



DST-AMRITA  
TECHNOLOGY  
ENABLING  
CENTRE



## Growing Together: SAICO Consortium's Survey-Based Strategies

[tec@amrita.edu](mailto:tec@amrita.edu)

# GROWING TOGETHER: SAICO CONSORTIUM'S SURVEY-BASED STRATEGIES



## About the Industry

Shoranur Agricultural Implements Consortium Pvt. Ltd. (SAICO) is a manufacturer of agricultural equipment operating out of Shoranur, Palakkad, Kerala. They fall under the umbrella of The Ministry of Micro, Small and Medium Enterprises (MSME). 160 units fell under the consortium, but nearly 60 of them had to shut their operations due to failing business.



## Preliminary Industry Study

Companies in the consortium are facing the risk of being put out of business owing to tough competition offered by the cheaper and better-quality Chinese products and in some cases, even products from North India. They argue that the unwavering support from the Chinese government towards the Chinese agricultural equipment manufacturers means that they are

able to combine technology with lean and agile manufacturing to reduce the overall production cost, thus enabling them to sell at lower prices and still generate huge profits. The employees we spoke to insist that most places they have gone to for help have turned a blind eye towards their struggles. Even after repeated requests, there seems to be no signs of help.

Another problem they face with products apart from scissors is the involvement of Tata steel in using a grade of steel different to MS steel that helps them cater to the areas with soft soil, which is roughly 80% of the total share. There is a lack of standardization in the production processes, and there are absolutely no safety measures in place. However, the biggest issue the consortium faces is the internal competition between the companies in the consortium,

that leads to a shrinkage and division of market share and profits. From the findings of the preliminary industry study, it was decided to prepare a questionnaire to conduct a detailed industry study.

## Questionnaire

The purpose of designing a questionnaire was to provide a structured way to gather data and information from the consortium. This allows us to collect required data to understand the current situation of the consortium and accordingly identify areas that require addressing. Before preparation of the questionnaire, functional areas were identified from the preliminary study. These functional areas are integral to the functioning of the companies in the consortium. The functional areas are Production & Planning, Inventory & Maintenance, Procurement & Logistics, Cost Management, People Management, Ergonomics, Quality Management & Sales and Customer Relations. A total of 276 questions were framed.

## Detailed Industry Study

The questionnaire was administered over multiple visits. For ease of study, the consortium was divided into four clusters, based on the products manufactured: welding, implements, cutlery and scissors. Each cluster contains a few industries operating under it. From the survey-based research, critical areas were identified at each cluster, and it was decided it would be best suited to base our approach around the 10 wastes of lean manufacturing, 14 principles of lean manufacturing and the 6S methodology. It was noticed that all four clusters experience almost similar problems.

## Welding Cluster (20-25 companies)

There is an overproduction of coconut de-husker. No proper demand exists from the customer and there are no proper pricing policies. There is a scope for commodity bundling, among household products. Unhealthy competition between companies hinders business. No incentive schemes are provided for employees, which may result in a lack of motivation. There is scope to implement 6S methodology, and Heijunka.



## Scissors Cluster (15-20 companies)

There is a difference in quality of raw materials received causing issues in production. A shortage of labor exists which can be solved by scope for labor pooling. Only partial 6S methodology practices are in place. No quality measures are in place.

## Cutlery Cluster (20-25 companies)

No proper raw material inventory. There is no documented quality system. 6S methodology not being followed. Over-processing occurs regularly. Internal competition exists between companies inside the cluster. There are no proper pricing policies in place. The attitude of the workforce shown towards the management is poor.

## Implements Cluster (25-30 companies)

Unnecessary motion taking place, which is a waste. No proper demand exists. Overproduction takes place. No quality systems in place. There is no proper inventory management and a severe lack of standardization. No safety measures in place. A severe lack of rapport between companies in the cluster

## Findings from Study

The consortium is unaware of customer demand, causing overproduction. This can be solved by incorporating proper demand management practices. Lots of delay and inventory build-up occurs in production activities. Creating a current state VSM would give the existing process flow.

The current state VSM will reveal a mismatch in the production output and customer demand. Demand Forecasting techniques can help overcome the mismatch. Companies compete with one another shrinking customer base and market. An understanding must be reached between companies.

## Demand Management

### Market Survey

The first step in demand management was for us to conduct a market survey. This was to help us identify the general trend of agricultural implements (hand tools) in the market. We began by identifying markets in and around Coimbatore and simultaneously pursued markets in Kerala. Conversations were also held with professors at Tamil Nadu Agricultural University (TNAU) and we also gained insights from the Deputy Director at Ministry of Small, Micro and Medium Enterprises (MSME), Thrissur, Kerala. Agriculture hand tools are being used more often in hilly regions. Mechanized implements are more often used on flat lands. Lack of labour availability is forcing farmers to adopt mechanized implements. Exciting schemes to adopt lean manufacturing are being rolled out by MSME. However, the consortium chose not to participate in those schemes. Common sharing facility was suggested by MSME. Product diversification was discussed an increased focus on horticulture tools was proposed. Collaboration with other consortiums was suggested to address demand at rural areas. Scope for aggregation of demand was also explored.

Exponential Smoothing is a time series method that is effectively used for demand forecasting widely. This method makes use of the available data and calculates the forecast for the next time series. The smoothing constant ( $\alpha$ ) can be varied according to smooth the graph along with the forecast and actual data.

### Jaiju Implements- Sickle

Daily Demand- 150

Monthly-3600 (approx)

Time	Actual Demand	Forecast Demand
1	3000	3300
2	3212	3195
3	3700	3200.95
4	3900	3375.6175
5	3850	3559.151375
6	3300	3660.948394
7	3100	3534.616456
8	3300	3382.500696
9	3400	3353.625453
10	3250	3369.856544
11	2450	3327.906754
12	3500	3020.63939
		3188.415603

$\alpha$	0.35
Initial Forecast	3300

*Demand Forecasting ~  
Exponential Smoothing Model*

## Forecasting Techniques

Production activities take place without prior knowledge of customer demand, causing them to overproduce. Hence it is vital the consortium incorporates forecasting techniques.

The survey-based research revealed a severe lack of any sort of customer demand data across the years. Hence, the demand forecasting model in figure 2 was done by taking input data that would approximately resemble the customer demand data at the consortium. This is a test implementation.

---

## Aggregate Planning

The VSM's revealed severe WIP inventory buildup. They also highlighted a broken process flow, right from procuring raw materials to performing manufacturing activities. Aggregate Planning specifies what materials and other resources

are needed and when they should be procured to minimize cost. This will help manage production in advance and reduce inventory as corroborated with the critical areas identified with the questionnaire.

Unit Costs		1	2	3	4	5	6
Normal	10						
Overtime	12						
Sub-Contract	15						
Holding Cost	1						
Period		1	2	3	4	5	6
Forecast	3300	3195	3200	3375	3559	3660	
<b>Output</b>							
Regular	3600	3600	3600	3600	3600	3600	
Overtime	0	0	0	0	0	0	
Sub-contract	0	0	0	0	0	0	
Output- Forecast	300	405	400	225	41	-60	
<b>Inventory</b>							
Beginning	1000	1300	1705	2105	2330	2371	
Ending	1300	1705	2105	2330	2371	2311	
<b>Backlog</b>							
Cost							
Regular	36000	36000	36000	36000	36000	36000	
Overtime	0	0	0	0	0	0	
Sub-contract	0	0	0	0	0	0	
Hire							
Backorder							

Normal	10
Overtime	12
Sub-Contract	15
Holding Cost	1
<b>Period</b>	<b>1</b>
Forecast	3300
<b>Output</b>	
Regular	3600
Overtime	0
Sub-contract	0
Output- Forecast	300
<b>Inventory</b>	
Beginning	1000
Ending	1300
<b>Backlog</b>	
<b>Cost</b>	
Regular	36000
Overtime	0
Sub-contract	0
Hire	
Backorder	

Here considering unit costs the manufacturing comes around the above price but it is not inclusive of the inventory that is held up

Forecast for the following time period  
Considering the company produces 150 products for 24 working days in a month  
Excess of 300 products is produced in the following month which is a waste  
Excess inventory held up due to overproduction in the previous month  
In addition to the manufacturing costs the idle inventory also carries holding costs well as man, machine, materials costs

## Process Flow Analysis ~ Current State VSM

The market survey results stated that the demand for agricultural hand tools is diminishing. Market survey results that the production activities are outdated. This also ties in with the results from the questionnaire clearly that reveal all clusters accumulate a lot of WIP inventory. Survey results also reveal that machines spend a lot of time in idle state. An effective way to tackle this problem would be to examine the process flow at clusters to streamline the production. A Current State Value Stream Map serves as the best technique. It highlights bottlenecks in the production process. Data was collected from different industries across clusters. The VSM as expected, revealed unusually excessive amounts of non-value-added-time and WIP inventory across industries. A current state VSM would also show how their production activities are out of sync with the customer demand. The market survey results stated that the demand for agricultural hand tools is diminishing. This context would make overproduction a bigger problem.

# Aggregate Planning

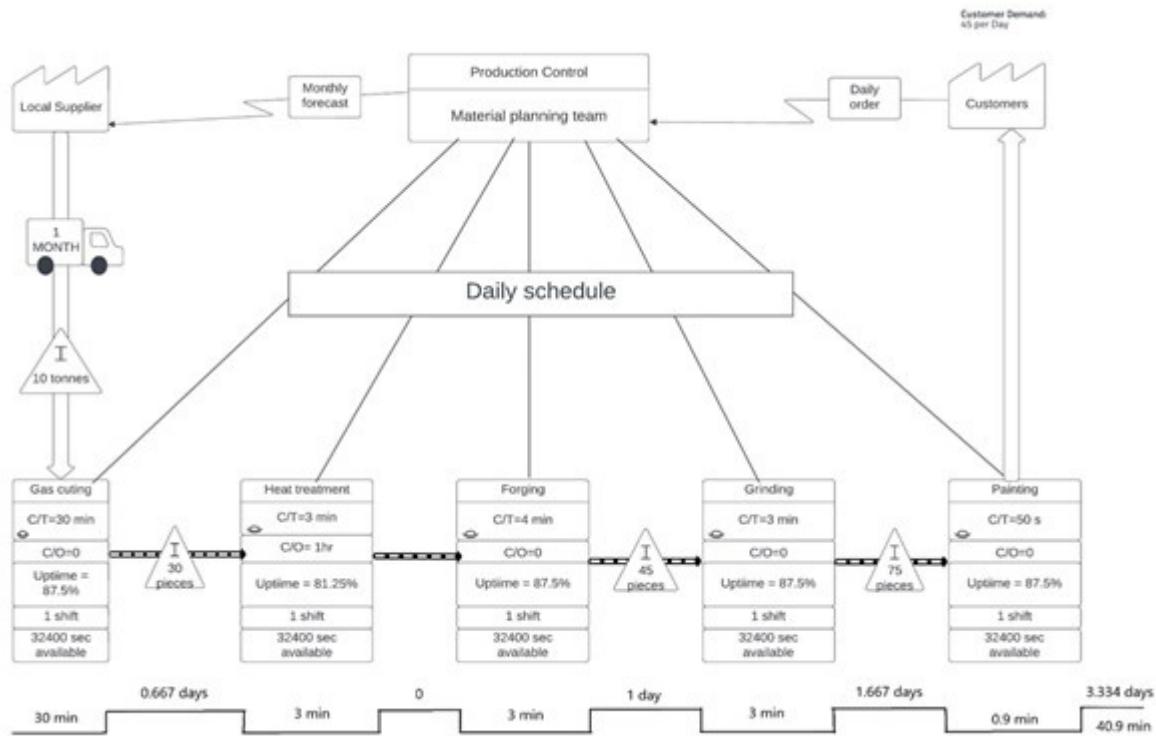


Figure 3: Current State VSM ~ Implements Cluster

Rails cut in batch of 2 tonnes only when previous batch is completely exhausted. This causes delay, which is a waste. As figure 3 shows, lot of WIP inventory and time between forging, grinding, and painting. This is due to grinding and painting operations not taking place daily. Demand is 40 pickaxes a day, however the company is overproducing. Total value-added-time is 40 minutes and 50 seconds. Total non-value-added-time is 3.334 days. % VAT is 0.85% and % NVAT is 99.15%

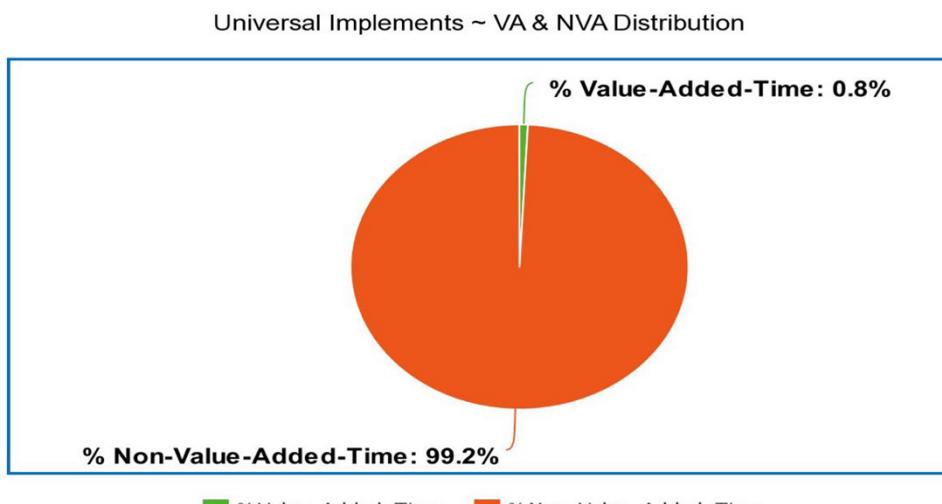
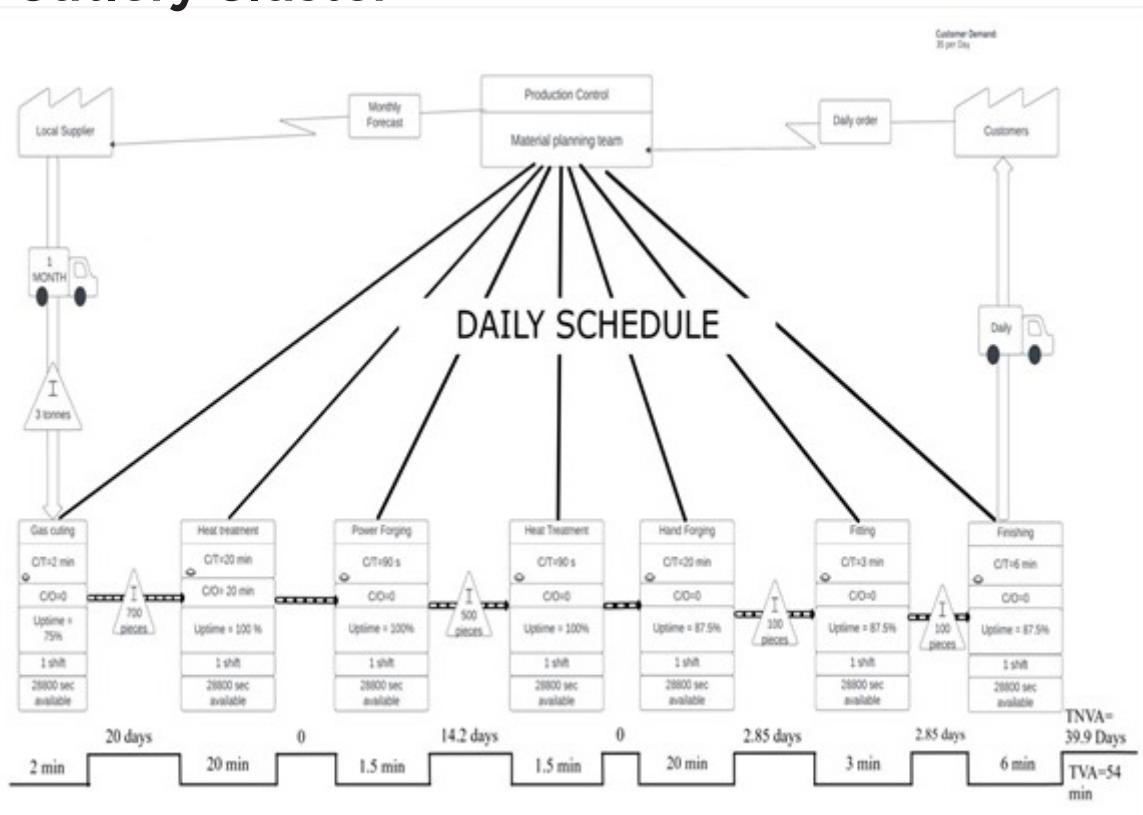


Figure VA, NVA Distribution

# Cutlery Cluster

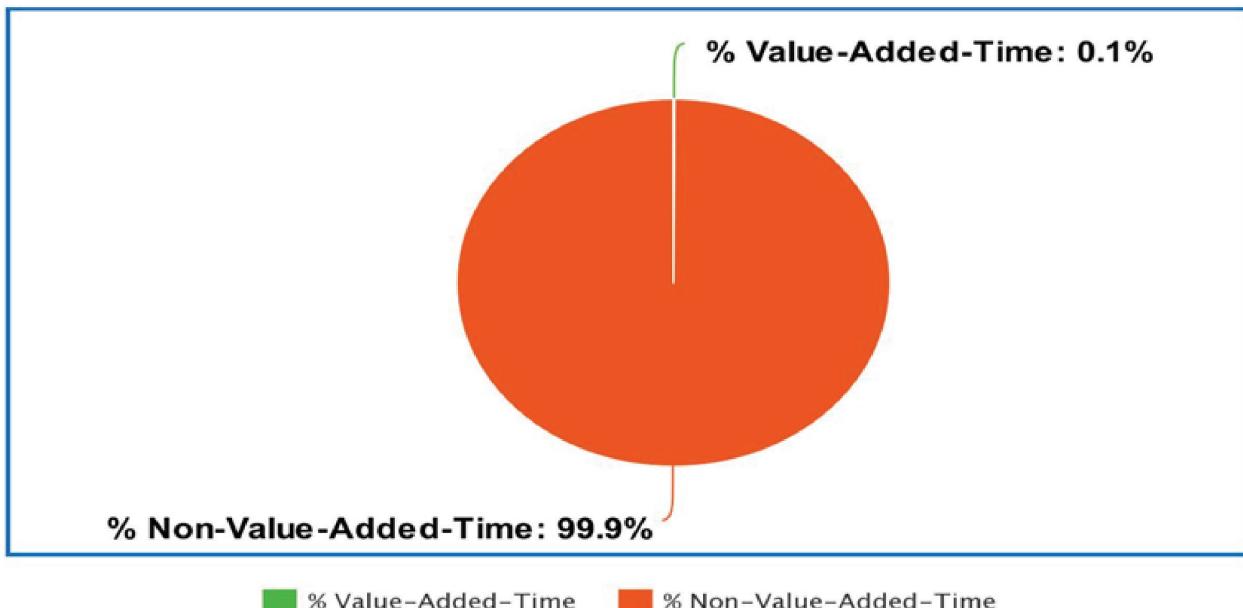


Current State VSM ~ Cutlery Cluster

## Findings from VSM

Monthly order of 3 Tonnes given to supplier. These are gas cut in large batches. The WIP inventory between gas cutting and heat treatment is 700 pieces. The large inventory means that the inventory stays there for 20 days (about 3 weeks). The cut rails are then taken for heat treatment, where they are heated to a high temperature, to make it easier to perform the forging operation. Since the forging process must be done when the rails come out of the oven, there is no WIP inventory. After the forging process, the pieces undergo heat treatment once again before performing hand forging. There is a WIP inventory of 500 pieces, and this inventory stays there for 14.2 days (about 2 weeks) before it goes for the hand forging. Hand forging is done to bring out superior finishing, as cutlery products all require good finishing. The WIP inventory between hand forging and fitting and operations is 100 pieces. The inventory stays there for 2.85 days. The WIP inventory between fitting and finishing is 100 pieces and this causes it to be there for 2.85 days. The total VAT is 54 min and the total NVAT is 39.9 days (about 1 and a half months). The percentage value added time is 0.09% and the percentage non-value-added time is 99.91%.

### Manikanda Implements ~ VA & NVA Distribution



## Suggestions

Shoranur Agricultural Implements Consortium Limited (SAICO), is a trading company and acts as a raw material bank for the companies in the consortium. They claim to be operating for the companies' welfare by providing raw materials, machine components and essentials at a reduced price. They offer cut rails and spring leaf to companies. One suggestion would be to encourage companies in the cluster to buy cut rails from the consortium directly thereby avoiding the gas cutting operation, which not only consumes a lot of time and money, but also workforce. This will reduce the wait time for cut rails, which the company often experiences. Another suggestion would be to adopt rotary forging, an alternative to power forging. Only a small area of the die is in contact with the work piece at any given time, rotary forging requires as little as one-tenth the force required by conventional forging techniques. die strength is much lower.

Because impact is not used in rotary forging, there are fewer environmental hazards than in conventional forging techniques. The average cycle time for this operation is 10 to 15 seconds. Because of the lower forging loads, die manufacture is easier, and the required die strength is much lower. Because impact is not used in rotary forging, there are fewer environmental hazards than in conventional forging techniques.

Complications such as noise, vibrations, fumes, and dirt are nonexistent. Performing the grinding and painting operations daily would reduce WIP inventory in the implements cluster.

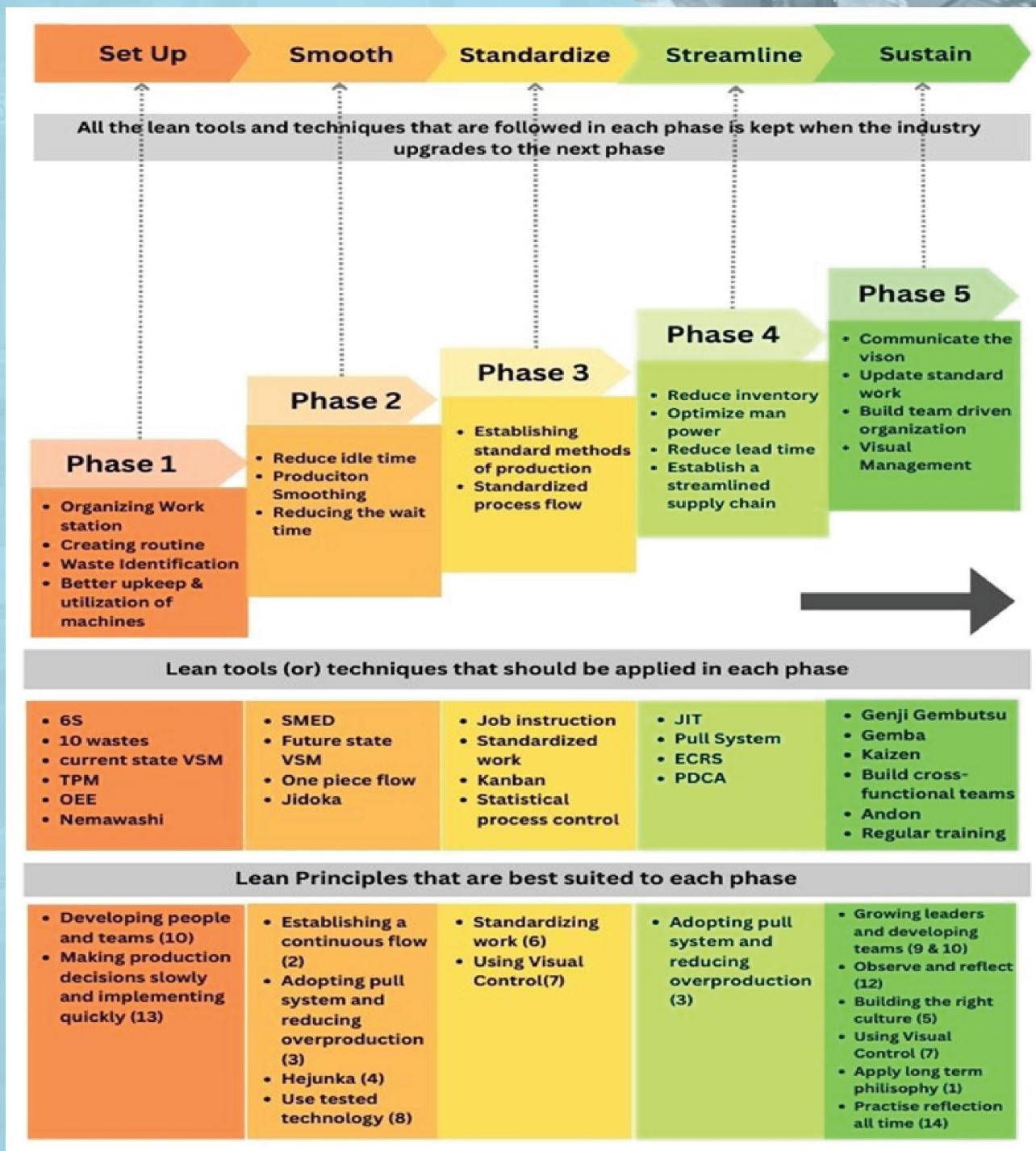
In the cutlery cluster, an alternative to hand forging is induction hardening. Induction hardening is a form of heat treatment in which a metal part is heated by induction heating and then quenched. The quenched metal undergoes a martensitic transformation, increasing the hardness and brittleness of the part. Induction hardening is used to selectively harden areas of a part or assembly

without affecting the properties of the part. This is followed by induction tempering, where the induction coil is heated to 450 degrees Celsius. The combined cycle time for induction hardening and tempering is 5 seconds, as opposed to the heat treatment process which requires 20 minutes.

## Development of a Lean Framework

A multi-level lean framework has been developed for the consortium. This will act as a roadmap for the consortium to adopt lean manufacturing. Since implementing lean is not a quick process, a phase wise implementation has been proposed. The 5 phases are set-up, smooth, standardize, streamline, and sustain. The work to be done in each phase has been carefully drafted based on the consortium's current situation, and resources required to evolve and willingness to evolve. For the work to be done in each phase, the lean tools that will

assist in performing in the work have been included another level. The 14 principles of lean manufacturing are the bedrock of any lean implementation process. A connection has been made with the work to be done in each phase and all the 14 lean principles. Hence once this framework has been followed and implemented, it would mean that the consortium has incorporated the 14 principles of lean manufacturing, meaning they well and truly have implemented lean manufacturing at the consortium.

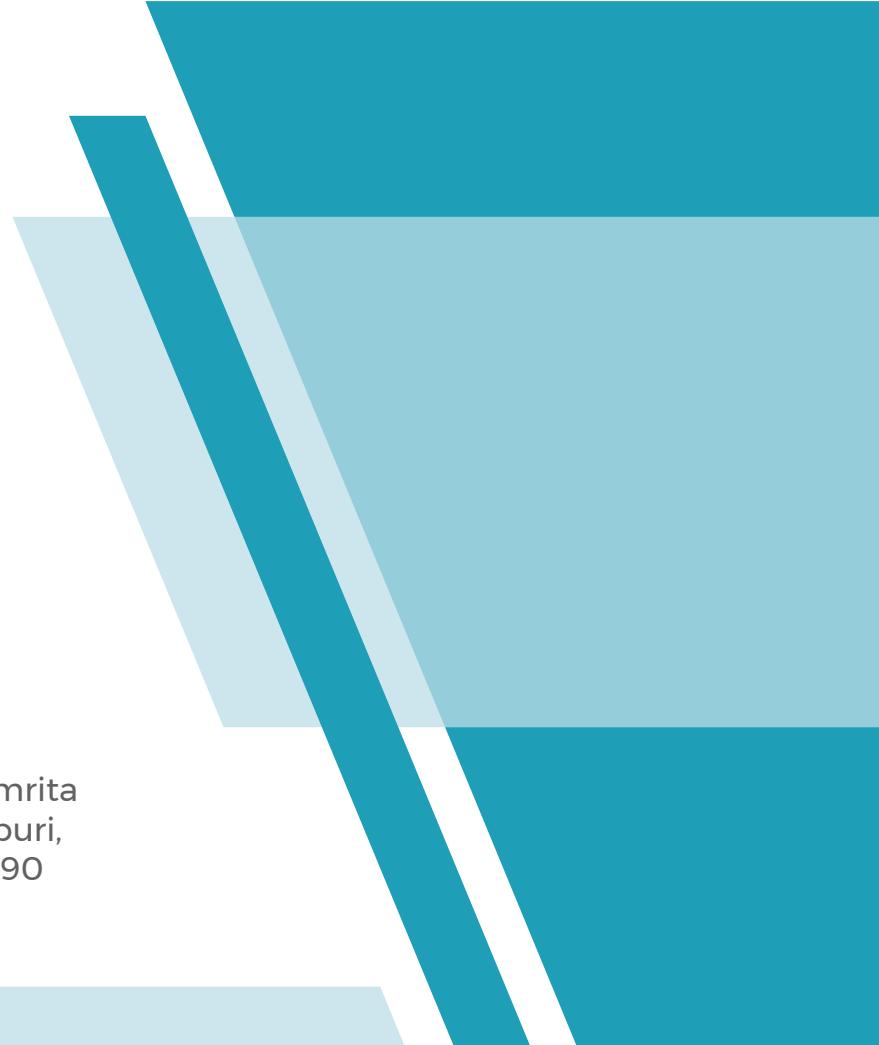




## **Survey-Based Insights**

**Survey results highlight the need to address all functional areas.**

- ▶ A standardized system is essential for efficiency, quality, consistency, and cost-effectiveness.
- ▶ Standardized systems provide a foundation for continuous improvement, regulatory compliance, and operational excellence.
- ▶ Streamlining the supply chain is crucial for operational excellence, cost reduction, and customer service improvement.
- ▶ A streamlined supply chain enhances collaboration and risk management, enabling quick responses to market changes.
- ▶ Expanding the market to North India and abroad is of interest, with a feasibility study planned.
- ▶ Automation is a requested area of assistance, with groundwork to be laid for implementation.
- ▶ Efforts are needed to eliminate internal competition among consortium companies and foster mutual understanding.



Technology Enabling Center Amrita  
Vishwa Vidyapeetham, Amritapuri,  
Clappana P. O., Kerala, India - 690  
525.

[tec@amrita.edu](mailto:tec@amrita.edu)