QuEST

BORN TO ENGINEER

# de-automation to achieve lower manufacturing costs

**In most product companies, one of the major objectives in any organization's quest for achieving manufacturing excellence involves lowering manufacturing costs while ensuring quality. This becomes more complex when there are multiple product lines and verticals/domains involved.**

**Nagabhushana Junjappa**
General Manager - QuEST
Global Manufacturing

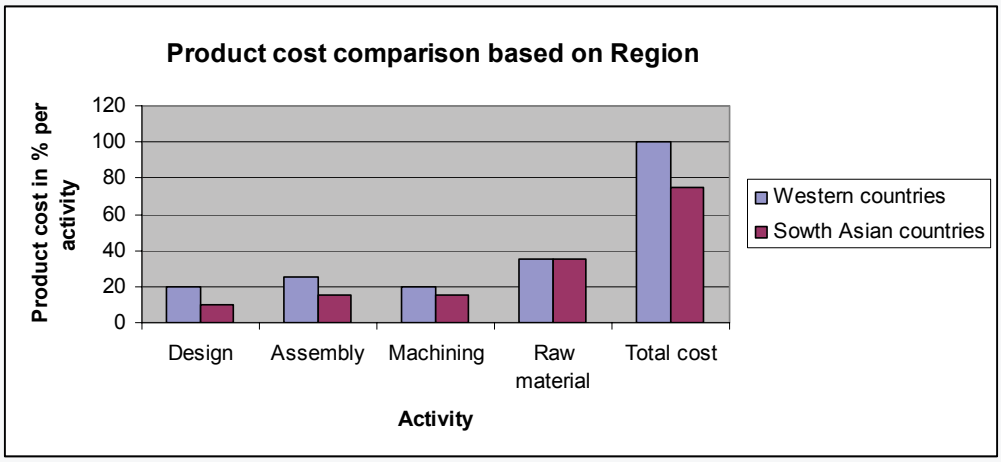
# contents

In most product companies, one of the major objectives in any organization's quest for achieving manufacturing excellence involves lowering manufacturing costs while ensuring quality. This becomes more complex when there are multiple product lines and verticals/domains involved. One method that has been used effectively to achieve lower cost and eliminate defects is the automation of processes, systems and practices. Automation ensures that human error is eliminated, and also lowers process costs in regions where the cost of skilled labour is high. Henry Ford's introduction of the Ford T model automobile in the early 1900s, which was mass produced using assembly lines, subdivision of labour, and a higher degree of automation that previously, is one of the early incidences of the usage of the concept of automation combined with streamlined manufacturing systems.

Today, many companies have automated significant parts of their manufacturing operations, with the assumption that this lowers manufacturing costs. While this assumption is certainly true in many cases, studies that calculate total life cycle costs, could throw up some surprising figures. Analyses have shown that a manufacturing system which has a very high number of machines (involving high initial capital costs) turn out to be less expensive over a period of 10-15 years for manufacturing a particular product, even after taking into account a certain amount of product design evolution over this period. This is true when the volumes are high enough. However, it is very likely that in cases where there are larger variations in product design, and lesser volumes of each variant, the cost of manufacturing would be higher than optimum. The automotive industry is an example where automation was used to manufacture hundreds of thousands of components in a cost-effective manner, using assembly lines, sequential processes, fixed machining actions, etc. Special purpose machines, robotics and flexi-cells have eliminated many wastes which generally happen in manual processes, and also lowered manufacturing costs over time. However, industries where there was a need for variations in the product that required major design and hence manufacturing process changes, and also lower volumes, would not probably achieve lower manufacturing costs by implementing automation the way the automotive industry has done. This is because the cost of adding new manufacturing cells or stations in order to accomplish the changes required, were high. The need to accommodate changing product design within the manufacturing process, combined with lower volumes meant amortization costs became higher. Such industries used flexible manufacturing systems with as minimum set-up time as possible to allow the manufacture of small batches of different kinds of machining operations. But the acquisition costs of such machines are very high. Even then, in the regions where skilled labour costs were very high, the cost of automation was lower than the cost of labour if spread over a significant period of time. In many cases it is observed that there is machine capacity existing in excess of what is needed in order to minimize labour.

An important aspect to consider in detail with regard to automation would be a region and vertical specific parameter - labour costs. In the western/developed world, labour rates are higher compared to China/Asia. In such a scenario, it is arguable that automation can reduce manufacturing costs. More and more companies are looking at outsourcing manufacturing to China/Asia/Latin American and African countries, driven by the need to reduce costs, or by a business necessity, or by the lack of skilled labour, or a combination of such reasons. A recent article has stated that China will overtake the US as the largest manufacturer in the world, accounting for 17% of the manufacturing value-added output of $ 11.8 trillion, compared to the US's 16%, by 2009. One of the biggest factors that has contributed significantly to cause this, is the much lower cost of labour in China compared to the US.

In India too, labour costs are lower than in the West. This has lead to design work being outsourced to companies in India. There is currently an increased interest in Western companies to start sourcing manufactured components and assemblies also from India. This is because of, amongst other factors, the cost of labour is lower here coupled with higher skill sets and systematic training in engineering. Taking the aerospace industry as an example, when we look at any component that is manufactured, it generally involves the following steps: design costs, machining, special processing or surface treatment and assembly. Depending on the level of outsourcing it could be all of these steps or a few of these steps that would be involved in manufacturing a component in India. The chart below gives some information on the cost comparisons in doing the various product design and manufacturing steps in the West and in South Asia.




Companies derive as much as 50% cost savings on engineering design, roughly 40% cost saving in processing and assembly and around 25% cost savings in machining related activities. These varying degrees of saving can directly be attributed to the labour content and cost of labour between these regions.

While cost savings accrued due to design outsourcing is well documented, the savings derived from manufacturing and assembly outsourcing has not yet been formally studied and known, in India. This is due to the fact that apart from the labour content, factors like capital investment, fixed overheads, logistics, etc., influence the savings levels. In machining, these factors play a major role. As a bench-mark, labour content in machining processes, is largely limited to around 10% of the cost of manufacturing and major portion of the cost originates from capital investment in plant, machinery and equipment.

Being in low cost countries does not provide any advantage as far as the acquisition cost of machines and automation equipment is concerned – a special purpose machine costs the same in India as in the US. Similarly, the raw material would cost the same in both regions (probably a bit more in India due to the logistical requirements). Thus it limits the savings potential when similar or same machining or manufacturing process is involved in India as it is in the US. This problem is accentuated by very high levels of cost of capital (currently at around 14% in India). Hence, the key to achieve higher savings in manufacturing costs, is to explore the possibility of how the initial/upfront capital expenditure costs can be reduced, and how the labour content can be increased. The opportunity for the aerospace industry therefore, is to look at accomplishingthis in India. Achieving this in India is possible, and can bring lower manufacturing costs for aerospace component and assembly manufacturing in India. Thus, lower manufacturing costs can be achieved in aerospace manufacturing in India by de-automation, rather than by automation - the exact opposite of what would happen in the West.

If one were to breakup/strip down the manufacturing processes, and study what previously automated activities could be replaced by labour without compromising on quality, thereby doing away with some machines and equipment and thus saving capital investments, the potential cost savings could be as high as 20% - 30% in the total cost of manufacturing. This is one of the principles used by QuEST Global Manufacturing to deliver value in aerospace machining to its customers. For example, one of the products currently outsourced to QuEST Global for manufacturing, required a $1,000,000 flexible transfer line which needed auto-loading and transfer automation based on the original manufacturing process. QuEST Global substituted the elements of auto loading and transfer automation with manual loading and transfer. This reduced the capital expenditure by more than $500,000. This in effect increased the potential manufacturing cost savings and rendered the project economically viable for offshore outsourcing. An important point to be noted, is that the substitution of automation with labour must be supported by high levels of Poka-Yoke, streamlining of systems and practices, ensuring the appropriate levels of skilled labour with the right knowledge is put to the task, etc.

This involves extensive training, strict adherence to standard operating procedures and quality consciousness. The initial cost of this effort can be high due to the learning curve, and this can reduce the saving potential for the first year of operations, but it delivers higher savings in the subsequent years. Further cost savings can be achieved by doing the process design in such a manner as to take into account the new de-automated manufacturing process. The whole premise of de-automation to achieve lower costs is based on the assumption that the labour employed practices the guidelines and procedures required, to the fullest extent. Hence companies must invest in the right kind of manpower, and provide the sufficient amount oftraining, and also ensure the up-gradation of skill-sets, to avoid defects due to human error. Deautomation, when done right, will help achieve cost savings that would impact business positively in a world where every penny and cent matters.

## Author Profile


### Nagabhushana Junjappa

Nagabhushana Junjappa is responsible for Business Development and Customer Relationship Management in QuEST Global Manufacturing. His responsibilities include identifying potential opportunities with customers for manufacturing, growing the relationship and creating a road map for providing integrated product development support to customers.

Nagabhushana Junjappa has over 18 years of experience and expertise in manufacturing ranging from operations, process planning, product development and program management, vendor management and strategic initiatives.

Nagabhushana Junjappa is credited with establishment of strategic relationships with aerospace and automotive OEMs. He was earlier employed with Bosch in India.

He is extensively trained in Design for Manufacturing and contributed to complex product development through the Product Life Cycle for fuel injection and engine development programs. He has been associated and credited with streamlining manufacturing systems & cost reduction through re-engineering of both products & processes.

Nagabhushana is a B.E. in Mechanical Engineering from the Regional Engineering College, Karnataka

(KREC Suratkal).

## About QuEST Global

QuEST Global is a focused global engineering solutions provider with a proven track record of over 17 years serving the product development & production engineering needs of high technology companies. A pioneer in global engineering services, QuEST is a trusted, strategic and long term partner for many Fortune 500 companies in the Aero Engines, Aerospace & Defence, Transportation, Oil & Gas, Power, Healthcare and other high tech industries. The company offers mechanical, electrical, electronics, embedded, engineering software, engineering analytics, manufacturing engineering and supply chain transformative solutions across the complete engineering lifecycle.

QuEST partners with customers to continuously create value through customer-centric culture, continuous improvement mind-set, as well as domain specific engineering capability. Through its local-global model, QuEST provides maximum value engineering interactions locally, along with high quality deliveries at optimal cost from global locations. The company comprises of more than 7,000 passionate engineers of nine different nationalities intent on making a positive impact to the business of world class customers, transforming the way they do engineering.

QUEST

BORN TO ENGINEER

http://quest-global.com