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Manufacturing -traditional entrepreneurial to professional system driven

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ABSTRACT

Manufacturing is a vital activity and is a strong pillar of the economy. Small and lower-middle size manufacturing units play a major role in the manufacturing sector. These are mostly traditional entrepreneurial units that operate on intuitive instincts of the entrepreneur. These units have a very big scope for improvement in their performance by embracing simple systems that will strengthen them to face the prevailing fierce competition endangering their survival. The system approach will not only ensure survival but, also, steer them on a continual improvement path. This paper is an attempt to encourage these units to move from entrepreneurial mode to system driven approach and reap big benefits with minimal additional effort. Through my journey of over twenty five years in traditional units, I wish to share the experience with an intent to prompt traditional entrepreneurial units to take steps towards becoming a vibrant system driven unit with a big leap in terms of improved working leading to improved bottom line. Simple, practical, yet powerful systems are presented with relevant demo to guide the efforts of willing entrepreneurs to move towards systematic working. I make a humble appeal to the community of entrepreneurs of traditional small and lower middle size units to take benefit offered in this paper and use the simple tools for improving the working of their enterprise.

Keywords: *Systems, Systems Approach, Traditional Entrepreneurial Manufacturing, System-Driven Professional Manufacturing*

The small and medium scale industries are the backbone of the industrialization process in developing and developed countries. They play a crucial role in increasing the country's economy. Most of the small and lower medium size manufacturing units are traditional entrepreneurially run units that are under continuous pressure to be competitive to survive. These units can be significantly improved by adopting simple, yet, effective system tools that can help them get a competitive edge. These tools can turn them into professional system driven units that will significantly improve their performance and will give them the strength not only to survive but, also, to prosper.

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Traditional Entrepreneurial versus Professional System Driven Units

Traditional units are the units which are mostly driven by the entrepreneurs themselves, all vital decision making is limited to them and they use only intuition while deciding about vital problems. Many entrepreneurs are gifted with intuitions that help them choose right path but many are not that fortunate. Intuitions many a times fail and organizational crisis occurs. These organizations do not have a database concerning important aspects of the business and are confronted with situations when they have no alternative but to go for intuitive decision making. The employees do have knowledge for their core technical / commercial areas but they are not aware of management principles. The traditional organizations that have some competent employees with good management knowledge, often, do not have any voice in decision making. I have been a part of such organizations where the entrepreneur did not take advice from the knowledgeable employees and took intuitive decisions, which ultimately proved to be costly avoidable mistakes; I shall elaborate on the same while moving along my journey through such units.

On the other hand, we have system driven professional units where decision making is mostly delegated to professional competent managers who have grooming about management principles and are capable of taking vital decisions based on factual data and decisions are sound decisions resulting in positive results. Intuitive judgments, though not ignored, are cross-checked with the help of factual data before finalizing the decision. The different processes have unambiguous way of working through work instructions / SOPs which give structured systems to perform the processes. In these units, the performance review systems are in place which review the performance of not only each process, but also of each employee. Advance management tools viz., lean management / six sigma applications have become a culture in these systems driven professional units. These are progressive units that are concerned for further growth and expansion.

But such units are found in large or upper medium size units; majority of units in small and lower middle size sector are not system driven and work on intuitions of the entrepreneur.

This paper is written keeping these traditional entrepreneurially run manufacturing units in mind. These units cannot employ highly paid professionals from management institutes. The entrepreneurs cannot delegate vital decision making to the employees who are not groomed and competent for vital decisions. Through this paper, I want to share simple easy working tools which will help the entrepreneurs in their efforts to transform their traditional working to system driven without any investment on additional resources. The tools are scientific (I am not dwelling on the complex scientific theories behind them) and I have made them simple and easy to implement through sample demo templates, which will prove as important and effective aid to the entrepreneur. The entrepreneur, through the use of the systematic way of working and using these tools can steer the company on continual improvement path with same resources— the better methods as suggested in the paper would help in utilizing the resources more optimally. Only a mind-set change is required to accept the changed way of working; the change is feasible and essential, if there is a will to improve working of the organization.

I hope the paper reaches them and they make an effort to improve themselves and the working of their organization and move towards becoming system driven efficient units.

Before I proceed further, let me just give a brief on the structure of this paper: I go on to explain the pillars on which manufacturing stands and then take you on a journey to improve the working of manufacturing operation step by step in a structured manner, starting from setting the house in order to systematic working of each process. Then we discuss performance evaluation and periodic review of processes and also of employees.

Let us begin with understanding what we mean by Manufacturing:
Manufacturing is the vital constituent of the overall business cycle. On manufacturing systems, William K. Holstein and Morris Tanerbaum suggest that "All manufacturing systems, when viewed at the most abstract level might be said to be "Transformation Process"—processes that transform resources into useful goods and services. The transformation processes typically use common resources such as labor, capital (for machines and equipment, materials, etc.) to effect a change. Economists call these resources "factors of production" and usually refer to them as capital, labor, and land. The production managers refer to them as "five M's"—machines, materials, money, men and methods".

It is, indeed true that the strength of a manufacturing unit is inherent in the five "M" pillars on which it stands. As stated above also, the five pillars are:

1. Machines
2. Materials
3. Money
4. Men
5. Methods

The first four pillars are materialistic and they go on to determine the size and scale of operations but do not reflect much on the efficient way of working. We may pump in a lot of money to buy sophisticated machines and procure the best material and have good competent people to run the operations but if the methods adopted are not robust and efficient, the result is mediocre or poor. In this competitive era where it is survival for fittest, we cannot afford to be poor or mediocre; we have to be the best. The manufacturing units which stand out are the ones that have the best methods (Systems) in place, which put them on track of "Continual improvement". I used the word "Continual" and not "Continuous". The difference lies in improvements with sustenance mechanism—In "Continual" improvement, you cannot slide back to a lower level once you have reached a higher level through improvement efforts; thus, the movement is only upwards. In "Continuous" improvement you may do improvement and take the organization on a higher level but since there are no anchors to keep you fastened, you slide back to the original level. The "anchors" which prevent the slide are the ***Systems*** that you have put in place.

The current scenario in most of the Indian traditional manufacturing units
Currently most of the traditional manufacturing small and lower size units are entrepreneurially run. They routinely produce and sell; and only at the end of the year, they see results in their balance sheet, get satisfied to see that they made a profit and they move on to next year.

But they do not realize whether with the same resources used, could there have been better profit? They do not know that this complacency may endanger their survival in coming years.

Without a critical review of the working of the processes, one can never realize that with the same resources, there can be a better smarter way to work which could result in better outcomes. Better methods always yield better results. The improved planning reduces the set up times resulting in higher run times and higher production; a better and more effective preventive maintenance system can prevent breakdowns and add to higher production. Even small investment on a needed supporting ancillary equipment can increased production very significantly. Take a simple example from a plastic molding unit:-

An item being molded at a cycle time of 12 seconds (i.e., 2bottle in 12 seconds) using double cavity mold may produce 14400 bottles per day ((2/12)*60*60*24). If one reviewed the running speed, one could find that with better mold cooling achieved by replacing cooling tower water with chilled water, could result in better speed (say cycle time of 9 sec, i.e, 2bottles in 9 seconds); we could produce 19200 bottles per day((2/9)*60*60*24), i.e., a productivity rise of over 33%!! Such a phenomenal rise in production is possible with only one decision (based on factual data) of using chilled water through chillers rather than cold water from Cooling towers.
I recall my experience in one of the traditional run unit where I found low speeds in injection molding unit; the reason was that all the injection molding machines were using cooling tower water for mold cooling while its blow molding used chilled water. The chiller had adequate capacity to service both molding units. The injection molding was not using chilled water because they were sure that chilled water cannot and should not be used for mold cooling in injection molding. I could not believe my ears when I heard it. It was ignorance on their part. Traditional units, sometimes, suffer for lack of knowledge and awareness. When we installed pipelines and connected chiller to injection molding, the speeds went up by over 25%!!

Such avenues of improvements surface up only when we have built systems in manufacturing processes which create awareness and propel such opportunities through the inbuilt performance evaluation mechanisms and periodic reviews in Monthly MIS (monthly information systems) meetings. The systems, if in place, when analyzed, give valuable information, which steers the organization on a ***continual improvement*** path which sustains the higher achieved levels.

In the above paragraph, we talked about 5M's— I have seen the traditional organizations which are fortunate to have no limitation on 4M's viz., they possess huge financial resources, have bought most expensive and efficient machines and are using best quality materials and the organization is manned by learned competent people in their fields, but still, their progress is not at levels which they could be. The only reason for this is that most of these manufacturing units are driven traditionally in an entrepreneurial mode where the 5^{th} M i.e., Methods (Systems) is not on robust footing and all vital decisions are taken based on the intuition of the entrepreneur.

I have seen that even when capable managers were in an organization, they were given backseat and, even, decisions regarding Capex were taken by the entrepreneur himself intuitively. The decisions were not based on ROI or payback considerations. Since the vital decisions were not based on factual data (the data did not exist because of the absence of systems, which prevented the building of database). Many a times the intuitive decisions backfired and even a single such backfire, sometimes, pushes a prosperous organization to huge loss and even to the brink of closure.

I have seen an organization buying machines worth a crore of rupees even when existing capacity was under-utilized and future demand slump was visible. The extremely costly machine was not even commissioned, not even a single piece produced from it and it remained idle till, ultimately, it was felt that it would be better to dispose it off; but then, there were no buyers!!

On capital investment, the above was an example where the organization went in for investment when it was not required, I recall another traditional unit where they did not go for capital investment when it was evident that it was the most needed thing to be done. In this unit, all bottles produced at machines were packed and then sent to the leak testing department where these were unpacked and each bottle was passed through fast leak testing machine to detect invisible holes. This activity used labor costing over Rs three lakhs per month. This labor expense could be saved if we invested money on buying additional leak testing machines so that each machine had a dedicated leak testing machine and leak testing on each machine could be done without any additional labor expense. Then the bottles could be leak tested online, packed and moved to stores directly. There was no need to unpack and do leak testing at leak testing department. In fact the leak testing department could, then, be eliminated. The investment was around Rs ten lakhs i.e., the Payback period was only about four months!! After four months, there could be a saving of Rs three lakhs per month. The organization following traditional thinking was incurring huge avoidable labor expenses on leak testing department.

Such blunders can be avoided if an organization runs professionally as per efficient systems with the involvement of competent managers. It is not wrong if someone says that in the current scenario of traditional run units, the most neglected M is "Methods", and this negligence is very-2 costly.

Most of the small and lower middle level units in India are not system driven. Even many ISO certified units are not having ISO systems in operation because they do not follow ISO systems and have just bought the certificate without implementing the required systems. The ISO certificate is just a "Medal hung on the wall". Their entrepreneurs wanted ISO certification not to improve the functioning but just to lure more customers.

The reason given for not implementing the ISO systems is reflected in the thinking of entrepreneurs: "We cannot allow employees to just fill the needed formats when they should be busy on machines". I, though, myself a lead auditor for ISO 9001 don't want to defend or propagate ISO systems. But I suggest that establishing the SOPs, designing formats, and training the staff does take time. But these are required to be done only one time. Once it is done, the use of format and implementation of the system is very easy and not time-consuming. The benefits are huge compared to the time and effort put in. Once you plant a seed, you have to work hard and take extreme care to make the plant grow. Timely watering, keeping soil properly prepared using effective manure, protecting the plant from animals, etc., have to be done till the plant has grown and can take care of its own. Once it becomes a tree, it does not require much care, rather, it gives you shelter and fruits. Systems are the same, you have to work hard initially for designing the system, training people, and implementing the system. Once the systems are established, these get rooted as a culture in the organization and like the tree, it does not need your care but it gives you protection from failures and gives fruit in way of recurring improved results.

Facilitating the transition of entrepreneurial traditional units to professional System driven units

The first and foremost thing in this drive for moving towards a professional system driven unit is to first set the house in order.

Setting House in order: Many factories in the small and lower middle size sector where I worked or happened to visit were found to look clumsy, disorderly, and dirty. The reason given was lack of space. My argument against this reason has been whether we keep our homes this way. Even if our home is just 1BHK, do we live in a dirty clumsy environment because there is a shortage of space? The answer is a big NO. We do away with unnecessary items that block space and arrange the needed things in an orderly manner. In our home even when the light goes off and we have to find the torch, the wife can get it easily in darkness because of orderliness maintained by her in the house. Not only place for torch is fixed, but it is, also, for everything; shoes will be at the entry of the house, the books will be in the bookshelf, the clothes will be in cloth cabinet and so on.. i.e., there is a place for everything and everything is in its place. We manage our house not only by keeping the things in an orderly fashion but also do sweeping and mopping of the floor on daily basis. There is an un-written SOP that all family members follow to make our houses our cherished homes.

On similar lines, our factories must follow a system and corresponding SOPs to make them a cherished place to work in. Need is much more for the workplace compared to our homes because more than $3/4^{th}$ of our waking time is spent at the workplace.

5S is a *Japanese system* for factories and workplaces which brings an orderliness in working.
As per Brian Mcfadden, the 5S system is a lean manufacturing tool that improves workplace efficiency and eliminates waste (Muda in Japanese). There are five steps in the system, each starting with the letter S:

1S - SEIRI - ***Segregation***
2S - SEITON - ***Systematic Arrangement***
3S - SEISO - ***Spick and Span***
4S - SEIKETSU - ***Standardizing***
5S - SHITSUKE - ***Self Discipline***

5S takes us on a continual improvement path; figure 1 below shows the ladder of improvement where having climbed the ladders, you would not slide downwards:

Figure 1: ladder's first step is 1S, 2nd step is 2S, 3rd 3S, 4th 4S and final step is 5S

The objectives of 5s are:

- Creating a neat and clean workplace.

- Systematize day to day working.
- Improve work efficiency.
- Standardize work practices.
- Improve work discipline.
- Improve productivity.
- Improve quality.

1 S-SEIRI means to distinguish between what is necessary and what is not necessary by following specific rules and principles and get rid of what is not needed.
When practiced at the units I worked, we could create extra space in the range of 20-30%. Not only that but, also, the sale of unwanted things brought cash to the company

2 S-SEITON means having things in the right place or the right location. It is for the most efficient and effective retrieval. Make a system that enables anyone to take out the things promptly.

SEITON believes in "Place for everything and everything in its place".
With boundaries marked for each machine, work station, and pathway; the shop-floor becomes orderly and there is ease of work. The storage and arrangement should be done so that:
Things that are used once or twice a year --- to be stored in a remote place.
Things that are used about once a month --- to be placed collectively in the workplace.
Things that are used daily --- to be placed within the work area.

While arranging the things, make sure that a single line flow of materials is maintained to ease the flow of materials.

In one company where I worked, the material flow was not in single line ----when you enter the shop floor you came across WIP (work in process) goods storage and then came machines and in next area, the raw materials were stored and next in line was printing department which got goods for printing from WIP area which was at the start position of the plant. After printing department was Finished Goods store as given in figure 2 below,

Figure 2: Improper flow of materials

The material flow was corrected by interchanging positions of the raw material store and WIP store and then the flow became single line flow which eased up the material flow.
While arranging materials in the store, we must be careful not to store similar looking items near each other. This is a frequent cause of complaints about material mixing. If similar-looking raw materials are stored near each other, wrong material may get issued to molding resulting in a loss due to the wrong production and if similar looking items are stored in the finished goods store, customer complaints on wrong supplies may result.

3 S-SEISO- SPICK & SPAN

SEISO means getting rid of waste and foreign matter and making the things clean. Make a system that eliminates the cause of dirtiness. SEISO (Cleaning) is a philosophy and commitment to be responsible for all aspects of the things you use, and to ensure that they are in tip-top condition. The dust, dirt and foreign matter, etc. are looked upon as the prime causes of an unexpected failure of equipment, unhygienic environment, and even accidents.

Therefore, SEISO should be viewed as a way to eliminate these problems one by one. We must take measures to eliminate the cause of uncleanliness viz.,

1. Prevention of leakage
2. Prevention of scattering
3. Prevention of falling

Seiso must be performed using checklists so that no aspect is left out. Make checkpoints:

1. Checkpoints for floor and machine cleaning.
2. Checkpoints for oil leakage and control
3. Checkpoints for additional tightening
4. Checkpoints for temperature control
5. Checkpoints for dealing with breakage.

If checkpoints are followed systematically, a part of preventive maintenance gets taken care of, and not only the whole set up looks tidy but also, these actions contribute to improvements in productivity.

In one company, preceding a visit of foreign experts, we did perfect cleaning and made the shop floor look impressive. After their visit, our production efficiency remained high by 3% for more than a week! A clean and tidy work environment does impact productivity.

We observed that in our glass bottle making unit, the production was highest in winter. The reason is that the heat of the furnace created a warm environment which prevented workers moving away from their machines and they attended the machines in a better way.
Thus, the environment does have an impact on productivity. The above 3S's build up a pleasant working environment.

4 S - SEIKETSU - STANDARDISING means continually maintaining achieved 1S, 2S & 3S standards. We need to make and maintain a system which enables quick detection of a disordered condition/ state. It must be made possible for anyone to see the actual situation at a glance through "the visual control".

Standardization is a condition where the segregation, systematic arrangement, and cleaning have been repeated and maintained. The extensive visual controls must be implemented so that abnormalities show up by themselves.
Possible tools for visual control could be:

Labels - lubrication label, accuracy label, inspection label, a label showing the person-in-charge, equipment number, and category.

Limit marking - meter zone, stop line, place marking for machines, layout marking Danger alerting signals.

Visualization - A status indication, direction indication, maintenance display board, instructions, color code for pipes, picture of safety gadgets to be used in the area, direction sign for emergency points & fire extinguisher, caution, and operation reminders.

5 S - SHITSUKE - SELF DISCIPLINE means having the ability to do things the way they are supposed to be done. The emphasis is on creating a workplace with good habits and discipline. This self-discipline will result in doing the right things as routine by injecting healthy work culture in the organization.

Discipline means to get accustomed to the operation in compliance with standards. It is the discipline to honor faithfully the promises agreed upon by the fellow people.

The purpose of "SHITSUKE" is to support the four "S" (Segregation, Systematic arrangement, Spick & Span, and Standardizing) as the means to satisfy such fundamental things. We should keep practicing the activities through those procedures until they become our work culture.

Discipline means thinking about the many problems that occur from day to day and resolving to do better. People sometimes make the most unbelievable mistakes because they let their guard down- because they forget their discipline.

When you assume that something is easy just because you have done it many times, you are most likely to get it wrong.

To instill the self-discipline, the following will have to be done:
1) Cultivation of habits
- Make clear what should be done.
- Do it every day with the participation and practice by everyone.

2) Conduct training
- Train employees until they become capable of complying with the standard.
- Make workers responsible for the action and not for the results.

It is very important to practice and more practice because practice reinforces correct habits.
The disciplined workplace is the most important thing to ensure "Product Quality" and the traditional working units must work in this direction.

The implementation of 5S can be done easily while all activities of the organization are going on. Only a little extra effort is required which results in recurring benefits continually.

Some benefits expected on the implementation of 5S are as follows:
1. Increase in production efficiency.
2. Reducing wastage (Muda in Japanese) of all kinds. Material wastage reduces, machine breakdowns reduce, rejections reduce and Labor efficiency improves.
3. Low production cost.

4. More space and storage are obtained.
5. The Organization tends towards becoming world class-company.

The first step towards becoming a system driven unit is the successful implementation of 5S in the organization and making it work culture through the vibrant working of each S.

The next step is to systematize the working of all processes of the organization.

System Approach to Manufacturing operation: Manufacturing is the core part of a business. Productivity being the keyword, attempts are made to keep it at the highest level. Kanthi Muthiah and Samuel H Huang (2006) say, "Productivity measurement and improvement go hand in hand because one cannot improve what one cannot measure." But before we measure and improve, we must first build structured systems.

The system structures will need:-

1. Identifying processes involved in manufacturing operations, decide how the process will be carried out, develop and implement a monitoring system
2. Defining the characteristic which will reflect the level of its working. Evolve measurable index for each of the above characteristics
3. Developing suitable formats for collecting data which will help in arriving at the above indices. We need to develop the working sheets for calculating the indices
4. Collecting data and measure the indices
5. Comparing the indices over a period to learn the trend of progress/decline and do brainstorming to learn the reasons for declining trends, if found, and take needed actions
6. Taking corrective and preventive actions (CAPA) for sustaining the efficiencies of different processes at high levels
7. While sustaining high levels, take improvement projects to improve operational excellence

We shall, now identify the processes involved in manufacturing operations and then deal with each process in detail about its systematic way of working, monitoring its working, developing performance index for each process and review mechanism for the same. For ease of implementing the systems and monitoring mechanisms, sample demo templates have been made and provided in the index table at the end of the paper. I suggest that entrepreneurs should study the details critically and implement the suggested methods; it will benefit the organizations significantly.

The processes involved in a manufacturing operation (I have taken case of a rigid plastic packing unit, but the processes are more or less same for others as well) are:

Planning
Mold Development
*Production & Maintenance --- **Primary**-----Injection/extrusion blow/injection blow/injection stretch blow /compression molding and **Secondary** -- printing or decoration/ fluorination /wadding etc*
Quality systems
Stores
Human Relations in the organization

Following paragraphs show a way to the systems approach to each of the above processes:

Planning

Planning is the most critical of all processes. Planning, per se, is critical and it can make or break the unit for which it is being done. Evident examples in pandemic times are poor planning in the USA, Britain, and Italy; whereas we, in India, are fortunate to proceed with proper planning. The results are obvious.

In manufacturing also it plays a very critical role. Poor planning viz., allocating a job on a bigger machine will result in higher power consumption and hence increased cost when compared to run it on an appropriate smaller machine if it is available. Even preceding jobs on the machine is important and can result in a higher cost. For example, if the previous job on Extrusion Blow Molding machine was of a single cavity and we are planning double cavity job on this machine, we shall be spending avoidable time on job change and set up time, which will increase because we shall have to make changes from single head to double head, which is very time-consuming. In this case, we should have planned the job only on available double head machine. Needless to say that if the planner plans a job on a machine that is not capable of producing it, the organization will be incurring a loss that could be avoided by proper planning. It is not wrong to say that Planning can make or break an organization. In short, the planner has to utilize available resources optimally.

I worked in an organization which did not have a planning department, Job allocation on machines was done in adhoc way; the jobs were loaded on machine on instructions from sales people sitting in Head Quarters. The benefits of proper planning as discussed above could not be taken but there was more adverse impact on productivity. Many a times, the intimation for making a job change came after 4 p.m and immediately the running job was unloaded and the job change crew got busy in doing the job change. In unplanned job change, normally, the job change took more than three hours. At 6 p.m the shift was over and the job change crew left leaving the job change half done. The machine remained stopped for remaining part of the day and only next day morning, the job change was completed and next job started. Needless to say the productivity took a backseat and production efficiency was lower than 55%!!!...

Faber (2014) suggests six basic principles while doing production planning. The six principles to be considered concern the following:-

- Customer Demand
- Materials
- Equipment
- Manpower
- Processes
- Control

Customer Demand: Before you can plan to assign resources, you have to know how much to produce. The beginning of manufacturing is based on sales order confirmation (SOC) forwarded by the sales department. Production planning has to ensure producing on time for meeting the

delivery schedule, not only that, but planning has, also, to ensure optimal utilization of available resources.

Even in the traditional run units, this is the starting point in the manufacturing operation but not much care is taken to optimize the available resources.

Materials: To fulfill the production target, the availability of materials needed to produce should be ensured. The most efficient production planning keeps the minimum materials as standard inventory. Planners should evaluate how much material the company needs and when; the lead times for supplies and the reliability of the supply and accordingly decide on EOQ (economic order quantity) and MSL (minimum Stock Level) to be kept. The professional run units develop a system of ordering in such a way that minimizes the inventories and at the same time ensure that no stock out situation appears. Standard inventory models are available for this.
Equipment: The production planner takes into account the capabilities of the equipment used to produce the output. As mentioned in the above paragraph, the machine which is most optimal for the item must be chosen so that molding cost does not go up. We must make a machine allocation sheet where we allocate jobs on each machine in a sequential manner against time. A sample template sheet for molding machine allocation is given in ***Appendix A.***

The machine allocation sheet must be periodically updated by changing the dates based on actual performance to date and also when new orders are received.

Manpower: Manpower planning requires accurately estimating the number of employees required to do the work. The capacity of the workforce has to match the capabilities of the equipment to plan for the highest efficiency. In one of the units where I worked, we had arrived at standard manpower needed for each activity by employing time and motion study and had fixed a standard number of people to do the job activity and this data was used by the planner to do labor planning for each process involved in manufacturing and labor was managed by the HR department based on labor planning given by the planner.

Such a system will not be found in traditional run units and labor management will be poor in those units.

Processes: An effective planning makes sure that the processes used for the output continue to operate efficiently and safely. If there is some problem resulting due to downtime of machines, the plans have to be modified accordingly.

Also, the secondary processes have to be planned in a way that the products needed for them from primary processes are produced in time and are available in adequate quantity for secondary processes. For example, bottles for printing must be produced in quantities sufficient for printing machine requirements; if the quantity of molded bottles is less than the printing capacity of the printing machine for a day, the printing machine will get stopped for bottles.

Controls: A final production planning principle puts in place controls that detect problems as soon as they occur. Verification of inventory, use of qualified suppliers and personnel, standardization where possible are needed for better control. When controls are in place, it

enables us to take possible preventive actions to eliminate the causes of factor which could adversely affect production and would return the production to the required levels. In the unit where I worked, we had developed a production plan control tracker (PPC tracker) for helping control over production planning.

A production planning & control tracker is necessary to monitor and know the status of jobs under manufacturing. The PPC tracker must be shared on daily basis with sales people so that they know the current position of their items and if tracker shows that items will get delayed, they can, accordingly, inform the customers. The sales people can also suggest a change of priorities after seeing the progress n PPC tracker so that the planner makes the corresponding change in machine allocations.

Sample PPC tracker for molding process is given in ***Appendix B***
The controls on any process needs performance evaluation of the process and must be compared with the set target and if the performance is much below the target, reasons must be studied and actions taken.

The performance Index for the planning process in a unit where I worked was developed by me. The performance index with minor modifications can be applied in different manufacturing units; the details are given below:

Performance Indicators for the planning process
Performance measurement is defined as the process of quantifying the efficiency and effectiveness of action (Tangen, 2003). Tangen (2002) mentioned that performance measure criteria must be driven by strategic objectives and the measures must provide timely feedback.
The objective of planning is to ensure that deliveries to customers are done before the due delivery date and also the planning must achieve the lowest possible lead times from the dates of receipt of confirmed orders and also maximum lead time in the worst case, also, must not be very long.

The performances indices developed and used effectively by me were as follows:-
Suppose A= No of trucks dispatched before due delivery date during the month
B = Total number of trucks dispatched during the month

Monthly Delivery Index (D) = A / B x 100; Delivery Index calculation demo template is given in ***Appendix C***
We fixed the Target for Delivery index (TD) = 100%
Suppose Target for mean lead time =TM
The target for maximum lead time=TX
Actual achieved mean lead time=ML
Actual achieved max lead time=AL

Then ***Production Planning Control Index*** is calculated as :
PPCI=0.6xD+10x((1-((ML-TM)/TM)))+30x((1-((AL-TX)/TX)))
Please note that the performance index for PPC gives 60% weightage to timely delivery, 10% to average lead time and 30% to max lead time

The target for PPC index is normally kept at 97%
On monthly basis, we must calculate the Delivery index and PPC index and if the Delivery index is below 95% or PPC index is below 90%, we must analyze the reasons and take corrective actions.

Demo calculations for this index is given in ***Appendix D***
The performance evaluation for planning is never done in traditional entrepreneurial units. The planning is an ad-hoc activity in these units and it is aimed to somehow meet the delivery commitments to customers. We never know how bad it is being done and to what extent it is harming the organization.

Structured systematic planning and performance measurement, if adopted by traditional units will help them to get benefitted by reducing the lead times and serving customers in a better way. Now we move on to next process i.e, Mold Development process.

Mold Development Process—The molds are to be developed based on vital inputs from sales about the product needed to be produced from the mold, the annual demand of the product so that cavitation of molds, and the choice of a machine on which it will run can be decided. If it is a running product, then we can ask for its sample and its quality history. Based on the information, we develop ware drawing and get customer approval. After this, a mold drawing is developed and both drawings are got approved from the production engineers of the plant. The technical details of mold are then finalized and given to the vendor.

We developed a techno-commercial docket for doing mold development in a structured way the docket format is given in ***Appendix E***, The steps involved in the docket are:-

Step 1:- Marketing has to fill in data regarding the customer profile, details about the product for which mold is needed to be developed, get sample bottle from the customer if it is an existing product or get bottle drawing if available, get details of problems faced if any. They have to get an idea about the annual demand and our likely share in the demand so that we can decide on cavitation in the mold. There are many things for which marketing has to make efforts and fill in the requisite data so that mold development does not miss out on any important relevant aspect so that the mold developed is best suited for production and the product is of the best quality at an economic cost.

Step 2:- The Development department has to develop a ware-drawing giving due thoughts on all possible aspects after studying the samples, if available. If not available, then, using the product information provided by the marketing department, a ware-drawing is to be made by the development department. The drawing has to be got approved from the customer before proceeding with further work on mold development.

Step 3:- Mold cavitation is to be decided; mold drawing is to be developed and technical data is to be filled in mold development docket by development department and then the docket and both the drawings (the ware drawing and mold drawing) have to be sent to plant for their study and approval.

Step4:- After approval from plant, vendor is to be selected by development department and technical docket and mold drawings are to be discussed with them and a quotation is to be got and is to be got approved from MD and order released to the vendor

Step 5:- Progress of mold making is monitored through Gantt chart
Step 6:- After the mold is ready, a trial is to be taken at the vendor's end in which plant technical person and development person have to be present during the trial
Step7:- After the vendor end trial is successful, the mold is to be sent to the plant. The plant people have to take out samples and optimize on cycle time. Samples have to be sent to the customer for approval
Step 8:- If the customer suggests some changes, then requisite changes are to be made in process/ mold
Step 9:- After sample approval by the customer, the bulk production is taken.

Performance indicator for Mold development process: following gives the performance index for the Mold development process:
Suppose A= no of trials done before mold got approved
T= Target period for mold development
t= Actual time taken for mold development
Performance index for Mold Development process= 0.7x (t/T) + 0.3x (1/A)
(We have given 70% weightage to timely development of mold and 30 % to accuracy in mold making)

For mold development in the traditional units, the product (bottle/cap) samples are sent to the mold maker and it is left to them to develop molds as per samples. This, many times, results in a mold which needs several rectifications before the mold delivers the product satisfying customer requirement. Many a times the mold developed cannot be run at proper standard speeds due to faulty design, especially, due to poor cooling line design in the mold or mold is not suitable to run at high speed machine.

It is recommended that the traditional manufacturing units adopt the above systems which will help them to develop the molds accurately and in the shortest time.

Production (Primary / Secondary) & Maintenance Process: These are the main processes in the whole set up of an organization in which the raw material is converted into bottles/ caps /plugs and are decorated, fluorinated or the caps undergo wadding.
In traditional run manufacturing, there is very little focus on whether we are producing efficiently good quality, in good numbers. We are more than happy that production is going on and sales are happening but are we doing these efficiently; are we not missing deliveries; could there be a better way to carry out production? These questions do not have an answer. We do not have an answer because we are not having any measuring tools for measuring the working efficiency of the production process. In most of the traditional organizations, the production department is producing at levels that are far from satisfactory and complacency prevails and there is no scope for continual improvement.

In most traditional run organizations where I happened to work, when, on joining, I calculated production efficiencies, these were found to be hardly around 50-60 %. i.e., there was a good scope of improving production and we could produce higher numbers per day, which we, eventually, did by reaching the efficiency level of around 85%.

The poor outputs were caused at machines due to many reasons --- be it break downs or poor planning or shortage of manpower /shortage of raw material/ tools required not available or deficient tools were used, etc.. The reasons for low outputs, when looked into, were mainly because there was no focus on monitoring, the process worked with high rejections and also there were high downtimes. Optimal speeds were, also, not achieved.

Proper controls in production involve:

Proper maintenance of machines- Machines, if not maintained well result in frequent breakdowns and disrupt the production process. Preventive maintenance is an effective way to minimize breakdowns. In traditional units, this aspect is neglected and there are no structured systems.

We followed preventive maintenance checklists (daily, weekly, and monthly) based on three aspects –cleaning, oiling, and tightening.

Details of checklists are given in ***Appendix F***

Minimum job change/set up times-As mentioned in the "planning" paragraph, the planner has to schedule the sequence of jobs so that major changes in set up are avoided (e.g., discourage going from single head to double head or vice-versa). Having decided the proper sequence of jobs, we can cut down set up times by taking some basic precautions to avoid time-wasters during job change/ set up:

- Before stopping the preceding job, do all preparations for loading the next job. For example, for Mold change, bring the mold and accessories(to be loaded) near the machine; for printing change, keep the printing screens ready and bring them near the printing machine and keep ready the printing inks.
- Most of the time is spent in searching for the tools needed for doing a job change. It is a good practice to make a toolbox, in which all the needed tools are kept. The toolbox is brought to the machine before the preceding job is loaded.
- In advance, plan out what activities in job change can be carried out in parallel and accordingly put different operators to do the activities in parallel – it saves time.
- Special gadgets can be made which facilitate the easy and quick working of the activities during a job change.
- In plastic molding, flushing out the barrels to remove the color (from the previous production) before feeding fresh raw material of next job saves material as well as the set up time gets minimized

There is a system called SMED (Single minute exchange of die) which can be followed to minimize the setup times.

Traditional units must make note of above and introduce these systems in their working

Running at optimal speeds: In some organizations where I happened to work, I found that they were using the same cooling for molds which they used for cooling the heat exchanger. Coldwater from cooling towers was being used for both. Cooling towers have limitations on cooling up to some temperatures. If optimal speeds are to be achieved, mold cooling requires colder water than the one given by cooling tower and it can be given by using chillers. We could

increase speeds by over 15-20 % when we change mold cooling from cooling tower water to chiller water.

While doing mold trials, the last phase should be speed optimization where we go on increasing speed till quality parameters of the product get disturbed. The highest speed at which quality parameters are, all, met is taken to be the **standard speed**, which is kept in record, and at every job change, we set the machine at this standard speed.
Traditional units must do this.

Produce the right quality first time: This is most important. We must, while doing a job change/ job-set up; do First Piece Approval (FPA). Be it molding/ printing/ wadding or any other production process, the bulk production must not start without the Quality Department approving the first piece as of the right quality. The job setting team must, then, quit and hand over machine to production department. This should be done only after the right quality is produced and the QA department has given FPA. This ensures that the production process has commenced well and will give the right quality the first time. Production parameters must be monitored periodically and the QA department must do periodic sampling and testing of the quality of product coming out of production lines.

A word of caution, speed must be optimal--- set up team must give good first piece at standard cycle time. This ensures both quality and quantity.

Labor Management during production: Normally skilled labor viz., the operators are permanent trained employees but we do use temporary unskilled labor in doing routine production activities. Most often, especially in traditional units, the raw labor is directly put on the job—this results in improper working on the product and results in rejections and accidents also may happen. The respective supervisors must train each worker on "Dos" and Don'ts" for the activity that the unskilled worker is going to do. Special emphasis should be on safety aspects. I have seen new workers who were put on the job for removing flashes from bottles using a knife; removed part of their fingers since they were not told how to hold the knife to safe-guard from accidents.

Unskilled labor keeps on changing, and therefore, training becomes a perpetual activity. Training for unskilled activity is not time- consuming but most often we neglect it.

Control on materials: In most manufacturing, the materials constitute 55% of total cost and a little saving on the materials, add straight to profits of the company. Hence, wastage of materials is suicidal for a company. But I have seen materials getting wasted in terms of sweeping waste where raw material has fallen on the floor and got wasted. The fall on the floor normally happens while handling the material, especially, while doing batch mixing or feeding into the machine. Printing inks tend to dry and get wasted if kept exposed for long periods. There must be a focus on the wastage sources. These must be identified and actions taken to prevent material wastage.
Material saving is possible where machines are capable of producing products in a narrow range of weight, narrower than the specified tolerance limits. Control chart tools can be devised to run the machines at weights lower than the standard weight in such a way that none of the produced

product falls outside the weight specifications and, hence, we can produce good quality as per specification and still save raw materials.

I successfully used the Xbar R control charts in plastic units to effectively control weight on the lower side of specification and saved tons of raw materials while producing goods of the right quality.

While the above systems will result in good manufacturing practices but to improve any process, it is needed to have a good monitoring system to monitor all activities involved in the process and we must be able to assess its current working levels. Performance evaluation is needed for this:

Performance indicators in the production process: How do we know whether production performance is good or poor? One answer that comes to mind is that if the production quantity is more, we are delivering good performance. But how do we assess whether we are producing more, what is the bench-mark that above this quantity, it is good performance and how do we arrive at this bench-mark?

What if there was a power cut and we do not have a power generator?? Is it production department's fault that we lost production because of a power failure? Certainly not, the production department cannot be blamed for factors beyond their control. We have to give allowance for factors over which the production department doesn't have control. Thus, there is a need to develop a suitable index –Molding efficiency which maps the performance of the production department realistically.

I developed the index giving allowance for such uncontrollable factors like power failure, machines stopped for want of orders, raw material stock out, machines under trial etc.. We used the index to gauge the real efficiency of the production department under the factors under their control.

As mentioned elsewhere also in the paper that my experience in the companies I worked was that when we measured the molding efficiency the first time, it was found to be around 55-60 %. When focused on this index and when looked into reasons for low efficiency and suitable actions were taken, the same factories reached the molding efficiency level above 85%.

You can just imagine how much rise in production quantities would have been there which not only impact in lowering the production costs due to better productivity but, also, contributes significantly to profits.
The formula for Molding efficiency was developed in the following manner:-
Machine available hours per day =24
Machine hours lost due to factors beyond the control of production:
Time lost due to power cut=p
Time lost due to no orders from marketing= m
Time lost due to shortage of raw materials=r
Time available for production =24-p-m-r
Cycle time= c (time taken in seconds to produce one unit)

Target production per day=T= 1/c*60*60*(24-p-m-r)
Actual Production in a day= P (say)

Then **Production performance index** i.e.,
Production efficiency = P/T x 100---- It maps the real efficiency of production department for which they are accountable
There is another index which can be used by an entrepreneur for knowing how the assets for the company are being utilized, it is called Overall Equipment Utilization Index (**OEU**)
Overall Equipment utilization Index (OEU) maps the organizational efficiency:
Its calculation does not give any allowance for factors beyond the control of production i.e,
Hours available for production is = 24
Cycle time= c
Target production T1= 1/c x60 x 60 x 24
Actual Production=P
Then OEU= (P/T1) x 100

Difference between OEU and Production Efficiency:
OEU is the overall equipment utilization i.e., ratio between what we produced in 24 hours and what we could have produced at best possible capacities of machines. Here no exclusions are given in 24 hours be it due to factory problems or be it sales problems. It is an index that gives overall capacity utilization. The index is of use mainly to the entrepreneur, who can watch the level of asset utilization represented by OEU and he can guide his team to increase OEU----If OEU was low because of "no order", he has to gear up the sales team for booking orders and loading on machines. Similarly, if the plant is not working efficiently as shown by low production efficiency, which in turn lowers the OEU, then, he has to tighten the plant people.
In a nut-shell, "OEU" is an organizational index whereas "Production Efficiency" is an index for the performance level of the production department.

Appendix G gives the details of a demo template for calculations of OEU and Production Efficiency.

Other Performance indicators for production/ maintenance process:
Just producing more numbers is not the only performance indicator ---how economically you produce is also important. Following are indicators which factor in cost aspects:

Energy consumption per unit of production= power units consumed / production units e.g., for molding- it is power units per kg of production.
In our companies, we considered this index poor if it was higher than 1.75 units/ kg

Labor productivity index= production per man-day= production units in a day / number of labor used in the day e.g., for molding it will be kg/ manday
In our companies, we considered this index poor if it was below 75kg/ man-day
The quality produced is also important.

The production quality index measures the quality performance of the production process.

In the units I worked, two hourly production lots were inspected by the QA department and they accepted or rejected the lots—rejected lots were subjected to 100 % rescreening. At the end of the month we computed the number of lots inspected by QA department –say N and the number of lots rejected by QA—say n.
Then ***Production quality index = (n/N) x 100***
This index, if below 99% was considered poor.

Now we move on to the Quality Assurance process

Quality Systems
High levels of quality are essential to achieve company's business objectives. Quality, a source of competitive advantage, should remain a hallmark of company products and services. High quality is not an added value; it is an essential basic requirement. Quality does not only relate solely to the end products and services a company provides but also relates to the way the company employees do their job and the work processes they follow to produce products or services. Kishu Manghani (2011). He rightly says, "Quality control and quality assurance systems together constitute the key quality systems. Quality control and quality assurance are parts of quality management. Quality control is focused on fulfilling quality requirements, whereas quality assurance is focused on providing confidence that quality requirements are fulfilled."

Quality assurance, in reality, encompasses quality control because without fulfilling quality requirements (i.e., without QC implementation) one can never instill confidence in customers that the product would meet their requirements
Next paragraphs are devoted to Quality Assurance Systems

Quality Assurance Systems: Before we build QA systems, let us first examine the factors which may result in the quality deficiency in the produced lot:
Incomplete knowledge about customer requirement; inferior raw materials/ master batches / contaminated grinding material/ malfunctioning in machine working/ poor calibration of testing equipment/ and weak QA systems, are major factors which degrade the quality.

Care is to be taken at each stage of manufacturing by all concerned so that the ultimate product comes out good. Good QA systems provide the basic framework at each stage of manufacturing. The starting point is making a Quality plan. The quality plan is a roadmap for quality steps to be carried out at different stages of manufacturing processes. The plan makes it clear what checks should be carried out at each stage of manufacturing; how these have to be carried out (i.e., the methodologies) and what formats are to be used and what actions are to be taken based on results of testing.

A model quality plan is given in ***Appendix H***
The plan is to be strictly implemented, monitored, and controlled. Some steps in QA systems could be:

- Incoming inspection of incoming materials,
- First piece approval at the start of production,
- In-process checks to monitor the process at the proper level

- Periodic finished Goods inspection checks to ensure that good quality is being packed.
- Laboratory testing during processing
- Pre-despatch inspection.

In all above checking, the samples should be collected based on scientific principles of acceptance sampling – usually IS 2500

Having dispatched the material, sometimes one may encounter customer complaints about poor Quality. Concise and clear systems are needed to attend to customer complaints.
CAPA (corrective and preventive actions) is to be done to reach the root-cause. We used CAPA, an analyzing tool based on logic. In CAPA, the problem is analyzed in following manner:
First, brainstorming is done to reach at all possible causes for the problem. Then we eliminate causes by process of elimination logically using process knowledge and reach to possible main cause/causes. Why-2 analysis is then done to reach the root-cause. Based on the root-cause, the corrective and preventive actions are decided and actions taken.

CAPA must be shared to customers promptly, preferably within 3 days of receipt of the complaint.
We used to do CAPA using Fish-bone diagram—A demo sample template highlighting the logical approach is given in ***Appendix I***

CAPA is a problem solving technique. We used the technique, not only for customer complaints, but also, for analyzing reasons for machine breakdowns.
We need to operate QA systems at the highest levels and periodically we must, also, do performance evaluation of QA system.

The Performance index for QA system— In the units, I worked, I used the following quality index:

Quality Index (QI) = (10 x (10-(80R+20N)/T)
R=no of invoices where lots got rejected by the customer during the month
N= no of invoices to which complaint was made but the lot was not rejected
T= total no of invoices in the month
In the index, 80% weightage is given to external rejections and 20% to complaints without rejections.

The *quality index below 99%* must be considered as a poor quality index
A good and robust quality system is needed for sustaining the business by retaining the customers and not only that but business, also, expands when quality reputation reaches other prospective buyers.
Mostly traditional manufacturing units have weak QA systems that make them struggle for existence with virtually negligible growth. The organization where I worked, we built good and robust QA systems and took pains to build quality culture across the organization.

Next, we move on to ***Store Process:***

Store is considered custodians of materials. As mentioned in this paper earlier, that normally expenses on materials constitute 55% of the total expenses. Hence store is an important process and it must work efficiently to maintain the health of the organization.

Basic functions which are done by the store are Receipt, Stocking, and Issue of materials,
While taking ***Receipt*** of goods, care is to be taken to accurately tally the physical quantity received against the quantity mentioned in the receipt document i.e., challan. After receipts, the store person must get ***QA Approval for the quality*** of the material received. This is to be followed with receipt documentation.

Stocking of goods has to be done so that no goods are spoiled while in storage and also quantities remain intact and there is no shortage. While stacking the goods in store, care must be taken not to stack similar items near each other. This eliminates chances of mixing that may have serious consequences. Physical stocks must always tally with book stocks.

Issues can be for issuing material to production or stocks could be liquidated by selling or grinding if these are no longer needed. Samples also can be shipped for promoting the business. Dispatch to customers is the main component of Issues.

Stock-taking is a very important and vital activity of Stores. Normally companies close down all factory operations for a day or 2 once in a quarter and take physical stocks of all items and compare them with book stocks. Deviations found are investigated, reasons are found and stocks are reconciled.

These are the normal activities of stores of all companies, be it traditional or professional.
In traditional organizations, stock taking, often when confronted with unexplainable shortages does not get its reason as many transactions must have taken place after the shortage happened.
On the other hand, professional organizations carry out ***Perpetual stock-taking*** on daily basis and shortages are immediately noticed and reasons found.

In ***the Perpetual stock-taking system***, all goods brought in the store are stacked in different lots and we put a stock card on each lot. For lots in which there are additions of items or items have moved out (i.e whenever there is a movement of materials from a lot); the physical stock taking is done and stock reconciled on daily basis. Getting to the mistake is easy and most often mistakes are found and stocks get reconciled. Stock-taking is to be done on daily basis for each lot in which there is a movement. Since the lots having no movement are not needed to be counted on daily basis, this system is feasible and practical and serves as a strong tool to maintain the accuracy of stocks i.e, book stocks and physical stocks always tally. This ensures accurate stocks at all times and this coupled with quarterly physical stock-taking for all lots, doubly, ensures that stocks are accurate at all times.

All the above performance indices calculated monthly can be compiled in an MIS file which can serve as a monthly performance review tool in monthly MIS meetings. In my experience, these performance review meetings have proved extremely useful and guided the management to take timely action for making improvements and for preventing downward trends.

A demo MIS file is given in ***Appendix J***. The units where I worked, now, have a vast data-base which helps management in taking factual data based actions at critical times.

Now we move to the last topic i.e., *Human Relations in organization*
Human Relations in organization-Coming to the human aspect in the manufacturing process, maintaining and sustaining high motivational morale in the organization is very vital. Each employee must feel belonging to the organization and the actions of management must be geared towards creating and maintaining high motivation among employees.

This is the area, most neglected in the traditionally run units, where, many a time treatment given to an employee is worse than that to a personal servant. The employees are working for the organization and the organization pays them. They are not personal servants of the entrepreneur and this feeling should never be made to surface up. They must be treated with dignity. Self-respect is important to all –from a sweeper to manager. Any action hurting the self-respect is bound to reflect in lowering the efficiency of employee. I do not preach that erring employee should not be reprimanded. Reprimanding and even punishing is necessary for maintaining order and discipline. In the same way appreciation of good work is equally important. There should be fairness in our dealing. Periodic appraisal of performance at work, behavior at work place and skills enhancement must be done and the levels attained by each employee must be explained to him/her. Good work done, exemplary behavior and skills upgraded must be appreciated in the review and areas of improvement should, also, be communicated. While doing so, a path for improvement should also be indicated. In the next review the progress in improvement area should be assessed. This type of appraisal makes an employee feel that he is needed in the organization and the organization is interested in his/ her improvement. This sense of belonging to the organization is very healthy and it prompts the employee to deliver his/ her best.

In above appraisals, the unbiased system is vital. In traditional units, the boss does the appraisal. Recent events are fresh in mind and these push bias in his thinking; personal likes and dislikes also bring in bias. Biased appraisals are not digested by an employee and the credibility of appraisal is lost.

We developed appraisal systems in a unit which was based on performance indicators and the personal assessment by the boss. Weightage given to performance indicators was more that the subjective opinion.

We also did quarterly appraisals for behavior and for skill. These were opinion based where opinions of HOD and also of his boss were taken and averaged out to reduce personal bias.
Final appraisal score was obtained by giving 70% weightage to performance, 20 % to skill and 10% to behavior. The scores were averaged for each employee for four quarters at the end of the year and this score became the basis for award of increments.

Since this was factual data based assessment, employees trusted the appraisal and respected the outcome. The appraisal system was instrumental in sustaining employee morale at high level.
The details are given in A***ppendix K, L,M &N***

Apart from appraisals, day-to-day treatment to employees must be fair and commensurate to their actions and achievements. Human resource is the most difficult resource to handle and lot can be said about this. Single most important thing is fairness in dealing!

We have covered all the processes, the inherent systems and ways of monitoring and doing performance evaluation. We have done so without going into the management jargons and management theories. To make easy implementation sample demo templates also have been provided. I hope the entrepreneurs may find these useful.

CONCLUSION

The above discussions throws light on simple yet critical system tools, application of which can transform traditional entrepreneurial unit into a professional system driven unit.

The system driven unit is continually moving upwards through the inbuilt mechanism of performance evaluation of all its processes, which throws up areas of improvement. Not only we come to know where immediate actions are needed but we, also have tools which point to us what actions will eliminate the problem. Human judgmental costly errors can be avoided as vital decisions can be based on factual data. The database which gets built up, brings clarity about working of the different processes of the business; monthly performance reviews in MIS meetings give a platform at which progress is critically reviewed, future actions decided and actions are taken for improvement. The paradigm shifts from survival to growth. The systems work as anchors to prevent downward slide and steers the company on continual improvement path.

In this paper, I have tried to put the approach to systems in very simple terms based on my long experience with proven success in manufacturing operations with a hope that it will prompt the entrepreneurs to reap benefits for their units by switching over to systems that are not difficult but the benefits are tremendous.

REFERENCES

1. Faber (2014); faberinfinite.com/6-basic-principles-of-producion-planning/
2. Hosteins Williams K, Morris Tanerbaum, Production System, bitannica.com/ technology/ production- system
3. Maghnani Kishu (2011), Perspect. Clin.Res, 2011, Jan-March, vol2, no 1,pp 34-37. DOI 10.4103/2229-3485.76288
4. Mcfadden Abrian, what is 5S; graphicproducts.com/articles/what-is-5s
5. Muthiah Kanthi M.N and Huang Samuel H; A review of literature on manufacturing systems productivity measurement and improvement; journal of industrial and Systems Engineering; vol 1 no 4 pp 461-484. DOI 10.1504/ IJISE. 2006.010387
6. Tangen, S. (2002) 'A theoretical foundation for productivity measurement and improvement of automatic assembly systems', Licentiate Thesis, The Royal Institute of Technology, Stockholm.
7. Tangen, S. (2003) 'An overview of frequently used performance measures', Work Study, Vol. 52, No. 7, pp.347–354.

Appendix Table

Appendix Ref	Description	Link *(Please right click to open the link)*
Appendix - A	Planning --Job allocation on machine	Appendix - a
Appendix - B	Production planning and control Tracker	Appendix – b
Appendix – C	Planning – Delivery Index Calculation Template	Appendix - c
Appendix – D	Planning ---PPC index calculation template	Appendix – d
Appendix – E	Mold Development Docket Template	Appendix – e
Appendix – F	Preventive maintenance checklist template for a printing machine	Appendix – f
Appendix – G	Production Efficiency and Overall Equipment Efficiency Template	Appendix – g
Appendix – H	Quality Plan	Appendix – h
Appendix – I	Customer complaint Analysis –Fish Bone diagram template	Appendix – i
Appendix – J	Management information System file for monthly performance review	Appendix – j
Appendix – K	Staff Performance Appraisal sample template – KRA appraisal	Appendix - k
Appendix -L	Staff Performance Appraisal sample template –Behavior	Appendix – l
Appendix -M	Staff Performance Appraisal sample template –Skill	Appendix – m
Appendix-N	Staff Performance Appraisal sample template –Final appraisal score at the end of year	Appendix – n

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