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ACMA Centre for Technology (ACT)

IMPACT

INDIAN MANUFACTURING PRACTICES | ACMA CENTRE FOR TECHNOLOGY

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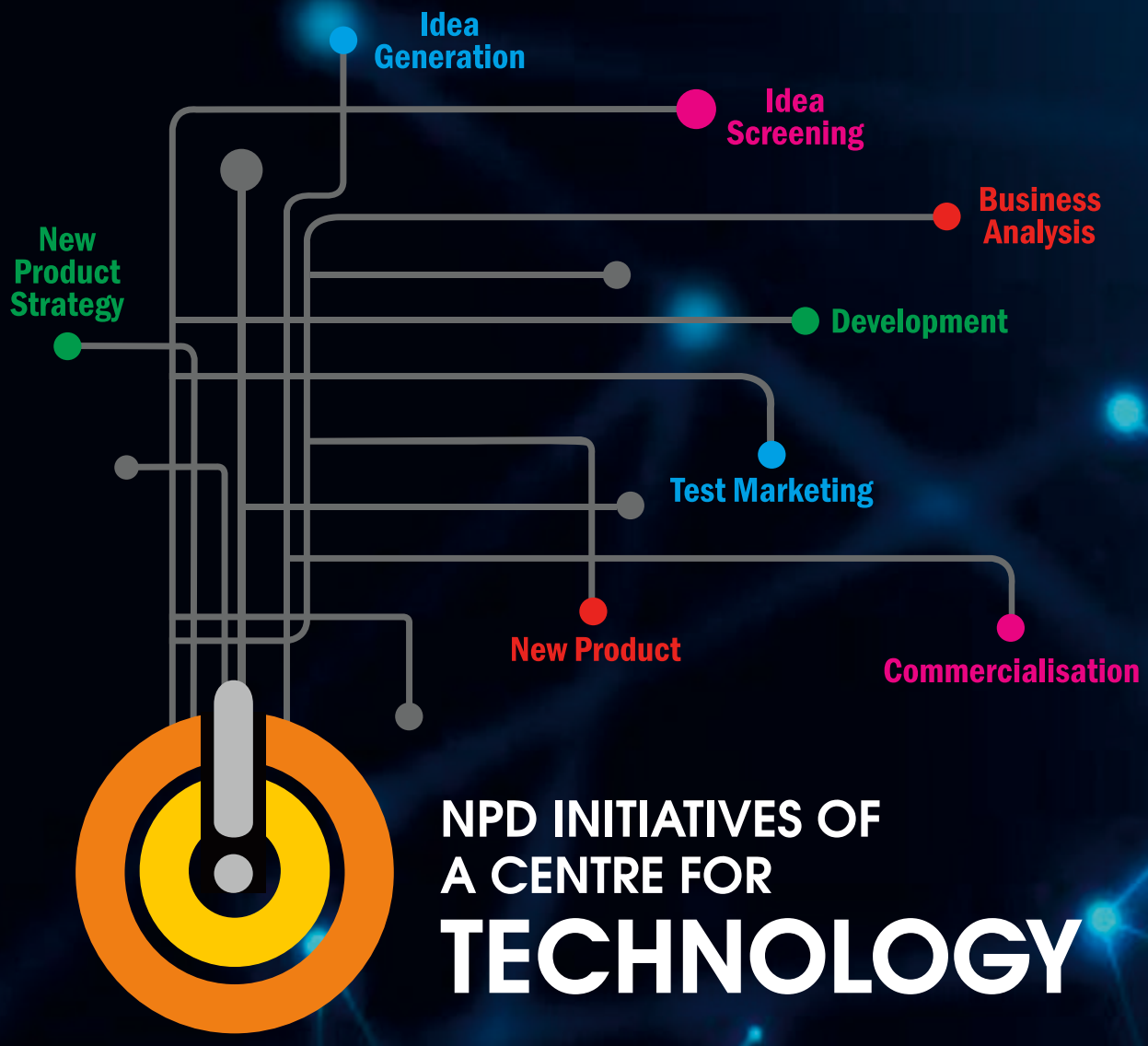

NPD INITIATIVES OF A CENTRE FOR TECHNOLOGY

ACT CLUSTERS & PROJECTS RUNNING
(as of 1st March 2018)

Sr. No.	Cluster	Region	No. of Companies	Start Date	End Date
1	ZED 2	National	5	Jan-17	Dec-18
2	ZED 3	NR	4	Jan-18	Aug-18
3	ZED 4	SW	6	Jan-18	Mar-18
4	Engg 4	National	5	Jan-18	Aug-18
5	NPD Foundation 2	National	6	Nov-16	Dec-19
6	NPD Design 1	National	5	Feb-17	Dec-19
7	Foundation 10	SW	4	Apr-16	Dec-19
8	Foundation 11A (FML)	WR	5	Apr-16	Dec-18
9	Foundation 11B (FML)	WR	7	Apr-16	Mar-18
10	Foundation 12A	NR	5	Jan-18	Dec-19
11	Foundation 12B	NR	6	Jan-18	Dec-19
12	Foundation 13	SW	10	Jan-18	Dec-19
13	Advance 9 (FML)	WR	5	Apr-16	Mar-18
14	Advance 10	National	8	Jan-17	Mar-18
15	Advance 11	NR	4	Jan-18	Mar-18
16	Advance 12	SW	4	Jan-18	Jan-19
17	Advance Plus	NR	4	Jan-18	Oct-18
18	HMCL Suppliers clusters - 6nos	NR	52	Sep-17	Dec-19
19	1-S/2-S project - WIL	SR	3	Apr-17	Dec-19
20	CRI Pumps Project	SR	2	Mar-18	Dec-19
21	LMW Suppliers cluster	SR	11	Jan-18	Dec-18
	Total current participating plants		**161**		

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INDIAN MANUFACTURING PRACTICES ACMA CENTRE FOR TECHNOLOGY

Contents

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Chairman's Message

Dear Reader,

I am happy to address and present to you the Vol. 10 Issue 4 of "IMPACT" with special focus on "New Product Development & Design Capabilities".

It is imperative for the Tier 1 companies to develop a distinctive wing in their companies that focusses on catering to the OEMs' ever changing needs by providing them with New Product Developed solutions.

Friends, New product development (NPD) is the process of bringing a new product to the marketplace. Our business needs to engage in this process due to changes in OEMs preferences, increasing competition and advances in technology and to capitalize on a new opportunity. Innovative businesses thrive by understanding what their market wants, making smart product improvements, and developing new products that meet and exceed their customers' expectations.

'New products' can be those that your business has never made or sold before but have been taken to market by others or product innovations created and brought to the market for the first time. They may be completely original products, or existing products that you have modified and improved.

With a well-considered NPD strategy, you can avoid wasting time, money and business resources. An NPD strategy will help you organize your product planning and research, capture your customers' views and expectations, and accurately plan and resource your NPD project.

Too often companies move forward with new products based on an instinct. They have an idea, they see value in it and decide to progress with the development of a product without thoroughly exploring the market for that product. However, without thoughtful research and abiding by the known principles of NPD, chances are that the company and product will encounter difficulties. And when the inevitable problems arise, companies look to research to justify their decisions.

In my opinion, once you've developed and rolled out the product, going back to conduct research to guide the product's development is not cost-effective or efficient. This can create substantial delays in the ultimate progress of the product and can deplete morale and potential market share by an ineffective rollout.

Hence, it's important to use research to guide the NPD process, rather than trying to correct it once problems arise. Test and experiment throughout the product development process, from inception to production. Too often companies first design a product and then figure out a way to sell it. The ultimate success or failure of a product is defined by the customers' willingness to pay for it. Research, experimentation, and testing should therefore be incorporated throughout the product development process, rather than after the product has already been developed.

This volume of IMPACT shares with your many articles on New Product Development that will help in bringing more transparency in understanding this robust process which is need of the hour.

I am sure you will appreciate the contents shared through this issue and I look forward to your valuable feedback, not only to improve "IMPACT" but also for augmenting the gamut of services from the ACT stable.

Best wishes
Srivats Ram

NPD INITIATIVES OF ACMA CENTRE FOR TECHNOLOGY

ACT road map for improving product development capabilities

Product development capability is very critical to business success in auto-component industry. In our industry we have suppliers at different levels. Most of them are in tier-2 or tier-3 level. They are developing parts to print. They do not have design responsibility of the parts, they produce. Some suppliers are at tier-1 level. They have design responsibility of the products, they produce. Irrespective of the levels, there are product development activities. They have to streamline their product development activities so that they minimize the start-up losses. This will in turn enable them to climb the value chain. Tier-2 and tier-3 companies can acquire the design capabilities thus partnering with the tier-1 companies. Tier-1 companies have to enhance their design capabilities so that they can partner with OEMs in a purposeful way. This is the vision of ACMA Centre for Technology.

In summary we want auto-component companies to eliminate the start-up losses during new product development and climb up the value chain, irrespective of their current level.

Figure 1.1

Our roadmap for launching various clusters for new product development is shown in figure-2.2

The initial focus is on tier-2 and tier-3 companies who manufacture parts, but they do not generally have the design responsibility. Great majority of companies are at this level. Consequently, we launched NPD Foundation cluster. First cluster has already been completed. The second edition of the cluster has been launched already. The second edition incorporates the learning from the first edition.

NPD Clusters

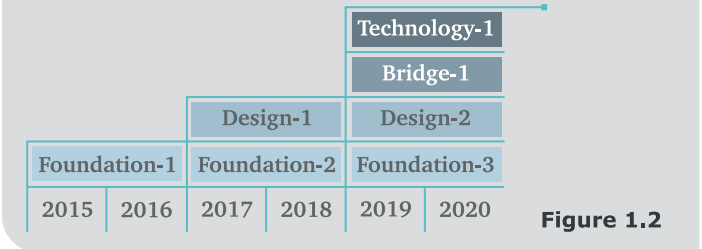


Figure 1.2

S. Selvamani
Mentor, NPD Program ACT

S. Narayanan
Expert, ACT Cluster

Vishal Saxena
Counselor ACT

The cluster that addresses the needs of tier-1 companies is called NPD design cluster. The first edition is launched in April 2017. The interim results are already motivating.

The next step is to help tier-3 and tier-2 to become design responsible companies. This cluster is called bridge cluster. This cluster is planned to be launched by end of 2018.

Design capabilities should be supported with appropriate technology development, acquisition and application activities. Technology cluster addresses these requirements. This cluster is planned to be launched in 2019.

Unique characteristic of these clusters is process orientation. In other clusters, we establish a model physical entity and deploy the learnings companywide. In NPD clusters, we improve processes one by one companywide.

More explanations about these clusters given later in this article.

NPD Foundation Cluster

Introduction

ACMA NPD foundation cluster program looks beyond current business and helps so sustain and increase the same for the future. This is done by building organisational competence to convert RFQ to a profitable business.

Prior to starting the program, we had no published new product development system for component manufacturers. Hence, we had to develop a system from grounds up. The requirements for new product development were somewhat clear from APQP from ASQC and ISO/TS 16949 standards. The challenge is creating a system to achieve these requirements in a manufacturing company. The counselling team with the support of Mr. C. Narasimhan developed such a system and we called this as Indian new product development system for automotive component manufacturers.

The NPD foundation cluster Roadmap

The first foundation cluster was designed along the three pillars of delivery, quality and cost. Quality was obviously the highest priority, as without a stable and predictable quality, without which both delivery and cost will suffer.

Cluster intervention goal

Figure 2.1

The cultural aspect of Indian companies is unique and cannot be compared to Western or Japanese companies. The structure had to be put in place in the organisation that will ensure team-based working rather than hierarchical and departmental silo-based working. Hence the involvement and conviction of the owner and top management of the company was essential for making the necessary organisational adjustments for the success of the NPD foundation cluster.

The fourth pillar of the cultural change was to move from individual "experience" based working to documented basis for activities of new product development and developing the organisational competence.

Only through this, the gains obtained through the cluster could be maintained by the companies in future.

The roadmap had five modules as illustrated below.

They were:

- Basic organisation and organisation set up
- New product quality assurance
- New product delivery assurance
- Product cost management
- Product optimisation

Roadmap - NPD foundation cluster I

	months																								
Initiatives	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Deliverables
DFM / DFA														Product Optimisation											Improved quality
VA/VE																									Reduced cost
Customer voice / QFD - basic concepts																									Improved customer satisfaction
DOE																									
Target cost											Product Cost Management											Setting and achieving target costs			
Cost models																									
Detail cost estimation																									
Project management									New Product Delivery Assurance											On time delivery of projects					
Gate and Project reviews																				High perpetuity ratio					
Redbox management																									
Requirements management					New Product Quality Assurance									First time right products											
FMEA and control plan														Consistent product quality											
Product validation and quality proving																									
Technical reviews																									
NPD process establishment	Basic NPD process and organisation setup											Controlled process													
Organisational alignment																									
Cross functional teams																									

Figure 2.2

The training materials and intervention strategy were not prepared upfront and had to progress as we engaged with the companies and understood their needs better. The first NPD foundation cluster was indeed the laboratory in which we wished to develop the future sustenance of this programme and in future of more advanced programmes like the NPD design cluster and NPD bridge cluster programmes which will be discussed later in this section.

Pillar 1 – NPD delivery

The key concepts for NPD delivery based on effective project management and issue resolution was to create a empowered and responsive project execution team and a steering committee consisting of functional heads who were accountable for the NPD process execution and excellence.

Typically, NPD in the component companies was run by a "NPD department" consisting of co-ordinators and reviewed by the owner/ CEO of the company.

This took up a lot of top management time in issue resolution and execution was poor. Problems were hidden till they became fire fighting situations and affected customer delivery and quality. The following illustration explains the basic concepts of the re-organisation of the NPD teams in the companies. The Daily Routine Management (DRM) was the foundation on which NPD delivery was based.

Cluster intervention goal

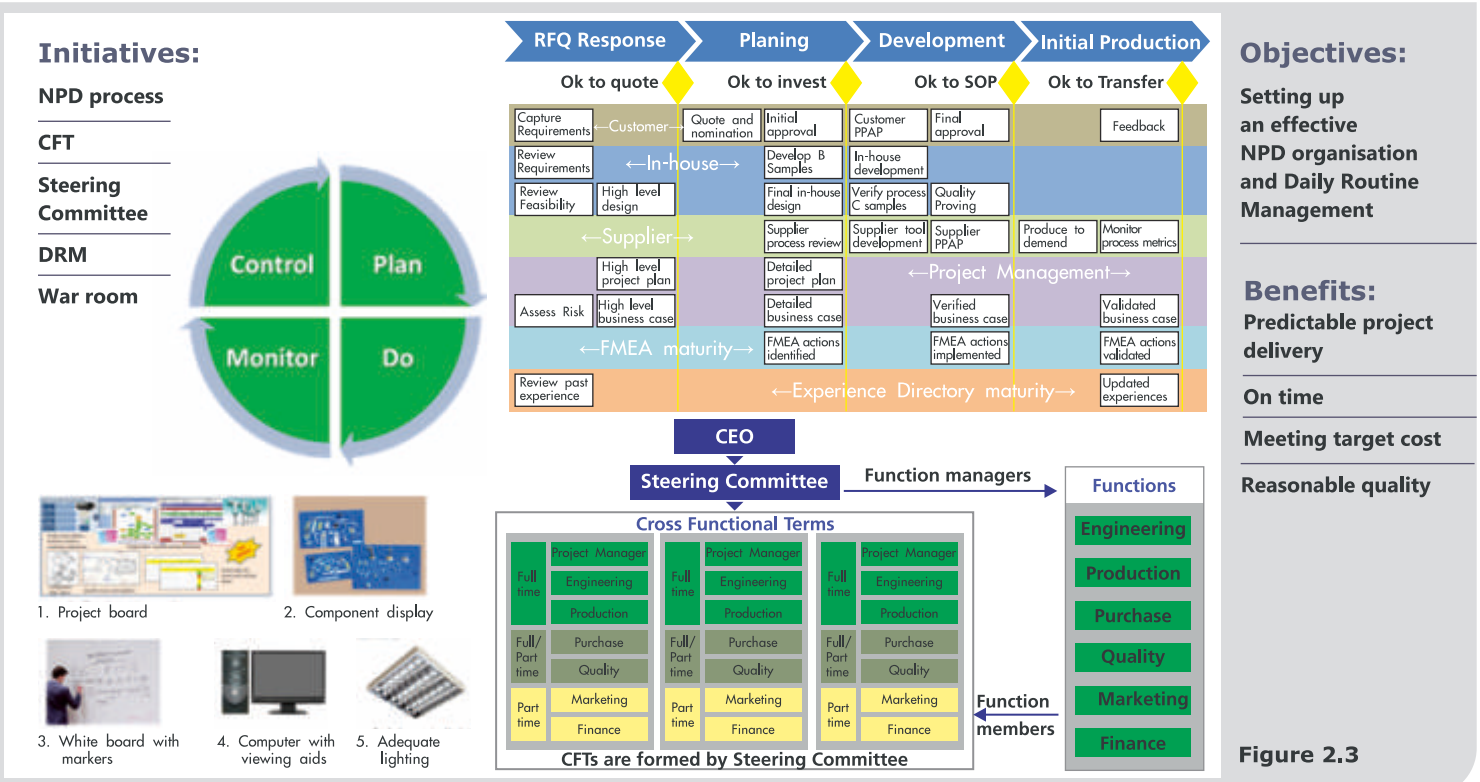


Figure 2.3

Pillar 2 - NPD quality

The basic concept is very simple. Check the output quality of every stage of the NPD process. Also, a new process step for checking issues before initial production was introduced. This is called quality proving. Quality proving detects issues in the production line which are detected before customer PPAP and start of production. This is indicated as "validation" in the illustration.

Approach to improve new product quality

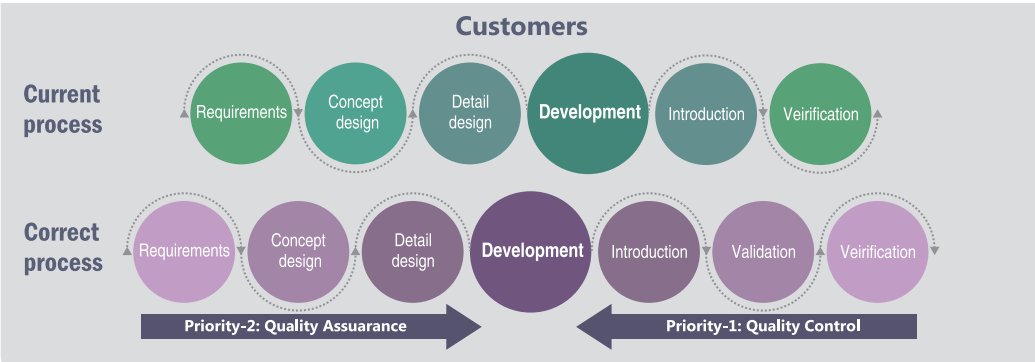


Figure 2.4

Pillar 3 – Cost control

The major concepts introduced were activity-based costing, frugal engineering, standardisation and re-use/ recycle. Being sensitive to cost is essential for component companies to remain competitive in today's globalised environment.

Module-4: Cost management

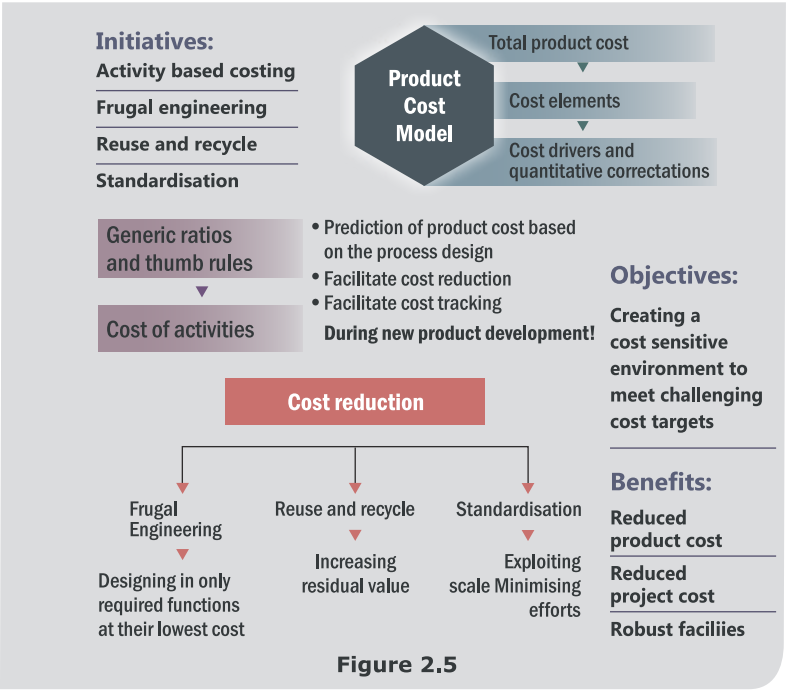


Figure 2.5

Pillar 4 – Organisational competence building

The concepts introduced here essentially were to learn from experience, document it (failure mode directory), prevent errors from recurring and instilling scientific and technological temper in process and tool design (Design guidelines and books of knowledge)

Organizational competence building

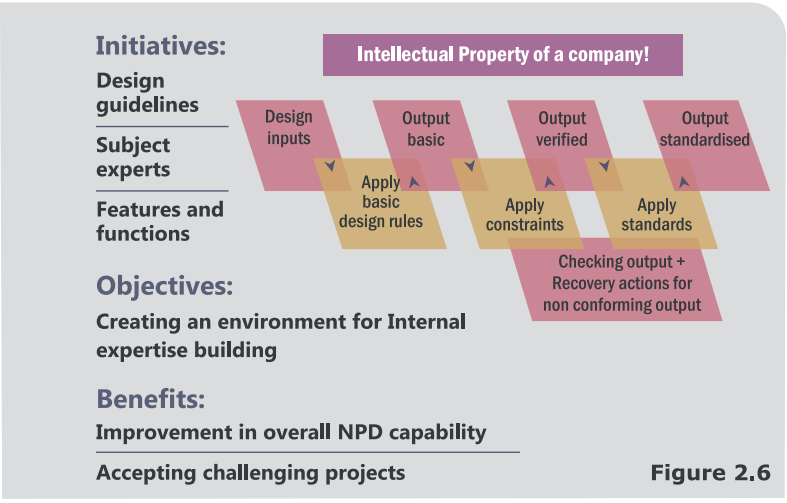


Figure 2.6

26 training modules were prepared during the course of the cluster.

The instruction methodology for the cluster is illustrated below.

Instruction methodology

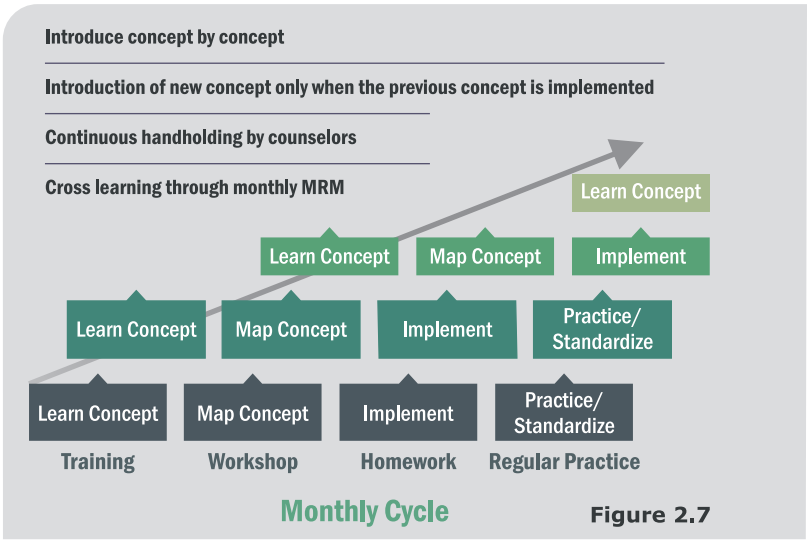


Figure 2.7

Participants in the first NPD foundation cluster

1. IM Gears Pvt. Ltd. - Gears and aggregates
2. JK Fenner (India) Ltd. - Oil seals
3. Menon and Menon Ltd. - Cast iron engine blocks and heads
4. Rockman Industries Ltd. - Aluminium pressure die casting and gravity die casting
5. Sanjeev Auto Parts Manufacturers Pvt. Ltd. - Gears and aggregates
6. Sundaram Auto Components Ltd. - Plastic mouldings

Measuring the results of the NPD cluster intervention

The metrics used for evaluating the effectiveness of implementing the cluster concepts and tools are:

Quality

1. Sample resubmission to customer:

This measures the number of times samples had to be submitted to customer for acceptance. This is a measure of how well the customer requirements have been understood and deployed in the process.

2. Internal sample rework:

This measures the number of iterations needed to produce the correct sample from new tools and processes. This is a measure of error free design of tools and processes.

3. Internal rejection during SOP:

This measures the rejection in first 3 lots of SOP of a new product. This is a measure of the effectiveness of issue resolution and problem solving before start of production.

Cost

4. Cost overrun vis-a vis RFQ

This measures the percentage of cost increase at SOP vis-à-vis cost assumed at the time of quote submission. This is a measure of the effectiveness of cost tracking and conscious efforts at cost reduction through frugal engineering, standardisation and re-use.

Delivery

5. Reduction in lead time for samples

This measures the reduction in lead time from business award to sample submission to customer. This measures the effectiveness of DRM, issue resolution and elimination of time wastage from the system.

Organisational competence development

6. Number of entries in failure directory

7. Number of design guidelines

8. Number of books of knowledge

These measure the effectiveness of knowledge build-up for error free design of tools and processes in the future. These create the learning organisation.

Business sustenance and benefits from cluster

9. New product perpetuity ratio

This is measure of proportion of New Product sales to total sales of the company. This is measure of the competitiveness in the company in generating a healthy NPD pipeline for business sustenance

10. Business benefits during cluster period

This measures in financial terms the efforts at cost tracking and cost control, the efforts through cost reduction projects, improvement in quality and reduction in rework. This figure is indicative of the future gains as the processes and concepts mature and are standardised for all future projects.

11. Business benefits during next year

This is an estimate in financial terms what financial benefits the company will derive in the succeeding year after the cluster program ends. This is a measure of sustenance measures put in by the company through an effective management review system.

The results of first NPD foundation cluster

The first NPD foundation cluster was a remarkable success.

Project management with cross functional teams and steering committee made new product management run on "auto-pilot mode" in the words of one CEO.

Very good improvement in quality of new products at start of production was demonstrated. Amount of rework at sample stage reduced significantly.

Significant saving resulting in impressive business benefits was demonstrated.

Business sustenance improved with healthy new product pipeline.

The average improvement across the cluster in NPD metrics is listed below.

Quality and business sustenance

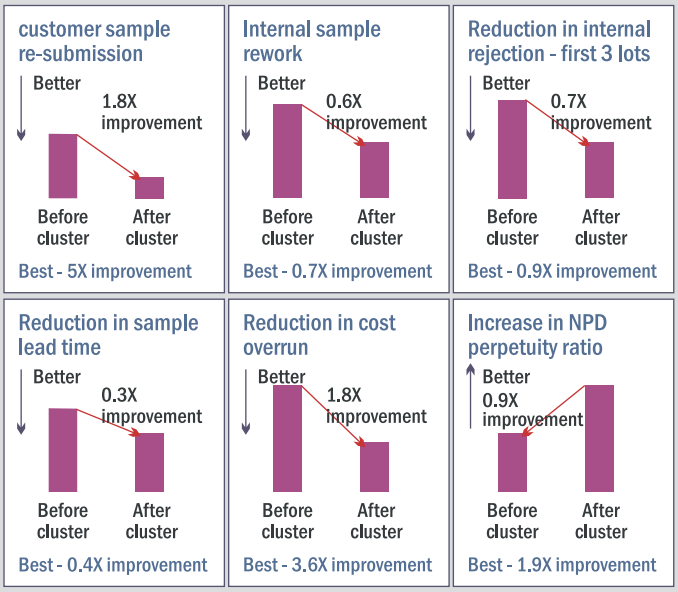
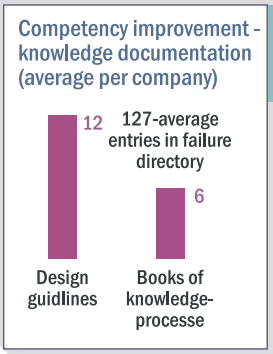


Figure 2.8

Competence development:

The design guidelines and books of knowledge were created by the process design engineers of the respective companies. This was one of the reasons for reduction in rework at sample stage in the journey towards Right First Time.



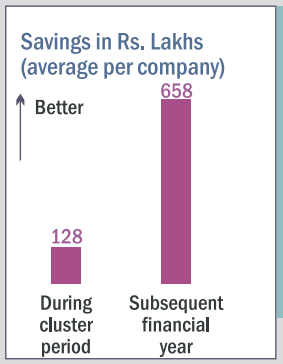
Total Design guidelines created - 74

Total books of knowledge created - 35

Figure 2.9

Business benefits:

To put the savings in perspective, the average savings during cluster period was approximately 0.44% of the current turnover. The average savings during the subsequent year was estimated at approximately 2.3% of the current turnover.



Total saving during cluster period - Rs.770 lakhs

Total saving during next year - Rs.3945 lakhs

Figures were validated by the companies' Finance function

Figure 2.10

Feedback of CEOs of companies:

Mr. Vijayaraghavan, MD, IM Gears

Systematic approach towards New Product Development.
Cross functional approach solved many issues quickly and encouraged team work.
Cost management given the due focus.
Knowledge capturing will be useful in the new projects.

Future:

Apply the lessons learnt in a focussed manner.
New business to bring in more assemblies.
Move from make to print to make to design.
To move from delivering process to product to function.

Mr. Nagaraju Srirama, President, JK Fenner India Ltd

Team work to introduce new parts
Systematic way of launching new parts
First time right
Improvement in business conversion

Future:

To implement this method of NPD process across other businesses
To move up the value chain

Mr. Sabnis, CEO, Menon and Menon Ltd.

Considering the recent expansion, NPD Cluster gave us very good opportunity for learning and refinement
New product development got converted into company wide important activity.
Recognitions was received from four important OEM customers during the period of last one and half years.
Concepts like Right first Time, Standardization, Documentation, Consistency and further improvement in QCD, etc..
New techniques like Frugal Engineering, Reuse and Recycle, QP 1-2-3, Activity based costing etc.

Future:

To create new benchmarks in the various performance parameters in NPD process. Add new business in the field of export and supplies to multinationals. Accomplishment of Company's Vision to be the leader in the field of selected activity.

Mr. Arvind Gupta, Director, Rockman Industries Ltd.

Process roll-out for design & its verification for all key processes.
Process to achieve First Time Right parts (Stage/ Gate wise controls).
Cost reduction and Cost control through project Cost monitoring & Frugal engineering.

Future:

Going forward, New Product Development is the key to the growth of the company, to Rockman. Learning's through ACMA cluster will greatly support us in achieving First Time Right products at the competitive price and reducing product development lead time.

Ms. MaithileeTambolkar, MD, Sanjeev Auto Parts Manufacturing Pvt. Ltd.

We observed Improved effectiveness of CFTs due to well defined roles and responsibilities.
Consolidation of knowledge through experience diaries and design guidelines is going to be one of our most valuable assets.
Focus on Quality during process design and development to achieve 'Right first time'.

Future:

Further reduce lead time of development.
Reduction in rejection at the stage of development
Cost effective development.
Effective use and implementation of QP

Mr. Rajesh Oomen, President, Sundaram Auto Components Ltd.

Response to customer's incremental requirements during the period between initial sample submission to SOP is a key for customer satisfaction and DRM is an effective tool to ensure the same.
System for knowledge accumulation, understanding the gap and actions to bridge the same are key for being competitive, both in technology as well as cost. A robust, yet simple NPD process is must to handle multiple customers and projects.

Future:

Implementation of sustenance plan to retain cluster program gains.
Implementation of cluster initiatives at other plants.
Increase of non-captive business share from 30% to 50%.

The second NPD foundation cluster

The following companies joined the second NPD foundation cluster which commenced in Nov 2017.

1. IP Rings Ltd., Chennai –
   Piston rings and orbital cold forming
2. JK Fenner (India) Ltd., Madurai –
   Automotive and Industrial belts
3. JK Fenner (India) Ltd., Hyderabad –
   Industrial couplings, pulleys, gear boxes
4. Munjal Auto Industries Ltd. Dharuhera, Bawal, Vadodara, Haridwar –
   Two-wheeler exhaust systems
5. ParanjapeAutocast Pvt. Ltd, Satara, Shirwal –
   Cast Iron and aluminium LPDC castings, automotive
6. Sundaram Clayton Ltd, Chennai, Hosur –
   Aluminium HPDC, gravity, LPDC, automotive

Learning from the first cluster and improved roadmap

Following were the key learning from the first cluster:

1. Quality control concepts to be introduced upfront so that companies will benefit from solving issues in new products which are already in initial production.
2. Start the process of competency building early. This will help the build up of a credible failure mode directory.
3. Include all plants in the process
   With this aim, the cluster roadmap was modified as shown. The content of different modules and training materials were also fine-tuned for better understanding.

Roadmap - NPD foundation cluster II

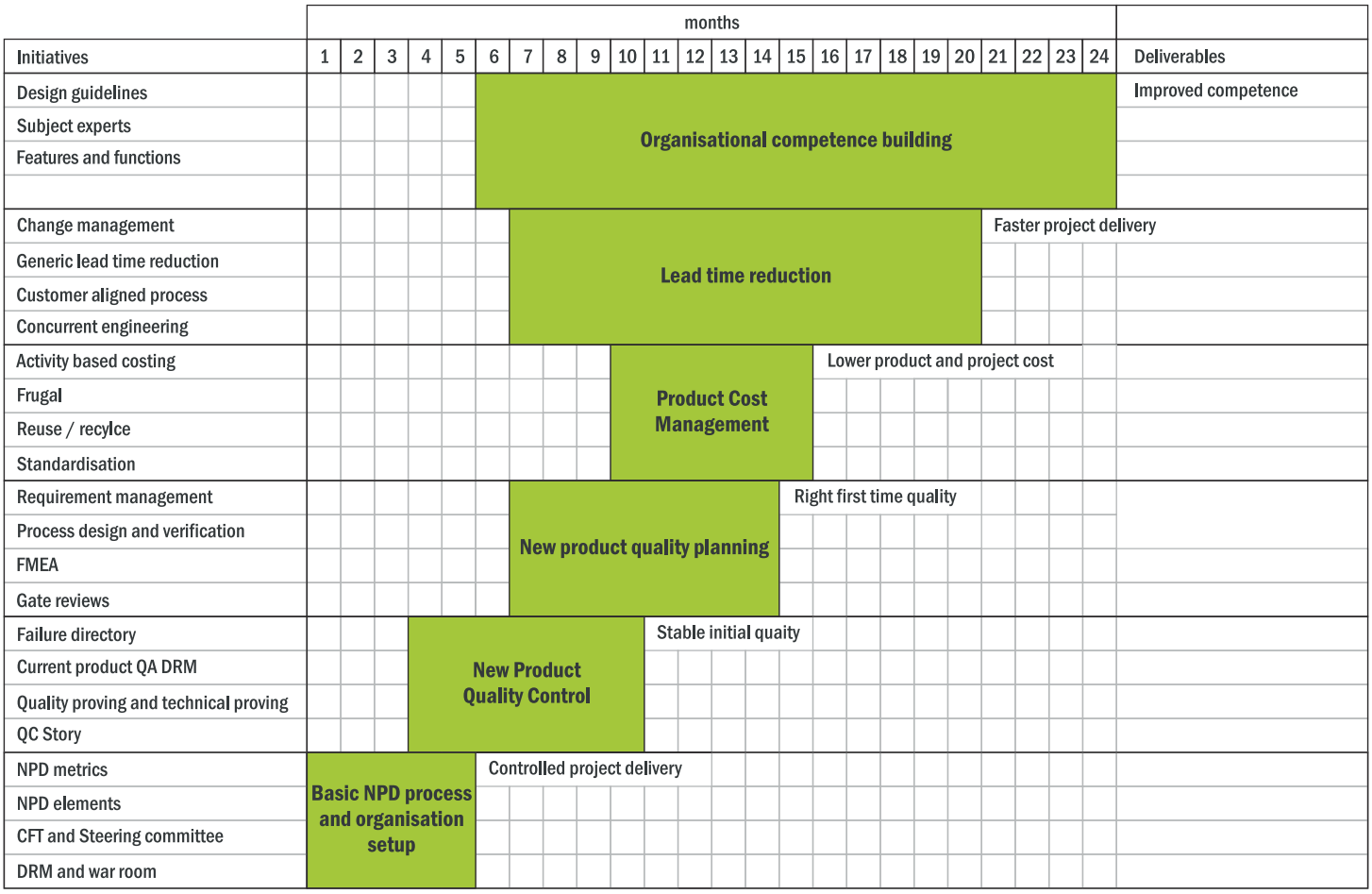


Figure 2.11

NPD foundation cluster II – the results so far

The second NPD foundation cluster has completed 16 months so far. Most of the concepts and tools have already been introduced and practice started. Due to phased nature of concept introductions, the NPD metrics have not matured yet. However, there are many encouraging trends, especially in initial quality of new products in production. Lead time for samples have also improved. Many companies have been able to show breakthrough reduction in lead time for samples.

The focus for first time right at sample stage has improved dramatically. Anecdotal examples of first time right are demonstrated by many companies.

The task for remaining cluster period is to standardise the practices across all applicable projects and rigorously track the metrices.

Some quantified improvements are indicated below.

NPD metric	Average improvement all companies	Best
Initial quality of new products in SOP	0.4 X	0.8 X
Lead time for samples of new products	0.2 X	0.5 X
Lead time for SOP of new products	0.25 X	0.35 X

Besides the above quantified metrics, following are some indicators of improvement so far.

- Failure mode directories with sizeable number of entries building up. These are based on solutions to live problems.
- Many instances of first time right samples due to more rigorous checking of inputs.
- Rigorous application of Requirements management to understand and resolve customer requirements and conflicts.
- Ambitious targets for improving NPD pipeline
- Required design guidelines identified. Most drafts prepared.
- Cost reduction projects through frugal engineering, standardisation and re-use building up.

NPD Design Cluster

NPD Design Cluster objective

New product design and, development clusteris the second part of the high level roadmap developed by ACMA Centre for Technology, for improving design and development capabilities of automotive component manufacturers. Acma centre for technology brings this cluster for companies who have design responsibility. These companies may be first tier suppliers to OEMs or second tier supplier to OEMs.

Whether you develop a component, a sub-system, or full system, the principles of development are the same. However, the challenges are different and complexity is different for each of them. Hence a different approach is required for sub-assembly or full system.

Nearly forty best practices are included and they are covered in four phases. The goals, phases, best practices, deliverables in each phase, and, imperatives of participating companies are outlined in this article.

As you are already aware, the purpose of the cluster program is to improve new product development capabilities of companies that have design responsibility. Customer satisfaction can be ensured only if we develop new products meeting the customer needs. New product development is also necessary for business sustenance. New product development projects have to be delivered on time; the products should have right quality; and target cost should be achieved to retain healthy margin.

Of the three parameters, mentioned before, the most important is new product quality. This is also the most difficult parameter to achieve, at least, during initial production. The current situation is not very motivating in most companies. With new products, internal rejections are high; rejection at customer assembly line is high; and there are warranty issues.

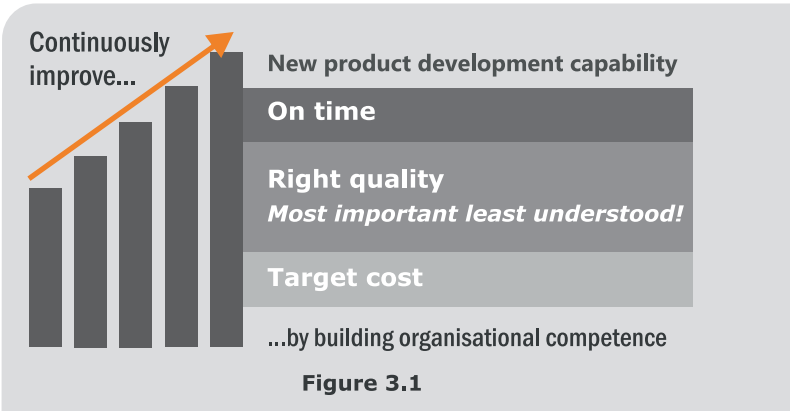


Figure 3.1

Quality – the first priority and Das V Modell

Achieving first time right quality is the need of the hour. Many people talk about, but first time right time quality remains elusive. As you will see a little later, our Cluster program comes with a comprehensive set of tools and best practices to achieve first time right quality.

NPD Cluster program helps participating companies to achieve the improvements in new product development in a progressive way. This will be achieved by building organisational competency internally. This means that the improvement will be sustained even after the cluster intervention. More importantly, companies will continue to improve further. Our aim is not to become just better, but to become global leaders.

The approach that would be followed in the cluster program for assuring quality is described below:

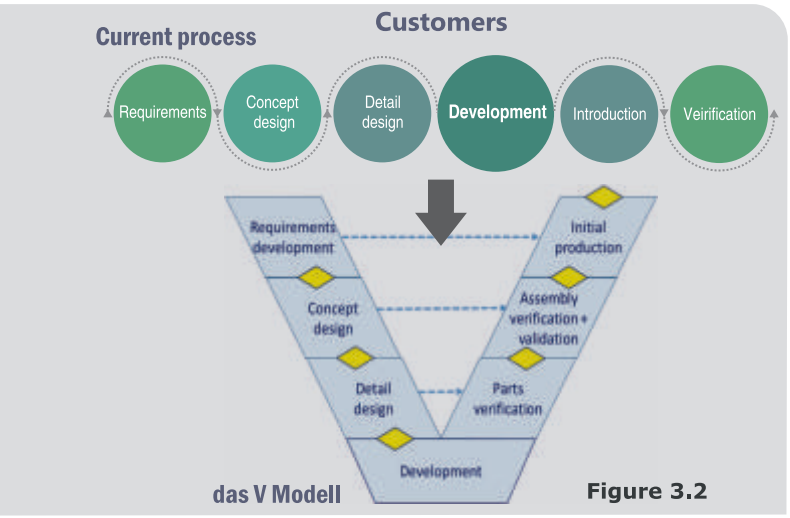


Figure 3.2

Current development process starts with requirements given by the customer and ends with customer receiving the product. Requirements to concept design; concept design to detail design; detail design to development; development to verification; and verification to new product introduction to the customer.

This is being followed by most of the companies and it is logical. However, the current system has two major flaws.

There are no checks at each stage. This means that any mistake committed during early stages will show up very late in the project.

The second flaw is: an important step, validation, is missing. Validation step is a very important filter for issues that would show up during series production.

The ultimate result is, effect of mistakes made in various stages accumulate and show up only during initial production.

Cluster proposes a comprehensive development process with built-in checking at every stage and an explicit validation step. This system is based on the official model of German government for developing systems and products. It is called "Das V Modell".

Left side arm of V is deployment where quality is being assured. In this phase, we strive to prevent mistakes. The bottom is the development. Right arm of V deals with quality control. In this phase we identify the problems and solve them before the product is finally delivered to the customer.

Software developers & system developers have started using this model with high level of success. As usual, mechanical system designers are late in adapting this model, even in Germany! Let us take lead.

The system is not really very different from normal stage gate models. The real advantage of this model is, it tightly links quality control activities with deployment activities as shown in the horizontal arrows.

das V model is developed by German government for complex system development. The picture shows a model customised for assemblies and sub-systems. This is some what simplified and review gates have been added.

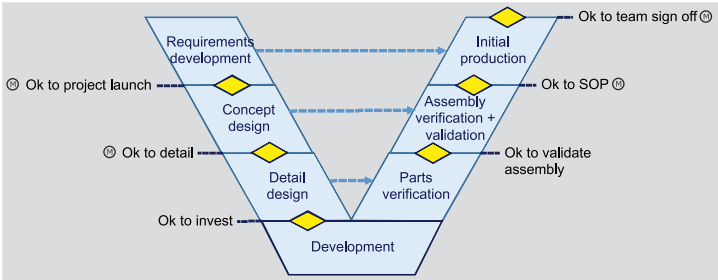


Figure 3.3

In this system, parts have to be verified according to the detail design specifications before they are used to make assembly. The verification could be simple inspection or a full-fledged testing as a part. This is defined by the part level specifications. This ensure that part level mistakes are not carried forward to assembly testing.

Normally, the assemblies are tested according to product specifications in the laboratory and some fitment trials in the vehicle. The proposed process requires that the product should be validated in actual conditions. Actual conditions do not mean only vehicle in use. It also covers entire life cycle, starting from manufacturing in our factories, transporting to vehicle manufacturers factories, assembly in the vehicle line and storage of vehicles before they are delivered to end customers. Validating our products in all these conditions ensures that we have no warranty problems.

In addition, the initial manufacturing quality is good and production ramps up smoothly to reach peak levels.

We have six design review gates ensuring that defects at each phase are not passed on the next phase. Out of six gates, four are management gates. They are: Ok to launch, Ok to invest, Ok to start production and, Ok to team sign off.

In summary, V model is systematic and it rigorously links design and, testing and validation steps.

The cluster intervention is based on three founding principles; Das V modell, the German product development system; Effective Japanese tools; and Indian daily routine management.

Das V Modell tightly links the quality control activities such as verification and validation at different levels with the deployment activities.

The tools used in various steps of this model such as, failure directory, bottle-neck engineering, design reviews, design guidelines, DOE, simulation and accelerated testing have Japanese origin. They are very efficient and effective in preventing problems and solving residual problems.

Three pillars of the cluster intervention - Das V Modell, Efficient Tools and Effective DRM

To assure success, we need a workable daily routine management system. Since Daily routine management is closely linked to culture, it should be suitable for Indian culture. ACMA has developed an Indian daily routine management. This daily routine management has already been tried out in the first cluster with very high degree of success.

New product design and development cluster integrates all these three principles to provide an effective frame work for product development system.

The entire intervention is delivered through the proven act cluster methodology.

NPD Design Cluster Roadmap

Cluster roadmap is based on capability maturity model. The maturity has five levels, namely, Initial, repeatable, defined, managed and, optimizing.

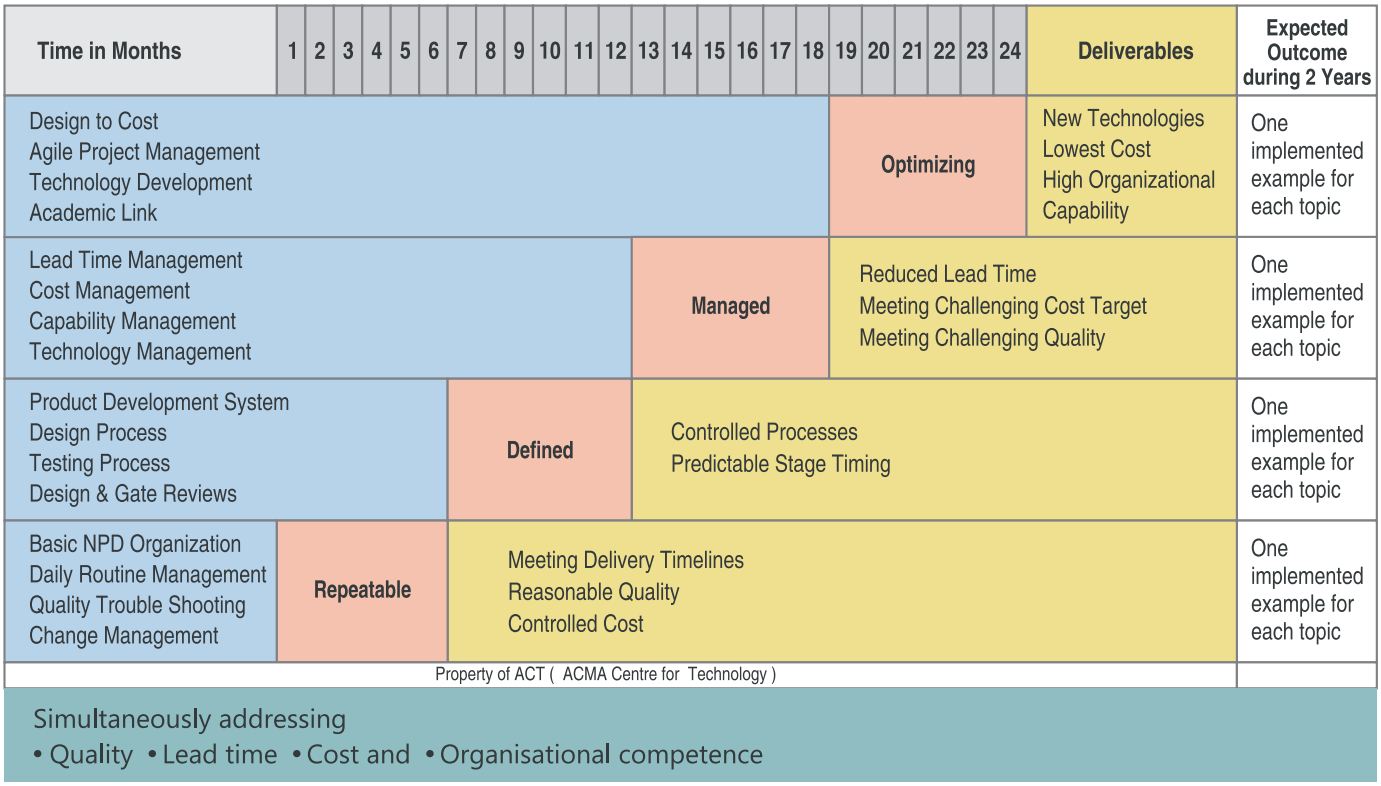


Figure 3.4

In cluster intervention, we address NPD quality, lead time, cost and, organisational competence together from initial to optimizing level progressively.

At the end of repeatable phase, project delivery will be stabilised with reasonable quality and cost levels. This is a very critical phase and it is heavily loaded.

At the end of defined phase, all key processes will be controlled so that project will progress smoothly.

At the end of managed phase, key process indicators will be tracked and improved.

At the end of optimizing phase, processes are optimised including technology management leading to cutting edge products at lowest costs.

Cluster intervention is for a duration of twenty four months. To move from initial level to optimized level in twenty four months is very ambitious target. Normally, it would take from three to five years. The participating companies may not be at the initial level in all the aspects. Each company may at initial level in some aspects, but it may be in advanced levels other aspects. We have to do only gap filling. Hence, the cluster can be completed in twenty four months.

In the eventuality of participating not reaching the required maturity level, Acma centre for technology will consider extending the timeline.

Addressing Quality

New product quality gets the highest priority in our cluster program. In most companies, initial quality of the new products is not good. High internal rejections, line rejections and warranty issues are very usual with new products.

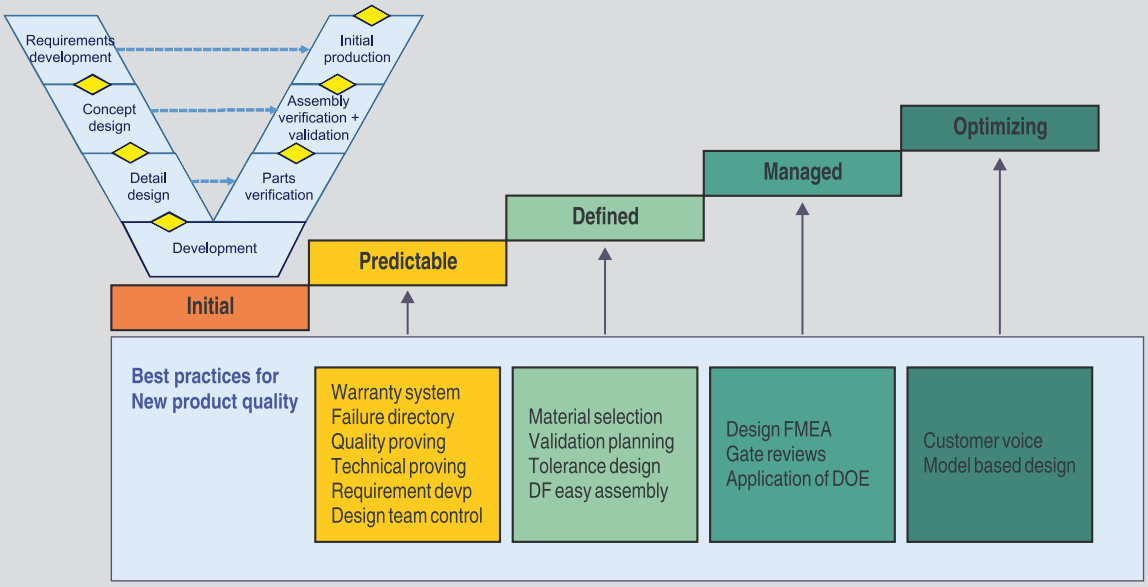


Figure 3.5

Left arm of V model deals with preventing such issues and right arm of V model deals with identifying these issues and solving them. It is more efficient to prevent the issues than solve them later. However, companies have projects at various stages and many of the projects are past development stage. The issues in these projects have to be solved effectively and efficiently so that we come out of firefighting mode. This will give lot of energy to work on the issue prevention.

In addition, solving these issues would help us to build realistic failure directories that are the basis for mistake prevention.

Hence the predictable phase has many best practices for effective and efficient problem solving. Best practices for preventing issues are introduced in later phases.

Since new product quality is urgent for us, many best practices are packed up front. Lot of hard work is required in the predictable phase. However, we will be suitably rewarded.

Addressing Delivery

Addressing new product delivery is nearly as important as new product quality. In the predictable phase, we work on setting up an effective environment for project delivery.

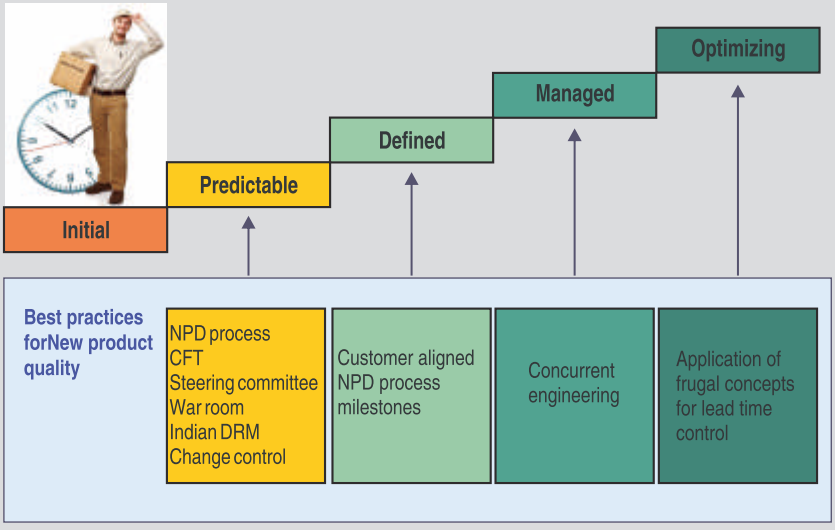


Figure 3.6

The first concept is new product development process. We will review the process for completeness and consistency in the first phase. It will be refined in the later phases.

New product development is best done as a team. We will set up effective cross functional teams for project execution.

A Project steering committee will be set up to assure that cross functional teams get adequate support.

We create a war room to make the projects visible.

It is not usual for NPD projects run smoothly. There will always be some setbacks and delays. To handle this, we set up a daily routine management that is suitable for Indian culture.

There will always be changes – external as well as internal. These changes are far more complex than engineering changes in a running product. We will establish an effective mechanism to track and implement both external and internal changes.

Since all these elements have to work together, they have to be bundled.

As you will agree, these elements put together define the NPD organisation and they have to be established very quickly. Hence, they are included in the predictable phase, which is already heavily loaded.

In subsequent phases, namely, defined, managed and optimizing, we build on these basic elements and make further improvements and refinements.

Addressing cost

We take cost a little bit easy in the beginning.

It is not that cost is not important. Cost is important for us.

Our reasoning is the following. In firefighting mode, delivery takes the highest priority. Sometimes, quality is compromised. Cost is totally neglected. This is natural. Hence our priority is to come out of firefighting mode. Hence delivery and quality is given higher focus in the predictable phase.

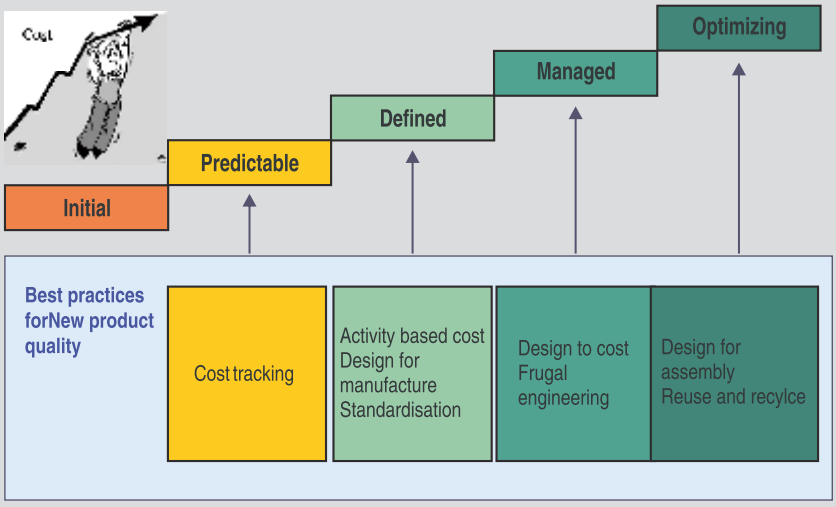


Figure 3.7

Though only quality and delivery are addressed in predictable phase, there is positive side effect for cost. Unnecessary cost increases will be avoided. When we start tracking the cost, we will already notice this.

In subsequent phases, we understand the sources of cost and introduce best practices to control and reduce cost genuinely.

We reduce cost in the most environmentally responsible way.

Addressing competence

NPD Cluster, by itself a competence building exercise. Here we focus specifically on product design competence and technology management.

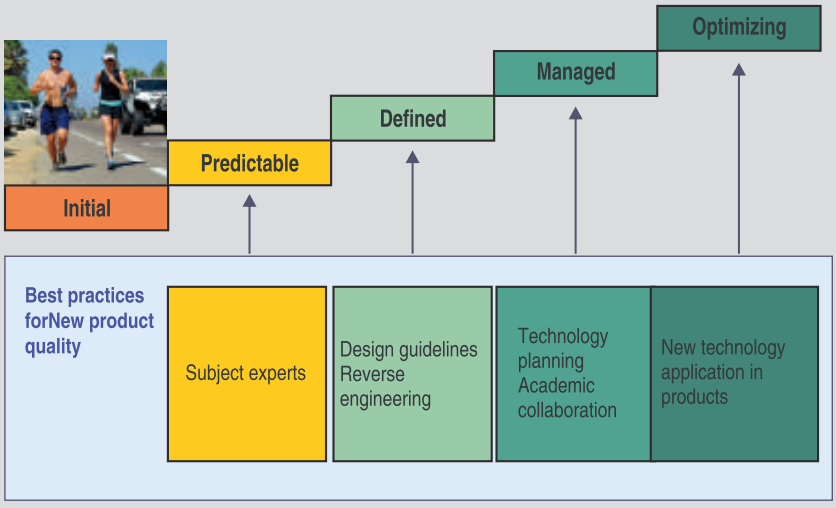


Figure 3.8

The best practices are evenly spread over the entire cluster program.

In predictable phase, we start with creating a culture of knowledge accumulation & celebrate the same. This is done by identifying potential subject experts and motivating them to collect knowledge and write book-of-knowledge.

In defined phase, we organise the knowledge in such a way that it is useful for the designers. We call this as design guidelines.

In addition, we introduce a powerful knowledge building tool, design reverse engineering. Reverse engineering is normally associated with recreation of physical parts and copying.

Design reverse engineering goes beyond recreation of physical parts and helps us to extract underlying design rules.

In managed phase, we introduce tools for planning new technology. Developing technologies on our own is not efficient. We need to involve academic institutions. Hence, we introduce some practices for academic cooperation.

In optimizing phase, we introduce best practices for applying new technologies to our products.

Eventually, we get a competence with which we can design products with new technologies in flawless way.

Intervention strategy

The cluster program, with nearly forty modules of best practices, is a big elephant. We implement them module by module. However, we may combine some modules together and implement them at once. This is necessary because it makes best sense as a bundle. This happens mostly during predictable phase.

Cluster time line is very, very ambitious, but I have a feeling that we might still make it. To make this happen, we will fully exploit the current knowledge levels in the companies. We focus only on the gaps and start from scratch. This is somewhat different from our NPD foundation cluster approach. In our foundation cluster, we had to start almost everything from scratch.

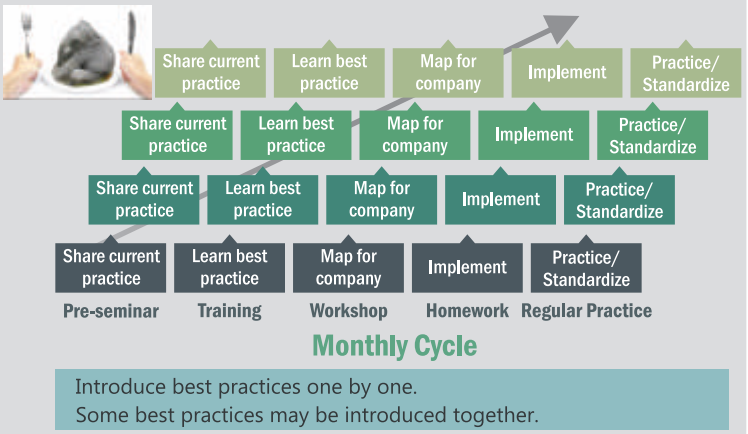


Figure 3.9

Keeping the above in mind, we have a five step approach for introduction of best practices.

Step one is sharing current practice by the companies. This step has two objectives. Firstly, it already leads to some level of cross learning. Secondly and more importantly, it gives us a clear view of the gap. Training program will be tailored to address just the gap. This step is done one month ahead of the training.

Step two is training. We may use companies that are already at a good level as case studies.

Step three is mapping. The concepts are generic and the interventions have to customised for each company. This is done by a workshop during the counsellor visit.

At the end of the workshops, implementation actions to introduce best practice are identified.

Step four is implementation of actions identified in the workshop. This is done as a homework and it has to be completed before the next counsellor visit.

Step five is practice and standardise. This will be monitored through a tracking sheet.

Step two to four runs in a monthly cycle.

High lights of this five-step methodology are:

Exploiting current status & minimissing intervention efforts

Company specific implementation

Effective follow through of implementation.

Imperatives for the participating companies

The imperatives for the participating companies are the following:

A stable promotion office is needed. The office should have a full time champion and he should be directly reporting to CEO. He should have a cross functional team supporting him. The team members need not be full time.

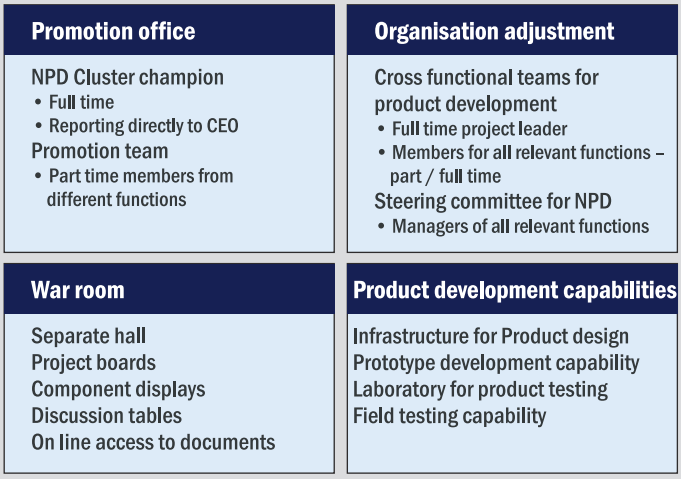


Figure 3.10

The second and most important requirement is the organisation adjustment. New product development requires a fully empowered cross functional team. The teams need full time project leaders and constant members. The members may be full time or part time according to the project load. We need a project steering committee consisting of all relevant functional heads. We want CEOs to stay away from review of project progress review unless issues have been escalated to them. However, CEOs involvement in implementation of best practices is welcome. This organisation adjustment is a mandatory pre-requirement.

We need a war room to make the projects visible.

Since we are focusing on best practices, the participating companies are required to adequate infrastructure for product design, prototyping, laboratory testing and field testing.

This basically means that full commitment of top management is required.

Expected results

New product development cluster aims to completely transform new product development into a companywide business process. The results will be seen as:

Smooth progress of projects with minimum trouble and rarely requiring top management attention. Projects in a true autopilot mode.

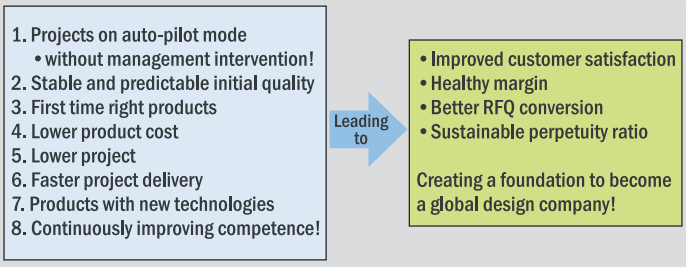


Figure 3.11

High initial rejection and then keep reducing them to an acceptable level will become history. We will have first time right products with table and predictable initial quality.

Rigorous implementation of cost reduction practices makes the product cost lower.

Rework reduction in product development leads to lower project cost.

Rework reduction in product development leads to on time delivery. With additional best practices such as true concurrent engineering reduces lead time further.

Company learns to introduce new technologies in their products as a matter of routine.

All these results will be achieved through comprehensive competence building.

The following are the expected business improvements:

First result is the healthy margin. In the past new products start with a low margin and we take many improvement actions during regular production to reduce cost and achieve a decent margin. With the cluster best practices, we can start with a healthy margin at the time of start of production itself.

Second result that will be seen is improved customer satisfaction. When customer needs a new product, we will get the first call! Share of business will also show a positive trend.

Thirdly, we will see a better RFQ conversion.

All the above put together, the new product sales will reach a healthy level assuring sustainable business.

While designing and developing products for global markets is not explicitly in the scope of this cluster, a strong foundation will be laid to become a global design and development company.

Result of first edition so far:

First edition of NPD Design Cluster was launched in April 2017. Three businesses of Wheels India and Harita Seating Systems are participating in the cluster.

It has been ten months since launch of the cluster. The major modules introduced are:

- Organisation adjustment
- This took some time to clarify true cross functional approach. However, it was successfully introduced.
- Indian DRM
- QC tools such as technical proving and quality proving
- NPD process and gate reviews
- NPD process was made flexible to cover simple configuration projects and complex platform projects.
- Activity leadership

The need for each team member taking leadership for his activities was understood and addressed.

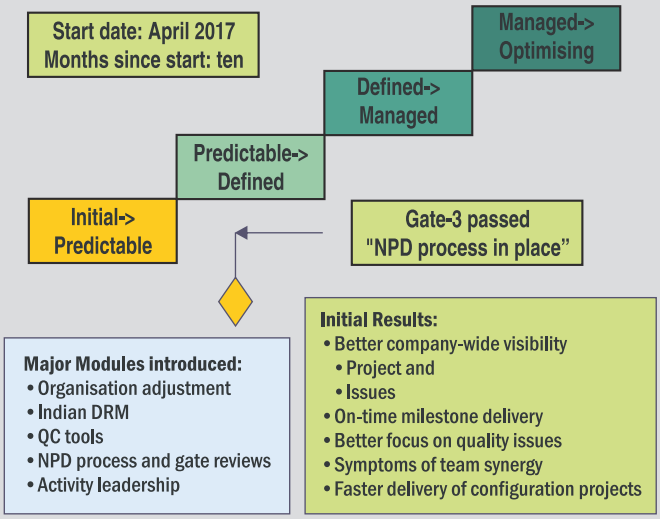


Figure 3.12

The initial results are very motivating. The following are the major improvements seen:

1. Visibility of projects and issues has improved companywide. Thus the organisations were able to resolve the issues on a timely basis.
2. This has led to projects reaching their milestones on time.
3. Quality issues are getting better focus and the failure directories are getting enriched.
4. Team synergy is seen. Activity leadership is taking roots.
5. Speed of delivery of configuration projects have increased significantly.

The cluster is moving in the right direction and it is likely to be completed on time.

Bridge Cluster

The path for a component making company to a design company has four steps.

Figure 4.1

1. Selecting a product range
2. Acquiring necessary technology
3. Acquiring customers and business
4. Developing products

Selecting a product range is a management process.

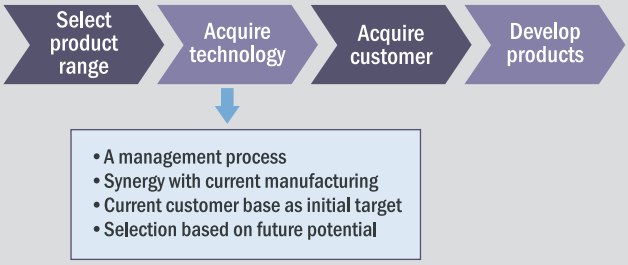


Figure 4.2

Factors to be considered are synergy with current manufacturing, current customer base as initial target and future potential.

Selecting a product range is a management process.

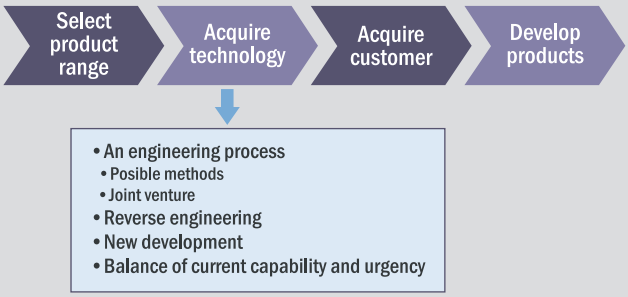


Figure 4.3

There are many methods are there. The following are the ones used most often:

- Joint venture or technical collaboration
- Reverse engineering
- New development through own efforts with the support of external experts

Acquiring customers and business is again a management process.

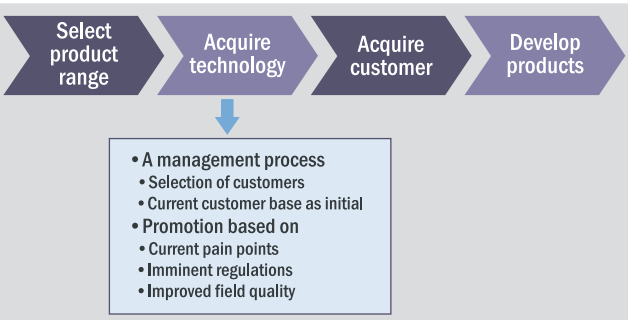


Figure 4.4

We have to select the customers first. Current customer base can be a good starting point.

Promotion has to be based on current pain points, improved field quality and imminent regulations. Promotion based on lower cost does not create a strong interest.

Developing products is again an engineering process.

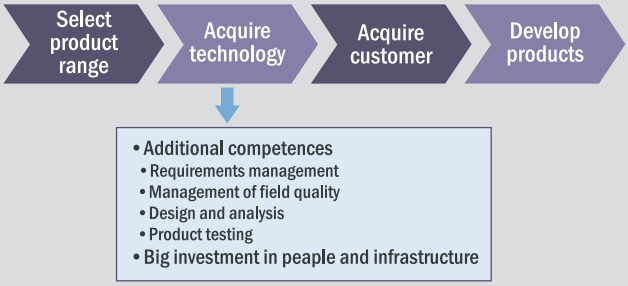


Figure 4.5

Companies that have gone through the foundation has the basic project management capabilities. Additional competences required are:

- Requirement management
- Management of field quality
- Design and analysis
- Product testing

This is a very big investment in terms of people and infrastructure.

Selection of product range and acquiring customers are management processes and companies are expected to do them on their own. Acquiring technology subject will be addressed by technology cluster.

Capability for design and development of products, the fourth step, is the focus of bridge cluster. The cluster will have four phases.

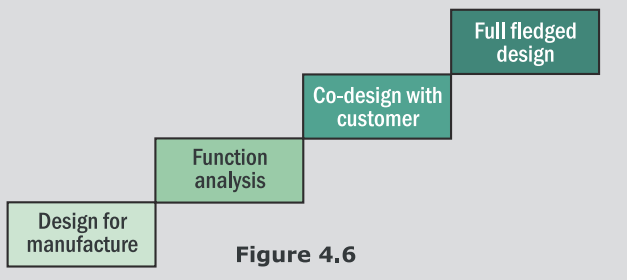


Figure 4.6

Participating in this activity is highly beneficial for OEMs. Many of their routine design work can be transferred to the supplier with improved quality and lower cost. Participation of OEMs simplifies the process for the component companies.

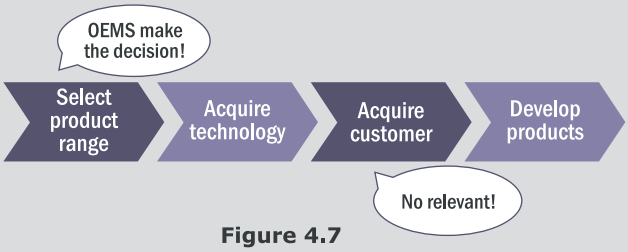


Figure 4.7

When OEMs take the lead, the two management processes are simplified for the component companies. Hence it is highly recommended that OEMs take the lead and select some suppliers to participate in this cluster.

First edition of bridge cluster is planned to be launched by end of 2018.

Technology Cluster

What is technology?

Technology does not necessarily mean high technology. Technology may even mean basic mechanical and electrical concepts. Technology is a means of accomplishing a function and its associated rules. Clarifying the functions to be accomplished and the underlying physical principles are the key.

Technology can be acquired through joint venture, technical collaboration, reverse engineering, own development or a combination of the above.

Technology cluster roadmap

Technology cluster roadmap will have five phases:

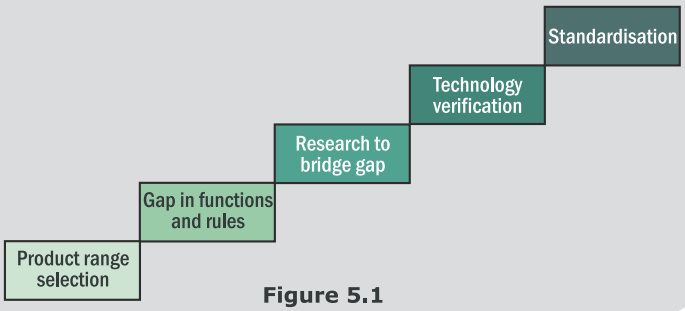


Figure 5.1

In product range selection phase, we cover the basic subjects and select a product range.

In the second phase, we analyse our current knowledge level regarding functions and the rules to accomplish the functions.

In the third phase, we conduct research activities such as Design of Experiments and Simulation to bridge the knowledge gap.

In the fourth phase, we verify the technology by building concept prototypes and testing the same.

Finally, we standardizing our learning through book of knowledge and design guidelines.

In all the other clusters, we focus on processes and we do not have model project. In this cluster, the outcome will be a model project. Companies will have to apply the learning through this model project to other product ranges.

Curriculum

The major subjects that will be covered are:

- Purposeful technical participation in joint venture
- Manufacturing and design reverse engineering
- Research methodologies – literature survey, Design of Experiments, Simulation and so on
- Effective co-operation with educational institutes
- Management of intellectual property

Technology cluster is planned to be launched in the beginning of 2019.

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HERO-MOTOCORP SUPPLIER EXCELLENCE PROGRAM

Since its inception ACMA has been the torch bearer for the Indian auto component Industry. It has represented the industry on various platforms and have made it a point to both cater and understand the pain areas starting from Tier 1 to Tier 2, 3 & 4 with respect to the ever changing and evolving requirements of the OEMs.

ACMA Centre for Technology (ACT) was formed in 1989 with a mandate to provide technical support and services to auto component industry to help them adopt global best practices. ACT has successfully established world-class shop-floor practices through cluster programmes, in over 1000 auto component manufacturing plants. The cluster-based deployment is an integrated and holistic approach, wherein a group of companies work together for overall excellence in their business practices. This is achieved through mutual learning and sharing. Today this approach has proved to be an effective and successful tool for upgradation of industry all over the country in a cost-effective manner.

In September '2017 ACMA joined hands with world's two-wheeler giant Hero Moto Corp Limited (HMCL), to upgrade its supplier base and Hero Supplier Excellence Program took shape.

Starting its journey as a bicycle manufacturer and establishing itself as the largest manufacturer of two wheelers in the world, the Hero Group has certainly come a long way. With four manufacturing plants across India, it is enhancing mobility for masses and empowering India with its two wheelers.

With a mission to focus on value creation and build enduring relationship with its supply chain partners, HMCL embarked on a path to upgrade their suppliers, consisting of tier-1 and tier-2 units. In this knowledge sharing journey, HMCL management entrusted ACMA centre for technology with the task of helping the supplier units to upgrade their knowledge base and change their mindset as per the need of modern manufacturing practices.

In the pilot batch, HMCL selected 52 companies from its supplier base, to take them through the improvement journey. After multiple discussions with HMCL officials to understand their requirements, ACMA designed a customised one-year improvement program for HMCL suppliers. The main topics of this roadmap are:

• Creation of Clean company by 1S & 2S activity and by removing waste throughout the plants, to establish a visual factory.

• Employee involvement in all improvement activities namely – suggestion schemes, Quality Circles, Kaizens and Safety drives.

• Quality improvement by setting standards of incoming materials, process parameters, and PDI. Recording and analysing customer complaints and also setting standards for internal audits and vendor audits.

• Production planning and control as per customer schedule, regular production monitoring and analysing the variance in hourly production.

• Delivery improvement by introduction of preventive maintenance, die – tools maintenance and SMED.

• Sustenance through periodic audits and monitoring PQCDSM parameters on regular basis.

The 52 participating companies were divided into 6 clusters based on the geography and product lines – 3 clusters in NCR, 1 cluster in Ludhiana and 2 clusters in Haridwar. Under the guidance of ACT's Head cluster program, ACMA formed a team consisting one Mentor and six counsellors with a cumulative industry experience of more than 125 years, for transforming the supplier companies.

On 11th September 2017, HMCL organised a mega launch of Hero Supplier Excellence Program (HSEP) at Gurgaon in the presence of top management of HMCL, top officials from ACMA and team members from ACMA, HMCL and selected supply chain partners. With this mega launch a unique three-way partnership began.

Immediately afterwards, ACMA counsellors started visiting the cluster companies. The interaction of counsellors with the cluster company's team members started a learning experience for all team members. The bi-monthly review meetings also helped immensely as it gave them an opportunity to learn from other companies in their cluster.

Improvement in plant after 1S, 2S activity is carried out, 1250 sq. meter of area saved in outskirts for new business

ACMA organised model plant visits to Munjal Auto Industries Ltd, Chopra Industries, Meenakshi Polymers and Sterling Tools. These visits helped the cluster companies understand the concepts better through witnessing the various implemented practices. Within weeks, the results started showing in all the companies.

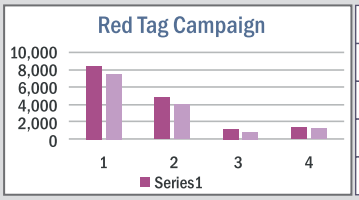
According to the pre-decided schedule, HMCL organised a joint management review of the supplier excellence program in Feb'18 at Gurgaon. The review was attended by high ranking officials from HMCL and ACMA. All 52 companies were divided into following four groups according to their product lines:

· Frame assembly
· Casting
· Sheet metal
· Denso and allied products

The overall improvements made by the participating companies are as follows:

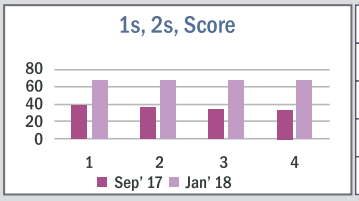
group of companies	red tag campaign	1S & 2S score	rework reduction	delivery improvement	savings in lacs rupees
frame assembly	89%	63%	16%	97%	11.16
sheet metal parts	83%	71%	30%	97%	7.43
casting companies	78%	77%	14%	95%	7.18
denso & allied products	91%	97%	19%	98%	20.18

· In red tag campaign, minimum 78% and maximum 91% of red tags raised, were completed.



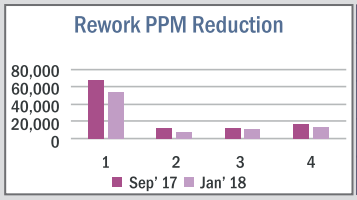
RED TAG CAMPAIGN	
frame assembly	89%
sheet metal parts	83%
casting companies	78%
denso & allied products	91%

· In 1S & 2S activity, minimum 63% and maximum 97% improvements were made.



1S & 2S SCORE	
frame assembly	63%
sheet metal parts	71%
casting companies	77%
denso & allied products	97%

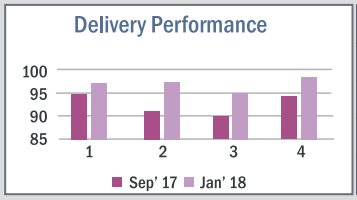
· In rework reduction, a maximum 0f 30 % reduction in rework was observed.



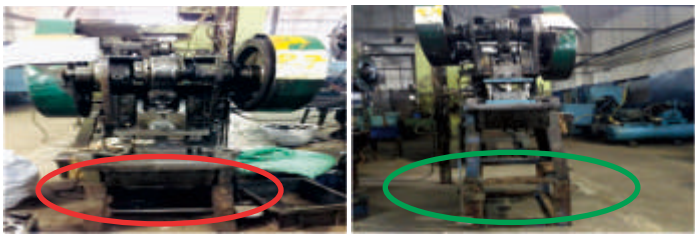
REWORK REDUCTION	
frame assembly	16%
sheet metal parts	30%
casting companies	14%
denso & allied products	19%

Quality improvement: Jig basket used for vertical washing of seat pipes, reducing metal to metal contact

• The delivery performance of all groups has also improved.

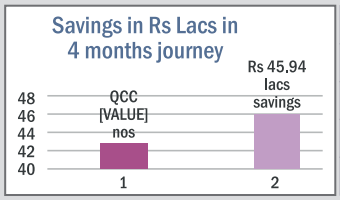


DELIVERY IMPROVEMENT	
frame assembly	97%
sheet metal parts	97%
casting companies	95%
denso & allied products	98%



Efficiency improvement: increasing the height of machine, improved working efficiency.

• Rupees 45.94 lacs of cumulative savings was done by 52 companies.



SAVINGS IN LACS RUPEES	
frame assembly	11.16
sheet metal parts	7.43
casting companies	7.18
denso & allied products	20.18

Energy Savings by Improving lux level from 100 to 200 by usage of sunlight.

HMCL officials encouraged the participating companies, advised them that will-power and commitment are keys to success along with this new way of learning from the other companies, in the same cluster. They expressed satisfaction by the improvements made by the companies.

ACMA officials applauded the HMCL management for the initiative taken by them for the upgradation of its supplier companies. They also praised the companies for all the hard work done in a short span of three months.

With the commitment of participating companies' teams, experience and guidance of ACMA counsellors and support of HMCL management, the HERO SUPPLIER EXCELLENCE PROGRAM will be a successful venture for all.

The HERO SUPPLIER EXCELLECNE PROGRAM, is headed by **Mr. V. K. Sharma, Head Cluster Program.** The program is running under the mentorship of **Mr. Sushil Sharma, Expert Cluster Program.**

V. K. Sharma
Head Cluster Program

Sushil Sharma
Mentor, HSEP Program

List of companies participating in this program.

Dinesh Rana
Counsellor

Cluster 1 HARIDWAR
Satyam Auto Components Pvt. Ltd
Sunmax Auto Engineering Pvt. Ltd
Neel Metal Product Ltd.
Lifelong India Ltd.
Hema Engineering Industries Ltd.
Micro turners
Bhagwan Precision
Munjal Showa

Mahavir Singh
Expert
ACT Cluster Program

Cluster 2 LUDHIANA
Suraj Udyog Ludhiana
Nicks Auto Industries Pvt Ltd
Highway Industries (Unit-1)
Metalmatic
SD Engineers
Munjal Casting
Aastha Autotech Pvt. Ltd.
Imperial Engineers (Auto) Pvt. Ltd.
BallKing
Suraj Autocomponent

Tanu Ahuja
Counsellor

Cluster 3 NCR
ADI Automotive Pvt. Ltd., Binola
Hema Engineering Industries Ltd
Jayashree Polymers Pvt. Ltd
Helical Springs
Roop Polymers Ltd (UNIT 7)
Sonakshi Industries Private Ltd
Neel Auto Pvt Ltd
Mahavir Die Casters Pvt Ltd., Fbd
Hema, Gurgaon
Hema, Neemrana

Mahesh Gupta
Sr. Counsellor

Cluster 4 NCR
Prime India Polymix P Ltd
Aree Cee
Varun Precision Components
VNM Polymers Pvt. Ltd
Karan Auto - Unit 2
Balaji Tech
Antech Engineers Pvt Ltd
Jay Cee
SM Auto Precision
Punch Ratna Fasteners Pvt. Ltd.
Saket Fabs. P Ltd
Blowell Auto Pvt. Ltd

Atul Gupta
Sr. Counsellor

Cluster 5 NCR
Em Vee Auto Pvt ltd Bhiwadi
B.R .Seth Associates
Alfa Cotec Industries
Vishwakarma engineers
Qualitech Sheet Turned Comp.
Kirat Plastics Pvt. Ltd
Pushti Metals

D. K. Sharma
Expert ACT Cluster Program

Cluster 6 Haridwar
Amar Auto Tech Pvt Ltd.
Advance Industries
M/s M & M Machine Crafts Pvt. Ltd.
Kirat International

ZERO DEFECT AND ZERO EFFECT APPROACH

C. Narasimhan, Chief Mentor ACT

Zero Defect & Zero Effect:

Whenever we talk about Zero Defect (ZD) what strikes in our mind is about, parts & products produced, without any defects. Going further we think that achieving absolute zero defect is not possible and so we tend to accept some defect which we call negligible, that we measure in terms of Parts per Million (PPM).

In current paradigm, all of us assume and accept that small amounts of defects will be here and there and that when detected and corrected becomes a zero defect. This is evident from the way we review quality in terms of PPM, Repairs, Rectifications, Rework, Recalls etc. For examples we write slogans "Achieve 50 PPM quality", and display all over, which means produce poor quality, rectify- repairs defects and then make it ok. We therefore employee people to work on, Repair, Rectify, Recount, Recheck, deburr etc.

It is the time to shift next paradigm:

We need to change from accepting defects to not at product defects, with winning or zero tolerance attitude and mind set.

We should look at beyond part & products ZD which is output but look at all activities performed in the entire chain, throughout business process, with the involvement of the people across the organization. Unless all elements of activities in the chain made to perform flawless, error free, mistake free, right from design, procurement, production, transport and dispatch to end user, we cannot achieve ZD parts and products.

Appropriate education, training, skill development, is most important and key to achieve ZD because people alone can change for ZD culture.

Achieving ZD is cluster transformation. Management of ZD is to implement and institutionalize ZD Culture Company wide. ZD is not a tool or technique but a cultural issue involving people's mind set change.

Now let us start understanding more about ZD. What is ZD? Who is recipient of ZD? And who is giver of ZD? ZD denotes use of products and services. Which means quality of products and services fit for intended use by a user. Fit for use is determined and assessed by only the user called 'The Customer'. Person uses the product delivered and decides by experience, free from any defects what so ever, ease of operation, satisfactory performance, no irritation, user friendly operation, no complaint at all in working conditions etc. Such a product is called ZD products and certified by the customer. ZD products performs so, till the intended life.

Who then the giver of ZD for use by the customer. As mentioned earlier, ZD product is the outcome or output or result of various previous processes carried out. Unless the processes are ok, flawless and robust the resultant product cannot be ZD. Processes contains a set of operations and the operations in turn contains a set of activities to compete the operation. Number of elemental sub activities are carried out to complete the main activity. In this way hundreds of activities are carried out in the entire chain till the product is ready for tests.

Let us understand ZD production system in this way---- output of a sub activities goes as input for the main activity. Output of a main activity goes out as input for the operation. Output of an operation goes as input for the process. Output of a process goes as input for product assembly. Output of product assembly goes out as ZD product. The result of input and output has got to be ZD to achieve ZD product.

In this new set, up every activity performer is the Giver of ZD output. Person is called Supplier. Every next activity performer is the receiver of the ZD input. Person is called the internal customer. Thus, every activity performer plays a dual role of supplier giving ZD and also the role of customer receiving ZD. There is a series of interaction and communication taking place between supplier of ZD and customer getting ZD daily across the entire chain till the last activity performer reaches the ultimate end user customer.

It is difficult for everyone to get to see the ultimate end user customer. But all of us understand need of the end user customer through internal chains of supplier and customer teaming together. For most of us engaged in the ZD performance, who then is our customer? Redefining customer is "A customer is one with whom we see and interact daily". Such a person is our customer, we need to give ZD parts / products to him. Everyone role in company is fulfilled by accepting who the customer is, by giving ZD parts / products to him.

How do we review and measure performance of ZD quality?

First of all, we need to move away from our traditional review and measures such as ppm quality, defects in ppm, rework percentage, internal recall data etc.

New review format to be uses (see attached), some of the new measures are:

VAPCO (ratio of Value added to personnel cost); First time pass, Process quality & consistency, Zero dents & damages, Parts handling, storage & transportation quality, product design quality, Tool design quality, skill level quality of activity performers, rate of Q by Plants and equipment. Now let us look at the resources employed to achieve ZD. How to address and use these resources gainfully. These are:

Men- The most important of all resource employed in manufacturing to build ZD culture. Men alone can think and act. They have to be adequately skilled to perform the activities to produce ZD. So, what is the skill and how to develop the skill necessary to perform the activities at all levels in the company, first of all, all employees, must have / possess education and knowledge of the work to be performed. The knowledge has to be used in practice while working. Knowledge gained and not practiced at work is wasted knowledge, not useful for ZD. Therefore, knowledge when practiced gets developed into skill at work. When we say a person is skilled means such a person is knowledgeable to perform activities assigned to achiever ZD. Skill is a factor promoting and practicing ZD culture.

There is misconception that skill is linked to particular trade or vocation e.g. welder, fitter, painter etc. which is not the case. Similarly, skilled person means using manpower and mussel power e.g. craftsman, XXXX and painter etc which is again not the case. In the next paradigm, skilled manpower is highly knowledgeable, can think and act for continuous improvement, innovation to produce ZD. He performs the operation totally deskilled and effortless, leaving manpower/ mussel power to plant & equipment and other devices to do the job.

Machines- With the advancement in machine tools technology, machines are capable of performing operations repeatedly, accurately and consistently on programmed set pattern. This kind of machine performance is required to assist production of ZD. To ensure such an operation of machine, we need to implement predictive maintenance. Due to lack of predictive maintenance, machine break down, loses consistency, affects quality, and ultimately fails to produce ZD. Skilled maintenance personal are to be employed in managing and standardizing predictive maintenance procedures. Robust system of predictive maintenance is another factor for building ZD culture in the company. Installing Lean machines or plants and equipment facilitate easy of predictive maintenance, for trouble free, defect free, safe operation of machines without any abnormalities. These days machines are equipped with built in features & devices such as poka yoke, adaptive control, to prevent any defects during operations. With the deployment of smart production / maintenance engineers such devices can be innovated, self-made and rectified within the company. This would enable building confidence, competence within the company for better and efficient management and maintenance of machines.

Methods- We should consider method engineering (methods of production) as a resource in management of ZD. Process engineering, production engineering and tool engineering forms parts of method production. To achieve ZD processes are to be robust, flawless and quality proved. This is yet another factor, in building ZD culture in the company. As mentioned earlier ZD product is the result and outcome of processes carried out through set of operations and activities. Unless output of all operations and activities are achieved ZD, the end product that goes to the end user customer cannot be ZD. Many design tools and software's such as CAD, CAM etc are available and use of such design tools to enable implementation of well-engineered and proven process in production. There are some of the must be engineering practices followed in companies with ZD culture.

Good performance of machines alone is not good enough for production of ZD parts and components. This is to be well supported by use of good tooling's such as jigs, fixtures, tools, tool holders etc. Combination of process engineering and tool engineering alone succeed in optimizing. Machine efficiency and effectiveness, current jigs, fixtures and tools are outlived design and not suitable for ZD production of parts and products. We need next generation of design with innovation in tool engineering. New skill sets are to be developed, with tool designers and tool manufacturing engineers. These to be in housed and developed to build competent tool engineers and will also facilitates developing skills amongst future recruits in the company.

Materials/Part Handling- Besides above initiative mentioned, there are some weaknesses in the production system affecting ZD. They are part storage, handling, transportation and transshipment during the process of production. Traditional these activities and operations are considered unimportant and treated casually. When we produce parts and components with almost care, well-engineered and achieve ZD. However, these ZD parts becomes defective parts by the time they are assembled into finished products. This happens mainly due to poor handling, storage or transportation. We do not have good engineering solution to parts handling activities and there is lack of focus and resources employed. In this area careful part handling activities is a factor for achieving zero defect, which at present ignored in most companies.

When part gets its birth from raw material, to the very first operation it must be treated like single item. Parts have to handle individually without touching to each other throughout the process until the assembly into main

product. Similarly, they have to store, transported individually basically in a container, without subjecting to dents, damages or scratches. This way it is possible to achieve zero dents and damages to parts. As mentioned earlier that unless all parts are made and delivered to assembly of final product as ZD parts then the final end product cannot be a ZD product.

Measurement of ZD- What is focused gets done, similarly what is measured improves. In the current state, we continue to use GO / No Go gauges for measurement. In this method the assumption is, what is produced is suspect quality. We therefore use gauges to segregate good ones with bad ones. From this method it is clear we do not product ZD. By this method it is judgmental and subjective assessment of quality. Based on this, concrete and clear action plans cannot be developed to achieve ZD. As mentioned earlier, unless all activities performed with ZD, final product cannot be ZD.

This included design (Product) activity. Design specs and dimensions are the reference points for production of ZD parts and products. Therefore, all measurements carried should be confirm to design specs and dimensions. All measurement should be carried out with appropriate precision measuring instruments, with actual and absolute readings. This is another factor for moving towards ZD culture. All readings and measurements to be compared with design data only. We should move away from traditional gauges and appropriate methods to absolute measurement methods.

Summary - To institutionalize ZD culture in manufacturing, following are the key factors-

We shall shift to the next paradigm that address all issues connected with ZD. Management of ZD supports establishment of ZD culture within the entire organization.

Skilling the manpower (all) in the company, with deskilled operation needed to facilitate, all to think and act on quality improvement.

Product design is the reference point, which address fit for use by the customer.

Parts handling, storage and movement, to be well engineered, to achieve zero dents and damages.

Redefining methods engineering (Method of production), which will cover all aspects of tool engineering, process engineering, production engineering, parts logistics engineering, packing, packaging and shelf appeal design engineering.

Importance of predictive maintenance of all plant and equipment, to be understood and acted upon.

To give fit for use parts and products to the next operation and carry this throughout entire supply chain.

For each improvement, we need a structured and proven path (Road map) and ACMA Centre for Technology is one of the preferred name for Operational Excellence.

Formula to achieve ZED

Conviction from the CEO of the company

Commitment from all functional heads and Managers

Involvement of all supervisors in the shop floor

Participation from all the operators in the shop floor

Dinesh Vedpathak, Head-ACT

ACT's ZED Cluster Approach: A unique one

ACT's ZED cluster approach is unique as it uses a totally new approach with New sets of techniques and tools, developed by ACT and successfully implemented in 6 plants from its 1st ACT ZED Cluster (Period 2015 to 2017) and you can witness through its achievements which are shared here.

ACT is now driving its 2nd ZED Cluster (Period 2016 to 2018) and launched its 3rd and 4th ZED Cluster from Jan 2018. Shortly ACT is launching its 5th and 6th ZED Cluster (Period 2018 to 2020) and many more companies are enrolling this program.

Road map used for ACT's ZED Cluster program is given here (which is refined over years based on inputs / learnings from previous clusters)

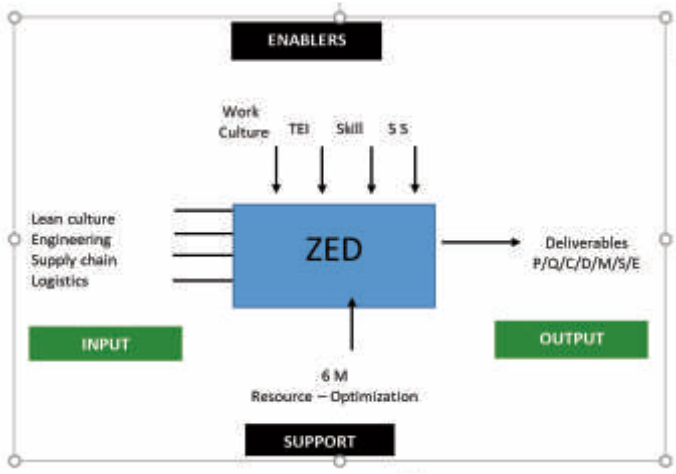
Time in Months (1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24)			Deliverables	Culture	Expected Outcome during two years
1. Concept of Real time manufacturing 2. Digital stream mapping 3. Data capturing (Manual / Auto)	Introduction to Digitisation cluster		Building awareness	Embracing digital culture	One implemented example of real time manufacturing
1. Horizontal Deployment plans 2. Holding gains (Audits) 3. Training Manuals	Holding Gains	Driving ZED model across plant		Sustenance Culture	Supporting company for developing horizontal deployment plan
1. Customer Requirement Validation 2. Capturing implicit & explicit customer requirements 3. CTC & CTQ for ZDQ 4. Operation standards for ZDQ	Delivering Zero Defect Quality	Matching customer needs Customer satisfaction % of Controlled ZDQ Process parameters ZDQ operators		Customer first Culture	One implemented example of each topic on one business line
1. New QA and QC for ZDQ 2. Concept of 100% inspection 3. Quality Proving 4. LCA , Poka-yoke & concept of Zero Rework 5. Parts Handling 6. Creation of learning centre	Develop Employee Skill	Role clarity for sustenance & Improvement of Quality % of Zero Rework/ Repair/ Rectify Processes % RFT % of deskilled operations % of Dent and damage free processes ZDQ training		Learning Culture	One implemented example of each topic on one business line
1, Five Tatvas : Reducing waste 2. Carbon Footprint 3. Waste Management and Control	Zero Effect	Cost reduction Carbon Footprint Reduction Conducive Work Environment		Zero Effect Culture	One implemented example of each topic on one business line
1. Travelling Trend Charts 2. DRVME sheet 3. PERT chart , Master PERT chart 4. Operation Stream Mapping (AGIP) 5. Star Diagram for Quality	ZED Tools	Continuous monitoring % Defects killed On time action completion % Defects passed to next stage Trans-shipment reduction		Systematic work Culture	One implemented example of each topic on one business line
1. ZED Model & Approach 2. Capturing all defects in one business stream 3. Quality war room 4. End of line rejection 5. Error vs Defect	Introduction to ZED	Understanding ZED Defects list Performance at a glance Reduction in Customer complaints / Inhouse rejection / Incoming rejection Clarity of concept		Zero Defect Culture	Creation of Quality war room
1. Safety 2. Must be Facilities Implementation 2.1 Checklist for Must be Facilities 2.2 Undesirable practices 2.3 Undesirable Habits 3. Abnormality mapping through 5-senses 4. Abnormality free machines / work-stations	Keep House in Order - Organise	Safe work environment Joyful workplace Must be facilities score Undesirable practices score Undesirable habits score Employee involvement Machine 1 - S score		Discipline Culture	One implemented example of each topic on one business line

ACT - ZERO DEFECT & ZERO EFFECT CLUSTER (ZED) ROADMAP

Application form for ACT ZED Cluster

Sr.No.	Subject	Description	Status of availability / Practice		Remarks
			Yes (1)	No (0)	
1	Practices of 5s	Documented system Available			
		Training system to all in place			
		Audit / Corrective Actions systems in place			
		Over all 5 S score > 75 %			
		Practices of 5s , Kaizen done across plant			
		Sub Score	0		0
2	Must be facilities - Current situation	Clean toilets - available			
		Clean change room- available			
		Clean dining hall-available			
		Clean kitchen-available			
		Clean dispensary-available			
		Clean training room -available			
		Clean drinking water facility -available			
		Sub Score	0		0
3	TEI activities	Kaizen system - Monitored			
		Suggestion system- Monitored			
		QCC- Practice & Documentation in place			
		SGIA-Practice & Documentation in place			
		Task Force Teams - Working & Documentation in place			
		Sub Score	0		0
4	Quality assurance system - Practices	Documented system available			
		SOP - Practice - Adherence			
		Calibration system - Practice - Adherence			
		Quality review -trends reviewed			
		Quality audits- Verification done regularly			
		Supplier QA system - Practice in place			
		Packing and packaging quality at FG monitored regularly			
		Packing and packaging quality for incoming material monitored regular			
		Handling - transportation - storage quality			
		Customer quality management - Regular review and actions in place			
		Sub Score	0		0
5	Inventory management system	Management of quality of inventory- ed, Grey & Green, mapping done regularly			
		Scrap yard management in place			
		Periodic physical verification of inventory done			
		Reviews - Inventory turns or No of days inventory done regularly			
		Racks - Present racks max height is 5 feet or No racks are used			
		Fork lift usage for inventory - No forklifts used on shop floor			
		Size of containers - Box pallets , small containers			
		Supplier JIT delivery system in place			
		No of storage points other than stores are 2 per cell / Line			
		Sub Score	0		0
6	Flow manufacturing	Single piece flow production practiced			
		Practice of SMED for all bottlenecks in place			
		Multi machine operations are in place			
		De-skill operation index is > 50			
		Practice of LCA use - across plant			
		Practice of Poka Yokes across plant			
		Practice of line balancing across plant			
		Practice of TPM - Step 0,1,2 and 3 across plant			
		Tool engineering - design & mfg capability with company			
		Sub Score	0		0
7	Visual Control Systems	Kaizen gallery available & updated			
		DWM Boards available and updated			
		Availability of Pictorial SOPs			
		Use of Colour standard for facilities as per standard			
		Sub Score	0		0
8	Management Systems - Discipline	Practice of Daily work management is there			
		Monthly reviews - Regular reviews conducted			
		Employee career development plan in place and practiced			
		Employee rewards			
		Communication done regularly to all employees			
		Customer Visits & Connectivity			
		Certifications - TS / ISO / OSHAS or any other (Mention in remarks) are received			
		Sub Score	0		0
9	NPD - NPI	Systems and Manuals - Processes			
		Organization- Manning for NPD is in place			
		Testing facility - Validation facilities available			
		NPD - Quality			
		Sub Score	0		0
10	Greening initiatives in Manufacturing	Energy efficiency measured			
		All types of Oil are recycled			
		Compressor air not sed across plant			
		Pollution free / Noise free/ Good Ventilation working in place across plant			
		Green processes in Manufacturing available			
		6 M resources Management practiced			
		Sub Score	0		0
11	Supplier management	Quality management in place		0	
		5 S practices at Supplier End		0	
		Delivery management in place		0	
		Supplier Visits and connectivity available		0	
		Cost management practiced regularly			
		Sub Score	0		0
		Total Score	0		
		% Total Score	0		

ACT's ZED Model designed by CN



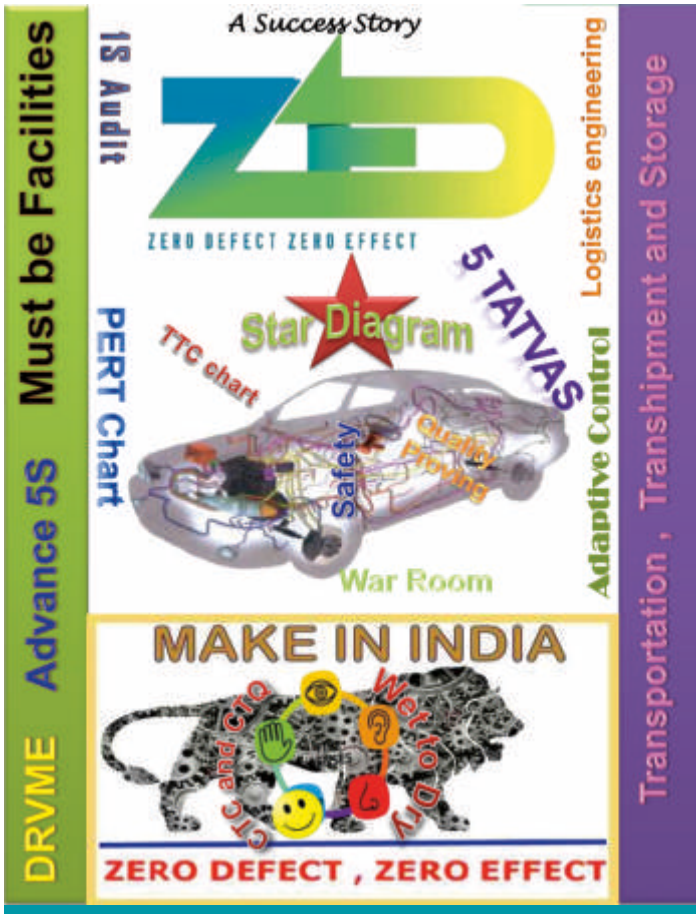
ACT's ZED Tools / Techniques / Monitoring methods:

- Customer Requirement Validation
- Capturing implicit & explicit customer requirements
- CTC & CTQ for ZDQ
- Operation standards for ZDQ
- New QA and QC for ZDQ
- Concept of 100% inspection
- Quality Proving
- LCA, Poka-yoke & concept of Zero Rework
- Parts Handling
- Creation of learning center
- Five Tattvas: Reducing waste
- Carbon Footprint
- Waste Management and Control
- Travelling Trend Charts
- DRVME sheet
- PERT chart, Master PERT chart
- Operation Stream Mapping (AGIP)
- Star Diagram for Quality
- ZED Model & Approach
- Capturing all defects in one business stream
- Quality war room
- End of line rejection
- Error vs Defect
- Safety
- Must be Facilities Implementation
- Checklist for Must be Facilities
- Undesirable practices
- Undesirable Habits
- Abnormality mapping through 5-senses
- Abnormality free machines / work-stations

ACT's 1st ZED Cluster Results

Company	Manufacturing process/ Products	Rework	End of Line Defects killed	In-process rejection improvements	Customer Complaints	Customer Appreciation	Per employee abnormalities corrected/ year	Undesirable practices eliminated	Achievement of Hospital Clean company
Company 1	Aluminium foundry & Machining	Eliminated	87%	45%	Zero	YES	120	95%	95%
Company 2	Aluminium die casting & Machining	Eliminated	97%	85%	Zero	YES	97	85%	90%
Company 3	Transmission Precision Components	Eliminated	93%	90%	Zero	YES	101	86%	100%
Company 4	Wiring harness manufacturing	Eliminated	96%	85%	Zero	YES	137	100%	100%
Company 5	Rubber - V Belts	Eliminated	88%	67%	Zero	YES	78	100%	100%
Company 6	2 Wheeler Locks	Eliminated	95%	85%	Zero	YES	130	95%	98%

All participating companies now using ACT ZED approach across its all plants & extended this approach to their suppliers to make entire supply chain - A zero defect quality chain.



Source, Yazaki India Pvt Ltd, Chennai

Our Customers speak better than us, You may ask before deciding and they will simply say!!!!!

…. HAVE YOU NOT JOINED YET!

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ROAD TO DIGITALISING BUSINESS

Profitability of Indian companies has been on a downhill since the companies have struggled to deal with the increasingly changing, volatile and uncertain global market and the rising impact of digital disruption. Despite India being the fastest growing large economy, the performance has slacked. This is according to a study of the performances of India's top 1000 listed companies over the last 5 years. The GDP fell from 8.7% in 2010 to 7.2% in 2015 and net profit more than halved from 4.1%(2010) to 2%(2015).

Although the overall trend was downward, there has been a marked divergence in performance between industries in these 5 years. The big winners have been sectors like automotives and auto component industry whose profits have risen to almost three fold. Similarly pharmaceutical and information technology sectors have also doubled their share of net profits.

In contrast industries like mining, construction, capital goods have taken massive losses and falls.

Deepak Agarwal,
Expert ACT Cluster Programs

Factors changing the business environment:

Firstly, the world economy is now one of instability and volatility. This reality has been shown by the drastic fluctuations in GDP since the 2008 financial crisis, along with high inflation rates and exchange rates.

Secondly, a force of digital disruption has uprooted the traditional formula for growth and now impacts every industry.

The third factor is the high level of indebtedness of the companies. Almost one-third of Indian corporates are in the debt trap, having high leverage or low interest coverage.

ROAD to Digitisation- Four Fundamentals of Success

Four milestones have been established, this comprises of Resetting assumptions, Organising for the future, advancing with Agility and Digitalising the business.

Firstly, leaders need to reset the most fundamental assumptions they hold about the market and the future. Given the huge changes in recent years, many of these assumptions are now superfluous.

Secondly, Corporate India will need to build a very different organisation to take on the challenges of today's markets thrown at them and make the most out of the opportunities. This should start out with uprooting the traditional hierarchical approach of Indian organisation, towards more fluid and open organisations which encourages collaboration and faster adaption.

The third is to get agile to better sense new threats and opportunities and act promptly. Organisations can implement and encourage contingent thinking. This drives the focus from trying to predict the future, to examine different scenarios and their impacts. As a result, the organisation becomes better prepared for every eventuality and it must adopt a bias for action in both defensive and offensive moves.

Lastly, companies need to digitise their business. To do this they need to focus on three areas. First, adoption of the principle of "start small, fail fast", to rapidly test digital initiatives and identify those to which they should commit more resources. Second, business should review existing data assets and see how they can be leveraged to deliver a strategic advantage. Finally, executives will need to spot digital talent inside and outside their organisations which will be crucial to implementing digital initiatives.

AOTS and ACMA Concluded MOU on the Collaborative Program, Japan

AOTS concluded a memorandum of understanding (MOU) with ACMA (Automotive Component Manufacturers Association) of India on January 31, 2018.

We interviewed Dinesh Vedpathak (Head) and Sapana Baravkar (Senior Director) of ACMA Centre for Technology (ACT).

Please tell us the background to why ACMA asked AOTS to conclude this MOU? (Economy, government policy, industrial trend, increase of local need for HRD, etc...)

In 2014, the government of India launched the "Make in India" and "Skill in India" initiatives aiming to upgrade the skill level of the manufacturing sector in particular. Under this government project, ACMA has been designated to promote manufacturing skills in the automotive sector since it represents 85% turnout of the automotive sector in India.

Dinesh Vedpathak, HEAD ACT

ACMA has educated 1,000 companies to promote skill development for the last 17 years. However, times are changing so fast, and now we are looking for innovation, such as new product development, IoT (Internet of Things), MFCA (Material Flow Cost Accounting), and cost reduction.

AOTS and ACMA have been working together for over a decade to develop the skills of human resources. As the end customer demands increases day by day, industry also needs to get ready by adopting necessary skills at the manufacturing level. This training scheme has been implemented quite well by AOTS programs specially designed for the ACMA membership. I myself attended AOTS programs in 2004 and 2017.

Now, the main purpose of concluding this MOU is to capture the attention of the world and encourage the whole industry to participate in and improve the programs. This MOU could be a starting point for two partners, AOTS and ACMA, to collaborate on upgrading skills which leads to future business opportunities for both countries.

What are your expectations of AOTS's human resources development programs and the impact of this MOU on future collaboration?

We hope the AOTS HRD programs will be expanded so that can be used by a large number of companies in India to meet their future needs. We also hope AOTS and ACMA can exchange knowledge and skills including benchmarks from other countries.

We have been already organizing development programs in India. Last year, we had 6 programs with 14 people sent for each. We would like to exchange experts and training with AOTS.

What are your expectations of business exchange promotion between the Indian and Japanese automotive component industry? How do you think this MOU can produce benefits for both countries?

The next step after signing the MOU would be to bring Indian auto sector delegations to Japan or bring Japanese company delegations to India for business exchange. This MOU will create business opportunities for AOTS and Japanese companies through our network in India.

Sapana Baravkar, SENIOR DIRECTOR

ACMA has been providing several HRD programs engaged in upgrading Quality, Cost, Deliver, NPD (New Product Development), Zero Defect Quality and Environmental aspects. ACMA has also created networks across India which will help cut down supplier development time heavily. Indian companies trained by AOTS programs have become more capable of doing business with Japanese companies.

Through these opportunities, we would like to finally make the relationship between Japan and India stronger. We would like to combine skill-up growth programs and business growth programs together.

What areas of industries is ACMA currently interested in for exploring cooperation with Japan?

The following topics are the areas that we are interested in currently:

- New technologies/ World class quality product and process design (for Electrical Vehicles)
- Digitization
- Innovations
- Automation
- Energy savings
- Zero defect quality
- Tooling innovations

What is the relationship between AOTS Alumni Societies in India and ACMA?

Recently, we have initiated dialogues with the AOTS Alumni Society network in India.

ACMA would like to work with Alumni more closely in India to start this program and ACMA will encourage previous AOTS training program participants to the ACMA Centre for Technology activities.

Thank you

ACMA-CARDIFF EXECUTIVE EDUCATION PROGRAM + B2B MEETINGS

ACMA Centre for Technology (ACT)

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Smart Manufacturing through Data Analytics & Business Opportunities In UK

Cardiff, UK from 21th to 30th May 2018.

ACMA Centre of Technology (ACT) organizes training programs to calibrate current levels and move towards best in class by visiting manufacturing facilities within country and overseas, listening to experts from respective fields. Following the successful delivery of the 'Operational Excellence' program in June 2017, we are coming up with proposal for an intense and immersive program of learning which explores data analytics and helps participants to understand the benefits that increases knowledge in this area which he / she can bring to the Automotive Sector in India.

We are pleased to inform you that **ACMA i**n association with Cardiff Business School, UK is organizing **Smart Manufacturing through Data Analytics at Cardiff, UK from 21st to 30th May 2018.** As you are aware, ACMA has been making efforts to explore business opportunities in the overseas markets for our members as well as creating new linkages for them with the global supply chain. UK Automotive market is one of the emerged markets in the world. In order to facilitate harnessing of the opportunity in UK, ACMA has decided to organize sessions on **'Business Opportunities In UK with support of Welsh Govt.'** for its members along with this training program.

Deliverables: Upon completion of this program, participants will be able to:

- Understand the huge potential of data analytics for operational improvements
- Identify in which areas & how data analytics can help to solve problems within your organization & beyond
- Appreciate the link between data analytics & innovation to help future developments in your organization
- Appreciate which sources we may consult for continuing to learn on new relevant findings in analytics research
- Apply software skills required for data analytics
- Embed and integrate a focus on data analytics across the organization
- Recognize Business Opportunities in UK with support of Welsh Govt.

Who should participate:

Top / Senior / Middle Level Management people who have decision making authority

Program Schedule

Training dates: 21st– 30th May, 2018, Cardiff Business School, Cardiff University

Day 1 - 21-May-2018	Day 2 - 22-May-2018	Day 3 - 23-May-2018	Day 4 - 24-May-2018
Smart Manufacturing and the role of Data Analytics	**Descriptive Analytics Dr. Bahman Rostami Tabar**	**Diagnostic Analytics Dr Bahman Rostami Tabar Prof. Aris Syntetos**	**Predictive Analytics Prof. Aris Syntetos Dr. Maneesh Kumar**
Evolution of Operations Management - Industry 4.0	Data Analytics within the Automotive Sector	Why did it happen?	Will it happen again? What may happen in the future?
Smart manufacturing Concepts	Historical data - what do we have, and how do we know "What happened?"	Data visualisation techniques	Hypothesis testing
Embracing Data Analytics	Data reflections Describing the data in different ways	Introduction to R	Interpreting the results in layman's terms
Guest Lecture Prof. Peter Wells The Future of the Car Industry		Functions of statistical packages such as R and Minitab	Visits to Protolabs
Dinner			

Day 5 - 25-May-2018	Day 6 - 28-May-2018	Day 7 - 29-May-2018	Day 8 - 30-May-2018
Site Visit B2B meetings	**Panalpina Spare Parts Case Prof. Aris Syntetos**	**Prescriptive Analytics**	**Data Analytics and Innovation**
Visit to Schaeffler or Control 2K or Tenneco	Cases	What should we do? What are our options?	Systematic use of data analytics for Organisational benefit
Session with the Welsh Automotive Forum	Panalpina Inventory Forecast Modelling within Automotive Supply Chains: D2ID software	The testing phase	**Visit to British Gas**
Introduction of project group work/homework	Panalpina 3D printing project: 3DP evaluator software	Sensitive analyses, option formulation and forward plans	Presentations to panel of academics - revisiting your problems based on what you have learned
Sessions on Business Opportunities in UK & B2B meetings followed by Dinner		Amazon's Approach to Analytics **Dr. Jane Lynch** **Potential Visit**	**Prof. Pete Wells** **Prof. Peter Nieuwehaus** **Prof. Aris Syntetos**

For more information, you may contact:

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ACMA Centre of Technology (ACT)

ACT NATIONAL / INTERNATIONAL TRAINING PROGRAMS / EVENTS CALENDAR- Year 2018 -19

Eligibility - ACMA member / Non - member / Cluster participants (past / present)

Sr. No.	Program Title	Location	Training/Event Date	Number of seats	Duration
1	ACMA - AOTS Production Management Training Course - Productivity Improvement (INAP 2) & Energy Conservation (Carbon Reduction Technology Promotion)	Osaka, Japan	7th to 20th March 2018	20	2 weeks
2	ACMA - AOTS Productivity Improvement, Energy Conservation (INAP) & Carbon Reduction Technology Promotion (CRTP) Program	Osaka, Japan	21 June to 4 July - 2018	20	2 weeks
3	ACMA - AOTS Business Opportunities in Japan	Tokyo, Japan	July - 2018	30	3 days
4	ACMA - AOTS Program: Material Flow & Cost Accounting (MFCA)	India	August - 2018	30	1 week
5	ACMA - AOTS Training for Non production people	Tokyo, Japan	September - 2018	10	1 week
6	ACMA - AOTS Production Management Training Course - Productivity Improvement (INAP 2) & Energy Conservation (Carbon Reduction Technology Promotion)	Osaka, Japan	February - 2019	30	2 weeks
7	ACMA Cardiff Executive Education Program- Smart Manufacturing through Data Analytics & Business Opportunities In UK	Cardiff, UK	21st to 30th May 2018	20	10 days
8	ACMA Cardiff Executive Education Program- ACMA India Supply Chain Management programme	Cardiff, UK	September - 2018	20	10 days
9	ACMA GIZ Expert Seminar "Consumption-based power generation from solar energy" (FIS- Technical information seminar)	Bavaria, Germany	8 to 14 Jul 2018	15	1 week
10	ACMA GIZ - Creative Business Design (MT- Management training)	Bavaria, Germany	Oct-18	15	1 week
11	ACMA GIZ - Workshop on Skill Development & Innovation (FUS- Follow up seminar)	India	Nov / Dec 2018	30	2 days
12	ACMA VDA QMC - Certification Course on Process Auditor of VDA 6.3	New Delhi / Pune / Chennai	Jul to Sep -18	25	3 to 5 days
13	ACMA Automation / Robotics Training	New Delhi / Pune / Chennai	July to September - 2018	30	2 days
14	ACT 5th Case Study Competition	New Delhi / Pune / Chennai	June - 2018	500+	2 days
15	ACMA Awards Celebration Excellence	Pune	Dec 2018 / Jan 2019	1000+	2 days
16	ACT Cluster Mela & Global Business Opportunities (B2B)	Pune	Dec 2018 / Jan 2019	1000+	2 days
17	ACMA Awards-Assessors Calibration Workshop	New Delhi / Pune / Chennai	May/ June 2018	50 per batch	1 day

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