Study of human factors in process improvement

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ABSTRACT

In the era of Industry 4.0, human is the most important factor which is actively involved in the process. And any improvement cannot be possible without human involvement. Human being and their interaction with machines, materials, systems, processes, and information are the baselines of quality and productivity improvement initiatives. If we consider stages of improvement humans will always come first, then process and equipment. It is found very easy to replace any equipment or machine if not performing well, or you can modify the process if you find out the root cause but, for people, this doesn't work. We can easily change people working on the process but you cannot easily change the mindset of people working on that process. It has been always a challenge for top management to change the mindset of people and align it with the way they have planned things. We should give "clarity of thoughts", an important aspect in the process of improvement. Next challenges that top management faces are concerning ASK, Attitude, Knowledge, and Skill. Attitude is inherent in the human being and is a settled way of thinking, we cannot easily change, or modify it. If we consider all resources 4M i.e., Men, Machine, Materials, and Method for identifying the potential root cause, the last three will not perform without the first one. The initial solution to this lies in managing the human factor in the Process to identify the latent cause. Thus, for working on change for betterment consider human factors change from resistance to acceptance. Roadmap for quality or productivity improvement with human factor goes along with values of human, motivation, engagement in the job and lead to job satisfaction. Human is that factor we cannot separate from any process and always comes first if, we want to improve upon quality and productivity.

KEYWORDS: Human factor, root cause, clarity of thoughts, quality improvement, productivity improvement.

1. INTRODUCTION

Industries in which working is completely driven by Humans, though there are advancements in the technology, unlike the automobile industry it has a minimal role for robotics and modern types of equipment. Technologies available such as robotic spray, and trimming are too costly concerning ROI and overall output. Since it cannot eliminate human intervention, it is necessary to develop human potential. To improve any physical process, it only takes some study and machine or tool used for the process. Still, results cannot be achieved as calculated earlier and it diminishes due to a lack of persistence. Top management starts complaining about the same because they aren't getting expected results. This leads to thinking in the direction where men working on the process are more important characters than processes. It is not only a single person; it is led by an individual's contributions to a team towards a common goal. It has been identified that providing the right mindset can generate more benefits than just merely modifying the process. Improvement in the process can be achieved through better allocation of human efforts in the work. It includes identification of the right people, their correct placement on the job, initial and on-the-job training required for the process, and giving chance to everyone to contribute towards work and advance in learning.

1.1 Clarity of thoughts:

If the purpose of every job is identified well, communicated one to one, understood clearly, and agreed upon by respective people, will always give the desired effect. Identification of purpose for the job allocated should answer 3W1H.

- What is the purpose,
- Who should do it,
- When to perform and
- How to do it perfectly?

Communication of the purpose of the job should be communicated directly and in a very structured manner before the start of the job. Who should communicate is also important and we should never forget they are communicating it to humans? Understanding the person at the other end is important otherwise communication cannot be completed. A major and strategic role is played by the agreement of the purpose of the job and with all the above-mentioned points. People will give their best as well as they will, in turn; help you out to improve the process.

1.2 People driven industry:

Key drivers of Micro and small industry are people. Machines and modern technologies aid humans to reduce their efforts but still, the brain behind decision-making is human. Along with Knowledge and Skill, the right attitude is the most important quality to have. Attitude is inherent in the human being and is a settled way of thinking, we cannot easily change, or modify it. While communicating the purpose of improvement, the common strategy cannot be implied for each one. Words may different but the message communicated should be the same. A speed of agreement also varies with the attitude of humans. Knowledge base and skill available are external things that can be given by management directly or through the coach. Skill is an ability to do things with expertise, which is learned by practicing under proper guidance. While identifying the purpose of improvement above mentioned three learning categories are important concerning the human perspective.

2. HUMAN ERRORS

Any work associated with machines is being backed by humans, also decision system is backed by technological and process-oriented logic is done by humans at various levels. If we consider the day to day operation for production or quality function, they came across many stages of decisions must make about missing materials, their proportions, catalyst dosage according to temperature, cleaning and applying release agent on Mold, and the decision for the next round of release, there are many more. Each decision may lead to an

error not supported by right, strong, and technical logic. There are the following human error possibilities like Heedlessness, Misinterpretation, Incorrect identification, less experience, Purposeful (ignoring rules or procedure), Unintended, Slow work, Lack of standardized work, Surprise (unexpected operation), Vandalize. With careful study of human factors, we can achieve process improvement. If we drill down deeply for any defect or problem, most of the time root cause comes to an end at the human. This is not true in most cases. As there is human working behind the machine, there are systems also working behind the machine and it is the system that has allowed humans to perform errors.

There are some clear indicators of weakness in the process like - High material wastage, scrap and rework, Lag in planned and Actual production count, several operator mistakes, and first-pass yield in the process. In some cases, the worst phase is where rework is treated as a separate production process. The very first solution to this lies in managing the human factor in the Process.

"Human error is not cause of failure, human error is the effect or symptom of deeper trouble", Dr. Sidney Dekker. Generally, Human error occurs due to four factors viz. Working Demands like the pressure of time, huge work content and load, continuous and multiple actions, cyclic actions and monotonous or similar work, one-directional action, requirements for the job or produce interpretation, unclear goals, roles, and responsibilities, lack of or ambiguous work standards. Individual Challenges like suitability with the task, clear knowledge, new technique newly introduced, incomplete communication habits, lack of skill/inexperience, indistinct problem-solver skill, incorrect attitude, illness, and poor health. Work Surrounding factors like an interruption, changes from routine, incorrect or misleading displays, workaround, hidden systems response, surprised equipment conditions, lack of alternative signals, and cultural conflicts. And most important factors of Human Nature like work stress, patterns of habit, assumption, overconfidence, job-oriented mindset, wrong risk perception, shortcuts, and short-term memory.

"It is usually a system that allows error to happen", Jeffrey Liker. We have to design a system and process such that there should not be any scope for the error to occur. Use the Prevention Poka-Yoke system to eliminate and reduce errors. While the investigation of errors we want to know, the outcome of a chronology of incidents you are investigating, which clues and signals were critical in the light of the error, and which assessments and actions would have prevented the error. What went wrong led to the physical cause. We asked what triggered the person to commit the wrong operation or decision. They are the management system's weaknesses. It includes job-related or on-the-job training, and the formation of policies, systems, rules, and procedures. People make choices based on these and if the system is incorrect or incomplete, the decision will lead to error.

3. NEED FOR PROCESS IMPROVEMENT
3.1 Changed Market Scenario

MSME sector is the highest contributor to the country's GDP. They are large in numbers and are scattered in many small segments. The main capital used in these small organizations is human resources; they are labour-intensive and have high demands for smart labour. India's contribution to the global market is increasing year on year. This demands higher output at high efficiency from the sector.

3.2 Era of IAF than QCD

As started from WW II Lean Manufacturing, TQM are increasing demands in Indian industry. Whereas they are more focused on Quality, Cost, and Delivery. Current industry dynamics have changed and that has shifted the focus on Innovation, Flexibility, and Adaptability. Good quality products are a basic requirement in today's competitive market. It is not ordered winning criteria now, rather it is ordered qualifying criteria. Cost is always a decision-maker but if we consider overall project cost rather than individual product cost, the implication of a lower product level may not give you a significant advantage. There is continuous improvement in lead time reduction of product due to lean manufacturing or

similar initiatives however, considering repeat business and changing customer demands has increased the importance of flexibility.

3.3 Post Pandemic Scenario

The MSMEs sector is the most unsafe sector during and after a pandemic because of its size concerning the number of employees, the scale of business in terms of monthly turnover, seasonality in the business, and resources. Experience is always the best teacher we ever had and a Pandemic had taught us many lessons and put forward many new challenges. MSME Manufacturing sector is quite unorganized and had a huge hit during the period. To overcome such a situation efficient utilization of resources is indeed required. It had given me a break and taught me to identify the most ignored waste from Muda-Human Skill.

3.4 Effective utilization of Human Resource

Each Process is driven by the Humans, for that they need to take a conscious call about the many tasks they perform at various levels. Even in a labour-intensive job, thinking ability is more important than that of doing a task. Interaction of people among teams also plays important role in performing any process function. A highly coordinated process led to the right results with this individual as well as teams' contributions.

4. REVIEW OF LITERATURE

As per W. E. Deming's 14 principles of management, the target of leadership is not just to identify and record failures of men, but to eliminate the root causes: to help people to do a better job by having less effort. The leader has a prime target to improve the system—i.e., to make things possible, regularly, for everyone to do a better job with satisfaction. Especially, they are not clear about their responsibilities. They don't know the perspective of their positions and roles. And if they know the purpose, they don't have the required skill set or abilities. There's no alternate for knowledge. What is the aim of management? Why do they exist? Quality is the responsibility that starts from the top people. Its origin is in the top management. They are the ones who decide about the quality and direction of the organization. The customer is the one for which we exist. We have to offer him exactly what he needs. This brings us to the importance of knowledge in the job, not only for frontline workers but for managers as well. He emphasizes one more point about human freedom as this causes innovation and thus improvement in process and the product delivered. To encourage innovation, give people a chance to make use of their capabilities, personal life, education, and hopes. Help them to achieve their purpose. To extract good out of them and to promote improvement, people must understand what their roles and responsibilities are, how each move and decision fits in, and how they can contribute towards organizational purpose. Very few people have the advantage to understand those things. Management cannot tell them in each case. The boss does not explain them. He does not know what his contribution required is. How could he know? When people understand what their jobs are, they may start enjoying their work.

4.1 Muda: 8th Waste

In Organizations people are working from lower level to top-level, Because of the absence of a proper engagement platform, we are not able to use creativity, productivity, their ideas for improvement. Unused human creativity can be available in the form of wasting time, new or alternate ways, skillset, improvement, and learning opportunities by not engaging in new work or listening to them. This a waste of human resources and waste of human talent occurs when top people in management failed to ensure that all their. Involving participation in various levels including decision making can lead to effective utilization of human talent.

Waste of Human talent occurs when organizations separate the role of management from employees with a lack of purpose and individual contribution to it. In an organization, management is responsible to plan, organize, control, and innovating the process. The

employee's job is to simply obey the orders given to them and complete the work as planned by the leader. Without engaging the worker's knowledge, ideas, suggestions, and expertise, it is difficult to get improvement in processes. The people working and touching the job, feeling the tool are most capable of identifying problems within the process, and material and developing alternative ways to get solutions for them. There are four Components whose failure leads to the eighth waste:

Knowledge	Skill
Human Waste	
Critical Thinking	Creativity
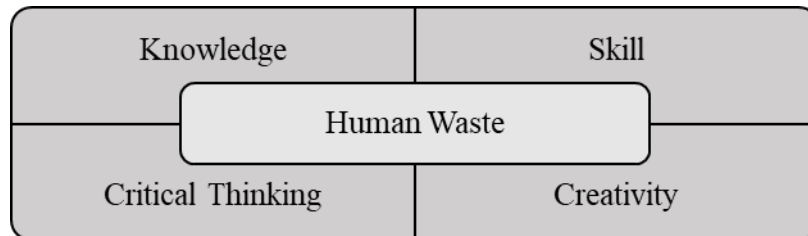
5. DISCUSSION OF STUDY

W E Deming said that it is wrong to assume that everybody is doing their job right. Knowing the purpose is the first thing on priority. Many factors are working on human aspects like motivation, purpose, attitude, clarity of thought, and training for skill level. We need to identify each of them very carefully to get the right outcome. It is not only about front-line workers, it is also applied to supervisors, line managers, and other human beings in the chain. There is step by step and carefully defined strategy that needs to be worked upon considering the nature of each individual and each organization is different.

Considering process improvement and its human aspects to create an environment of process improvement, physical factors like the work environment and physical conditions of work to be improved upon, consider mental factors like state of mind and awareness, work on behavioural factors and practising for improving skillset. We have identified the below-mentioned issues to boost improvement. Below mentioned are the challenges for improvement initiatives concerning the human factors.

5.1 Commitment
Lack of Visible Management Support

The management Role is not just setting targets but also, providing required resources, training, and ways to achieve the targets. It needs careful and active involvement during the course from all levels of management, starting from line manager to top management.

Poor Funding:

Any improvement initiative needs some resources that range from capital investment to small training activities on the shop floor. There are two types of initiatives, one is giving direct tangible benefits and the other is indirect and intangible benefits like reduced employee fatigue, increased awareness, involvement, and motivation. Often management tries to implement later one with no or minimal financial support. It should be considered from an investment point of view to get the soft gains in the long term.

Short Term Thinking:

Management often does not foresee long-term losses that arise from decisions they make for short-term gain. It is introduced by Jeffrey Liker in Toyota way.

Inadequate training and Understanding:

Knowing the purpose is most important. Besides the inherent attitude of the person working on the process, other qualities can be increased by training and practicing the tools for the job.

Slow Decision Making:

It is also observed that many improvement initiatives people are taking are killed by the slow decision-making process. The idea proposed by the person may have great potential but the inability of his leader to extract it fails to cause a late decision. Ultimately it does not result in fruitful gains.

5.2 Culture

Culture is a mirror image of leadership, not individual leadership, but the entire system of leadership. High impact organizations have a strong continuous improvement process, culture elevates the experience of the human workforce. The below mentioned needs to be addressed to promote process improvement in quality and productivity.

Fear of Doing yourself out of job:

It is important to create confidence in them about the improvement they are doing is to reduce their efforts. Any Improvement leads to soft gains for humans working on the process, rather it helps in reducing their efforts. This should not create any fear among themselves of losing the job, rather this should motivate them to achieve the next level in the continuous improvement system. It can be created by appreciating what they have achieved.

Firefighting and quick fixes:

Any Issue that arises on the floor has to be identified and drilled down to the root cause, often symptoms are taken care not the root cause or latent cause. Doing this we need to take care of targets as well, leading to a situation of firefighting and later quick fixes of problems. Such a situation on a repetitive basis leads to a culture of firefighting and that should be avoided.

6. SUGGESTIONS

6.1 Good Practices to follow:

- **Involve Everyone:** Make a conscious effort to be accessible to people working in your team, to treat them as if their opinion is valued and respected. Involve them in the decision to understand the process and to make them able to align with the decision.
- **Encourage People to Highlight Issue:** For staff to stay motivated, they need to understand the larger picture. On the other hand, negative issues, problems, and defects need to be highlighted. Whenever any negative situation arises, blaming one person is not going to help, identifying the reason and seeing the situation from a third perspective can help to address the issue correctly.
- **Empower People to solve their Issues:** Usually human beings can solve these problems on their own and the person touching the job at hand has known where the problem lies. We need to empower them to solve their issue while searching for latent causes on our own.
- **Find the Latent cause:** There is a problem that exists with Root Cause Analysis that works around the probable cause of the error. We, as human beings, will look for anything or anyone except ourselves as the causes of our problems, and we will do it as fast as possible. Latent cause analysis is an attempt to change people's mindsets and the way people think. It works around attitude, beliefs, assumptions, and culture. It requires people to look at themselves.
- **Recognise People:** We need to look for special assignments for the staff for the best performance concerning the process and give them opportunities for projects that will give open doors to participate. Look for opportunities to recognize their performance among others that will accelerate their performance.

- **Promote continuous Improvement:** Identifying and evaluating the process is most important and the person working on the floor or touching the job is the best person who can identify improvement opportunities.
- **Identify the right thing:** As identified by W E Deming, People usually want to do the right thing, but they do not know what the right thing is. To improve the quality right process can give the right output and the right people can identify the right thing to do in the process.

6.2 Wrong Practices to Avoid:
- **Let perfect get in the way better:** Any improvement action can be done with quick implementation. Give sufficient time for planning but do not wait for perfection, immediately try to implement. Executing is the key to any improvement initiative.
- **Workaround Issue:** Do not stop in between the process, get help from experts, and managers. There are many ways of working on the problem, identifying the hurdle, and finding out alternate ways to execute to improve the quality and speed of the process.
- **Blame People for Unsuccessful Ideas:** It is all about creating or rather nurturing an improvement culture. If any attempt for improvement fails, immediately identify what went wrong and try to correct that. It gives a boost to people to work upon than demotivating for any idea.

7. CONCLUSION

A human being is an important Resource. If we reverse Root cause analysis towards improving the process, we found that there are similar categories we can work to improve upon. All other factors will work as per plan only if the Human factor is identified and treated well. A change of mindset is more important than changing the process of a person. Any Improvement in Product is backed by improvement in Process and process is backed by a person working behind at various levels and surroundings. Considering the practices suggested here, a better understanding of human nature can lead to improvement in the process.

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