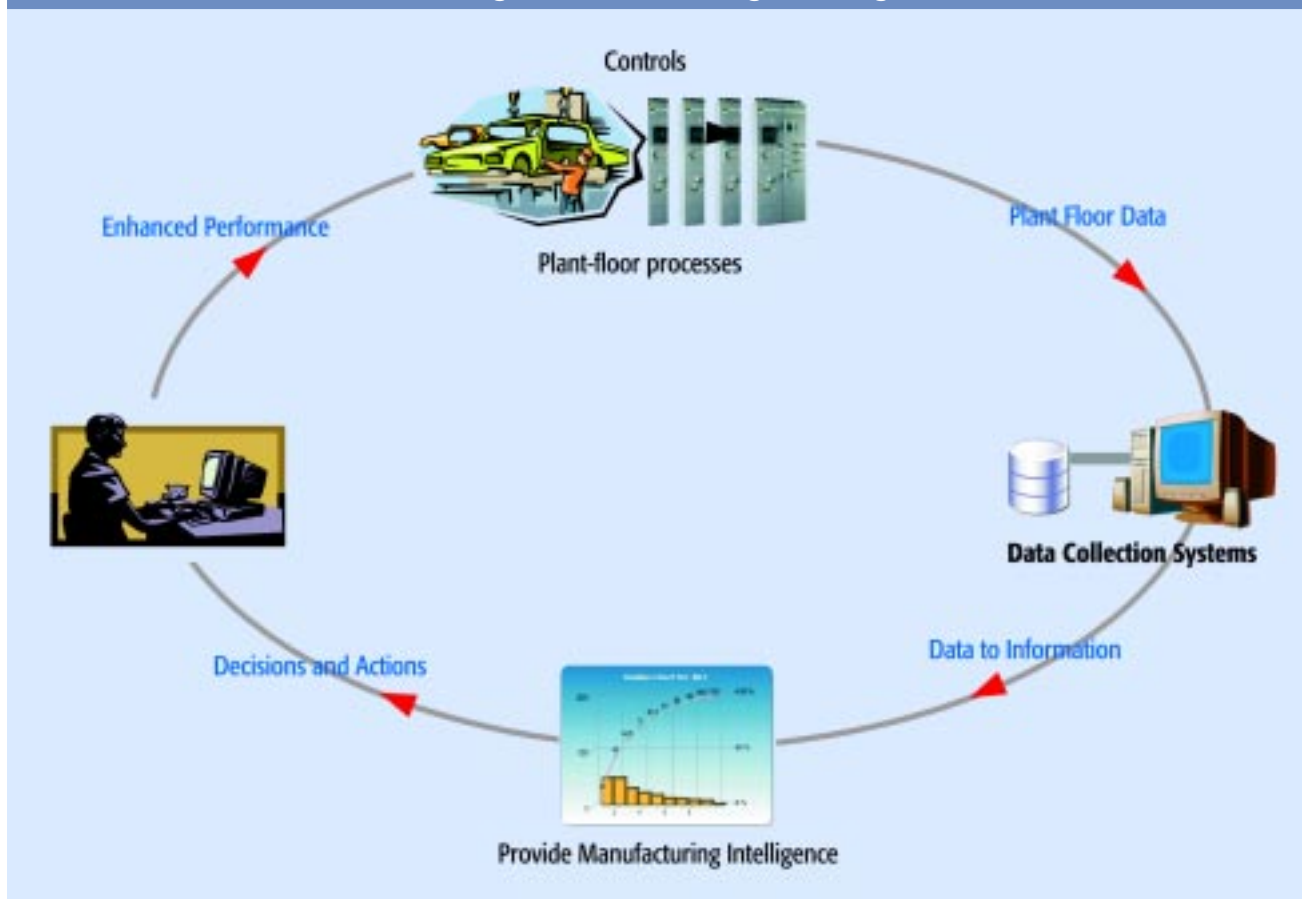
Indian manufacturers are also taking a number of initiatives to handle the increasing demand apart from building new facilities. They have brought in Lean initiatives, and have also started automating their operations using floor-level controllers. Some of them have implemented ERP, and are looking at RFID enabled production, but unfortunately they are not seeing value. At this juncture, some of them have realised that they have "oceans of data" and dont know how to retrieve and use that data. Some are not even aware that there is a "data mine" out there in the controllers and

in people's minds that could be tapped and used. The data needs to be captured, presented, used and decisions need to be made.

The 'Information Age' might be more accurately characterised as the 'Data Age.' The use of the Internet, wireless communication (RFID), high-speed controllers, SCADA, PC-based control systems and high speed processing equipment have resulted in an explosion in the amount of data we can collect. Dr. Eliyahu Goldratt called it "Haystack Syndrome." There is so much of data in databases, excel sheets, word documents, people's mind etc.

The key questions are: What do we do now? How do we capture, collect, and use data? Data is generally not useful unless it is converted into "information" and presented to the right people in the right format at the right time and used to make decisions.

Data to Information to Knowledge

With good level of automation and use of IT systems (like ERP, CRM, Factory Planning etc), it is the practice of companies to employ a person in the IT department to gather data from different systems, analyse it, and present it to the team. This is usually done every week or once in three days. This process does not lead to much improvement because it is a post-mortem of a loss that has already happened, due to which profitability and credibility may have already been lost. It would be either too late or the issue would have disappeared. (See *Traditional Data Analysis*)

In today's world, with the ability

Traditional Data Analysis

"Weekly" Plant Performance Reports Post-Mortem

Quality Management

Maintenance Management

Production Monitoring

Tracking & Routing

Material Pull System

Delivering Manufacturing Intelligence

of high speed computers, pertinent information must be constantly presented to people on the floor, so that they could make decisions and enhance performance and correct mistakes. Information should be sifted from the available data and presented to different levels of people in the format that they would want. For example, a Plant Manager would want to constantly know the Key Performance Indicators (KPIs) of the plant, whereas the Area Supervisors would want to know more about their area (in-depth); the Cell Operator would want to know more about the machines in the cell (like quality, maintenance etc) and should be able to enter data about the machines also; the Chairman of a group would want to know the performance

of all plants in that he or she owns. People in the organisations should therefore be empowered to make real-time decisions based on the information provided to them. (See *Delivering Manufacturing Intelligence*)

Where intelligence comes in

Manufacturing Intelligence helps managers understand the root cause of their problems and make decisions to improve the effectiveness and efficiency of the operations of their enterprise. Real-time manufacturing intelligence is aimed at converting machine or resource data into valuable information to make business decisions. This enables manufacturers to understand opportunities for improvement and ensure that all resources are operating

within the defined expectations. It also helps manufacturers understand the dependency between the man, machine, and material and link it to the decisions that are made.

Real-time data collection systems will help in performance improvement only if the data is analysed and only if the information generated pinpoints to the root cause of the problem enabling managers to make quick decisions allocating time and money on prioritising and eradicating these problems. Manufacturing Intelligence is the ability to get the required information out of the available data, and perform quick analytics to evaluate options and make decisions to improve the profitability of an organisation. When the information and decisions are pack-

aged and shared across the enterprise it becomes knowledge.

Software tools

In order to make real-time intelligent decisions, we need a powerful software tool that can be used by all people in the organisation. It should be easy-to-understand, pre-configured applications so that it can quickly provide visibility to mission critical data, helping to turn that data into useful and accurate information to enable people at different levels in the organisation make informed business decisions. Accurate data driven decisions lead to enhanced performance and improved KPIs. Today's visibility tools must include the following key capabilities:

■ Consolidation and integration of data from multiple data-stores (ERP, SCM, CRM, MES, Tool Automation etc)
■ Real-time reporting through Internet portals, handhelds, cell phones
■ Reporting based on organisational hierarchy
■ Embedded analytical tool
■ Fast analytics and correlation with statistically valid data
■ Lead to decisions that would impact KPIs
■ Allow secure access to personnel across the enterprise
■ Application pre-configured to a particular industry segment
■ High level of configurability
■ Directly usable by business or functional people (Non dependence on IT department for report generation)
■ Should be Web-based and allow for analytics to be done from any location
■ Integrate specific domain expertise and define KPIs through templates and pre-configurations

Using such a solution, the plant personnel will be able to function independently and focus on their KPIs and make decisions to enhance operational performance. They will be able to make decisions that are data-driven

and not based on actual "trial and error" methods. In fact, "trial and error" should be in a virtual environment. Such a solution will work effectively without significantly increasing the load on the operational systems. Users who want to create and run reports during the work day will not have to wait for them to run at night or on a weekly basis, as is typical in most companies today.

The dependence on IT department to generate data and provide it in a formatted way will considerably decrease, thus enabling functional managers to work towards their core functions by using the data visibility tool on a continuous basis.

Intelligent Reports

The software tool when integrated with upper level systems (like ERP, CRM, SCM etc) and lower level systems like plant automation should provide quick analytics. The top management should get reports on KPIs of different plants and functions matched with customer demand, accounting numbers etc on their PDAs or computers at any point in time. They should be able to decide which function in their organisation is the biggest bottleneck and should be able to calculate the improvement in profitability if the

bottleneck were removed (all in click of a button). The middle-level managers (or department heads) should get more intricate details of how their department is performing and be able to look at their problems and evaluate alternatives to remove the bottlenecks. The lower level manager or operators or supervisors should be able to understand the bottleneck amongst their machines or their operations and they should be able to provide inputs to improve teams and also evaluate the improvement they would get if they removed the bottleneck.(See *Intelligent Report Hierarchy*)

In an automobile manufacturing company for example:

■ The Head of Manufacturing would want to know the performance levels of each and every automotive assembly plant of the group. He/She would want to know the interactions of these plants with the dealers and suppliers. He/She would want to have some quick analytics built into the tools to make decisions on whether the plants can take more production, or whether new suppliers need to be developed etc. This will help them answer questions posed by prospective clients during negotiations and will paint the real picture to clients.

■ At the next level, the Plant Man-

Intelligent Report Hierarchy
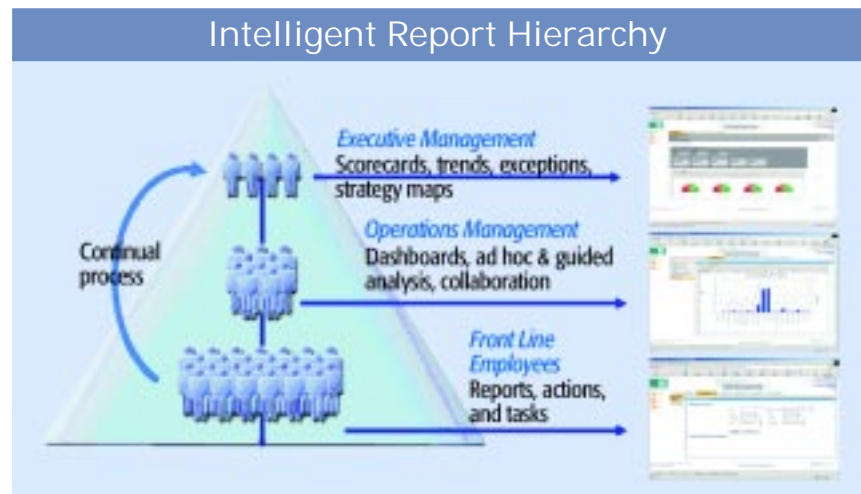
ager of each plant would want to know performance of his or her plant and would also want to monitor how the strategic suppliers, who have been developed by the corporate, are performing. He/she would want to know how his/her team of operations managers or area managers are performing and would want to perform analytics or "what-if" analysis on investments in certain areas and link it to the final demand and sales of the organisation.

For example in the automotive assembly plant, if Body Shop is starving the Paint Shop during production all the time due to "lack of carriers" coming back from paint, the plant manager may want to do a quick analytic on whether investing in more carriers is going to help improve the plant output and if that is going to get converted to more sales, thus he/she may justify the investment.

■ Similarly, the area managers need to know the performance of their supervisors and should be able to do analytics at that level and link it again to the plant output, and supervisors should be able to know how the resources, machines and operators are performing and should be able to perform analytics to make decisions for improvements. The decisions should

have an impact on the KPI of the plant. People at different levels of organisation will also need to record the improvement tasks that they implemented and the results that were recorded. This information will be recorded as knowledge at the enterprise level. With the help of IT systems in plants the decisions made at any level can flow to the machine or tool level immediately. These decisions need to be made continuously during production.

Summary

Manufacturing Intelligence is about providing visibility to different levels of people who are managing a manufacturing organisation and empowering them to make decisions as and when required. The computing speed of computers has reached great levels and probably the future improvements in the speed of computers are going to be slower. There have been great advancements in software engineering like use of Java technology, Internet and Intranet portals etc. Now is the time to use these advancements effectively in business and enhance the performance of organisations.

Profitability of organisations improves when "wastes" are removed. The rate at which "wastes" can be identified and removed determines the rate of growth of business. Manufacturing Intelligence enables business people to get visibility to the "wastes" that exist in an organisation and allows people to make data-driven decisions to remove the "wastes."

The journey towards achieving collaborative production starts with the plant-floor and moves up to the manufacturing level, then to multiple-plants, and then to enterprise. At each level, use of software will enable visibility and fast, bi-directional flow of decisions. All these software systems will deliver value only if we could corelate and make decisions. Investing in software tools that provide Manufacturing intelligence is the first important step that an organisation needs to take to move towards getting value for their investments in plant floor automation or other IT systems. **i2.0**

Vaidee works as a Manager - Consulting and Business Development in Brooks Automation (www.brookssoftware.com), Chennai. He is in-charge of RFID solutions, Manufacturing Execution Systems (MES) & Simulation business for Brooks and also works on mapping IT applications to business problems for Manufacturing Industries.