



## Tomorrow's Engineers Club Event



**An Autonomous Institute**

Affiliated to Visvesvaraya Technological University, Belagavi

Approved By AICTE, New Delhi

Recognized by UGC with 2(f) & 12(B) status

Accredited by NBA and NAAC



### A 3-day Workshop on 'Creative Thinking, Innovation and Problem-Solving'

Dates of the Event	15.12.2020 to 17.12.2020
Title of the Event	Workshop on 'Creative Thinking, Innovation and Problem-Solving'.
Organized by	Tomorrow's Engineers Club & IQAC, MVJCE
Name of the Coordinator	Dr. Sanchari Saha, HoD, Dept. of ISE Prof. Kavyashree C, HoD, Dept of CSE
Resource Speakers	<ul style="list-style-type: none"><li>• Dr. K Sudhakar, Professor (Retd.), Department of Aerospace Engineering, IIT Bombay</li><li>• Dr. A S Shaja, Director, Data Science, Envestnet Yodlee, San Francisco, USA</li></ul>

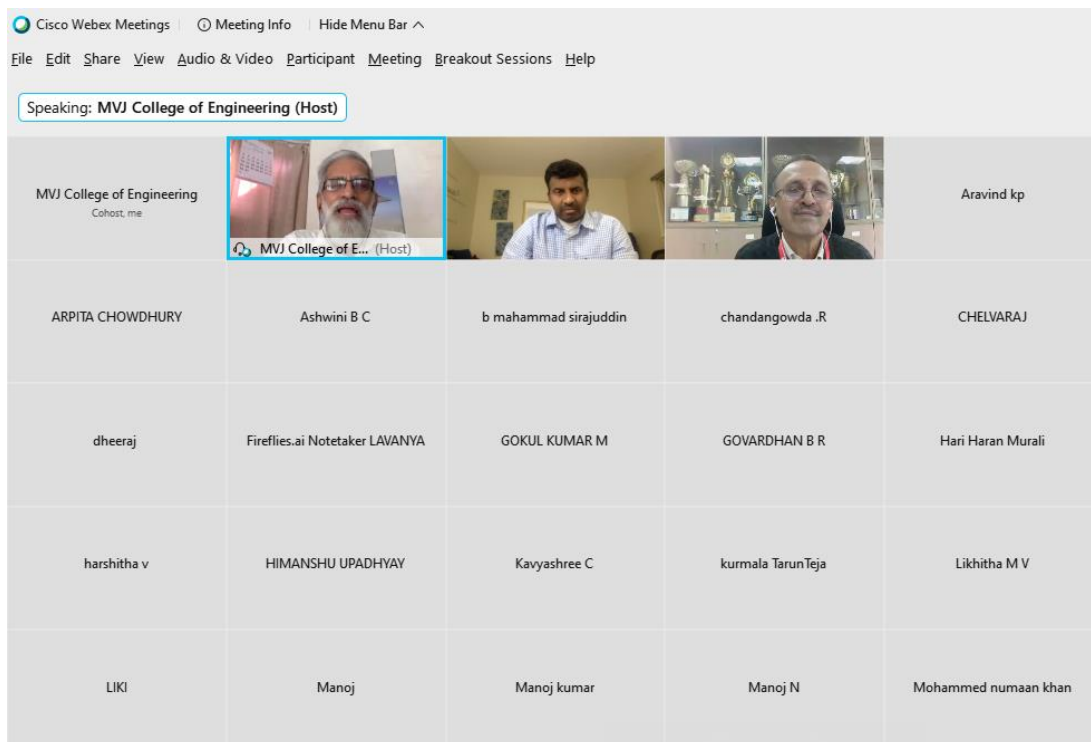
Considering societal problems as one of the major concerns of future Engineers, the 'Tomorrow's Engineers Club' of MVJCE conducted a 3-day Workshop on 'Creative Thinking, Innovation and Problem-Solving', from 15.12.2020 to 17.12.2020, in the virtual mode. The main objective of this workshop was to provide a platform to students from all the disciplines, to work together, utilize the skill sets of each discipline, think out-of-the-box, and present solution ideas to various open-ended societal problems that are present in our surroundings. Six interdisciplinary groups were formed, each group identified a societal problem and presented its solution idea.

## Day 1 (15.12.2020):

The Workshop was inaugurated by Dr. P Mahabaleswarappa, Principal, MVJCE. In his welcome address, he mentioned that while creativity is the ability to produce new and unique ideas, innovation is the execution of those creative ideas.

Following the welcome address, Dr. Sanchari Saha gave a brief introduction about Tomorrow's Engineers Club, its objectives and policies.

The Resource Speaker for the 1<sup>st</sup> day of the Workshop was Dr. K Sudhakar, Professor (Retd.), Department of Aerospace Engineering, IIT Bombay. He expounded the importance of creativity and innovation in problem-solving.



The screenshot displays a Cisco Webex Meeting interface. At the top, there is a menu bar with options: File, Edit, Share, View, Audio & Video, Participant, Meeting, Breakout Sessions, and Help. Below the menu bar, a status bar indicates "Speaking: MVJ College of Engineering (Host)". The main area shows a grid of participants. The top row features three video thumbnails: the first is for MVJ College of Engineering (Cohost), the second is for MVJ College of E... (Host), and the third is for Aravind kp. Below the thumbnails is a grid of participant names:

MVJ College of Engineering Cohost.me	MVJ College of E... (Host)			Aravind kp
ARPITA CHOWDHURY	Ashwini B C	b mahammad sirajuddin	chandangowda .R	CHELVARAJ
dheeraj	Fireflies.ai Notetaker LAVANYA	GOKUL KUMAR M	GOVARDHAN B R	Hari Haran Murali
harshitha v	HIMANSHU UPADHYAY	Kavyashree C	kurmala TarunTeja	Likhitha M V
LIKI	Manoj	Manoj kumar	Manoj N	Mohammed numaan khan



## Problem Solving - Importance of Creativity & Innovation

3-Day Workshop on  
"Creative Thinking, Innovation and Problem Solving"

December 15-17, 2020

MVJ College of Engineering, Bengaluru

K. Sudhakar

A.S. Shaja

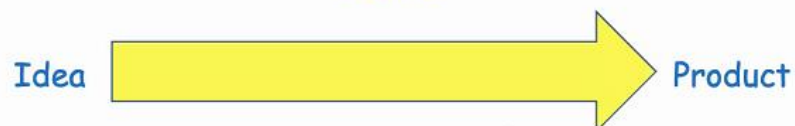
With past links to  
Department of Aerospace Engineering  
IIT Bombay, Mumbai

Viewing MVJ College of En...

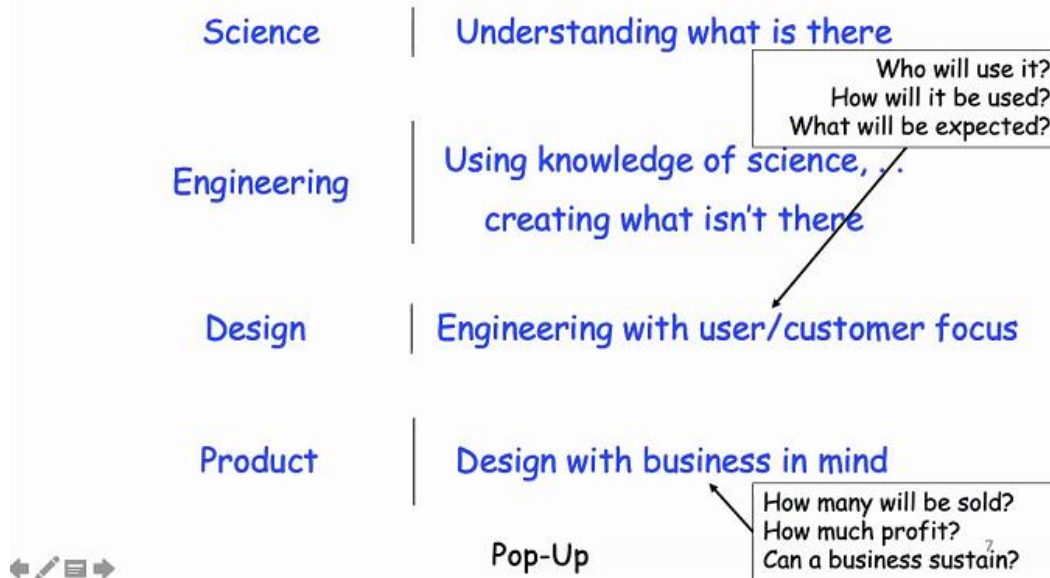
## Problem Solving - Importance of Creativity & Innovation

1. Context: Engineering
2. Target audience: 3<sup>rd</sup> + 5<sup>th</sup> Semester
3. Goal for the Workshop:

How to?



## Science, Engineering, Design, Product



## Problem Solving?

Different from solving 'Closed Problem' we are used to!

### • Closed Problem

- Clear/unambiguous problem statement
- All data required to solve is part of the problem
- Steps involved similar to problem solved in book/class
- One correct answer

### • Open Problems

- Drive clarity into problem statement
- Intelligent gathering of some data
- Identify steps as part of solution process
- Justify the interpretation of problem, assumed data, adopted steps to solve it and the answer

Uday	
Fireflies.ai Notetaker LAVANYA	
MVJ College of Engineering	
paras nath choudhary	

✓Correct Answer

**Q2.Simple Open Problem: Require a float to help 100 people to cross a lake. What weight carrying capacity (in kg) of float will you make?**

Answers	Results	%
✓ Your Answer	0/40	0
1 ton	1/40	3
100Kg	1/40	3
1000kg	2/40	5
depends on individual weights	1/40	3
70to90 kg	1/40	3
80kg	1/40	3
10000kg capacity	1/40	3
How can we reduce air pollution using technology ?	1/40	3
we dont have enough information to answer iwe can assume and make a boat of average weight of 100kg	1/40	3
70,000	1/40	3
dependes on the people weights	1/40	3
100	1/40	3
100*(average weight of each person)	1/40	3
less than the weight of 100 ppl	1/40	3
1000	1/40	3
around 8000kg . considering average weight of each person 75kg	1/40	3
if we assume average weight of 100 people as 50 kg ,then depending on the various parameters it	1/40	3
No Answer	22/40	55

Attendees	Results
Likhitha M V	
Mohammed numaan khan	Your Answer ✓
Shebin Joseph	How can we reduce air pollution using technology ?
Likhitha	
Ashwini B C	
Premanand	around 8000kg . considering average weight of each person 75kg
almisbah	80kg ✓
paras nath choudhary	100*(average weight of each person)
Amrutha MC	
Theertha	70,000
harshitha v	1000kg
Sneha R P	
Theertha	

## (Open) Problem Solving?

- Problem Solving is a general term. Refers to application of knowledge to solve real-life problems
- 'Problem Solving' for engineers = Use knowledge of science to create things and solve problems faced in real life.
  - US based Chinese Engineer: Created a wearable device to be worn by his aged father living in China. If his father has a fall it will alert him.
  - Socially aware Indian engineer. Created a device to carry water



After the session by Dr. K Sudhakar, students were allocated separate meeting rooms for discussion among their group members. After the discussion, students listed multiple problem statements.

### Team 1 - Proposed Problem Statements:

The screenshot shows a digital form with a header bar containing 'Questions' and 'Responses 6'. Below the header, there are four input fields for problem statements. The first field contains the instruction: 'Kindly indicate Not less than 2 and up to 4 Needs (i.e problems that your team has shortlisted)'. The second field is labeled 'Need-1 Or Problem-1 \*' and contains the text 'disposal of garbage in trains and under the tracks'. The third field is labeled 'Need-2 Or Problem -2 \*' and contains 'vehicles for handicaps (auto self driven motorcycle)'. The fourth field is labeled 'Need-3 Or Problem-3' and contains 'ensuring the safety of kids and old people'. The fifth field is labeled 'Need-4 Or Problem-4' and contains 'control of dust and pollution in busy places'.

### Team 2 - Proposed Problem Statements:

The screenshot shows a digital form with four input fields for problem statements. The first field is labeled 'Need-1 Or Problem-1 \*' and contains the text 'the problem faced in the language when we go to the place where the people less educated people area'. The second field is labeled 'Need-2 Or Problem -2 \*' and contains 'borewell resuses'. The third field is labeled 'Need-3 Or Problem-3' and is currently empty. The fourth field is labeled 'Need-4 Or Problem-4' and is also currently empty.

### Team 3 - Proposed Problem Statements:

<p>Need-1 Or Problem-1 *</p> <p>monitor our house door for any thief and gather information about that thief using his fingerprint linked to his aadhar card</p>
<p>Need-2 Or Problem -2 *</p> <p>a dustbin which itself recognizes wet and dry waste and separate itself</p> <p>predetermining the taste of food that we are preparing before each item we mix</p>
<p>Need-3 Or Problem-3</p> <p>a software with animations and which is user friendly and creative facilities that helps teachers convert the books and lectures into animated lectures</p>
<p>Need-4 Or Problem-4</p> <p>sensor pen that corrects spelling mistakes and also used to copy notes and rewrite as well</p>

### Team 4 - Proposed Problem Statements:

Questions	Responses <b>6</b>
<p>Need-1 Or Problem-1 *</p> <p>Problem Statement 1: Finding empty and safe parking places for cars in a busy area.</p>	
<p>Need-2 Or Problem -2 *</p> <p>problem statement 2:waste management</p>	
<p>Need-3 Or Problem-3</p> <p>to solve the malnutrition problem in children</p>	
<p>Need-4 Or Problem-4</p> <p>Alternative to hand bags</p>	

## Team 5 - Proposed Problem Statements:

Questions Responses 6

Need-1 Or Problem-1 \*

Can bluetooth connection cannot be extended from meters to kilometres

Need-2 Or Problem -2 \*

I have one problem statement guys  
\* we need to have one AI based app or website to give instruction to the Traveller or to route him to the traffic free cut route way in case of urgency\*

Need-3 Or Problem-3

now students are looking to earn many online and get into scams we can find a solution so that everyone find a simple job and earn money for student; like now web have freelancing

Need-4 Or Problem-4

The technology is improved ..why do army needs oly humans why not robots can b trained so tht we won't lose our people

## Team 6 - Proposed Problem Statements:

Questions Responses 6

Need-1 Or Problem-1 \*

Can bluetooth connection cannot be extended from meters to kilometres

Need-2 Or Problem -2 \*

I have one problem statement guys  
\* we need to have one AI based app or website to give instruction to the Traveller or to route him to the traffic free cut route way in case of urgency\*

Need-3 Or Problem-3

now students are looking to earn many online and get into scams we can find a solution so that everyone find a simple job and earn money for student; like now web have freelancing

Need-4 Or Problem-4

The technology is improved ..why do army needs oly humans why not robots can b trained so tht we won't lose our people



Once the teams had listed multiple problem statements, Dr. K Sudhakar explained to the participants about refining their problem statements and finalizing a single problem statement.



**Problem Solving**


Now that we have problems! Each group will be asked to meet again and pick one from your list!

Do we rush to solve a problem, once picked? **No!**

- State the Problem correctly.
- Confirm if that is the problem to be solved.


**"Problem well stated is half solved", Charles Kettering**

**"Problem well stated attracts better solutions"**



**What is meant by "State the Problem Correctly?"**

**"Mind Without Fear", Rajat Gupta**



**Early assignment at McKinsey**

- AT&T: Customers **rented phone from AT&T** & paid for the services. When a customer shifted home the phone would get packed and AT&T found difficult to reclaim it.
- AT&T approached Mc Kinsey: "3 million phones lost. How best to recover phones?"
- RG changed the problem to, "How to decide when to let go?"
- AT&T stated the problem as "How to recover phones?" while they actually wanted to "Reduce losses?"
- Next assignment from another client - "Plants running to capacity. In which city to build a new plant". Advise → Which plant to close down!

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## List of Finalized Problem Statements:

Group 1: Garbage disposal in Railways

Group 2: Problems faced by the Visually Challenged

Group 3: Segregation and Management of Waste

Group 4: Finding vacant and safe parking places for cars, in busy areas

Group 5: Freelance for students and public

Group 6: Food delivery app for small towns and cities

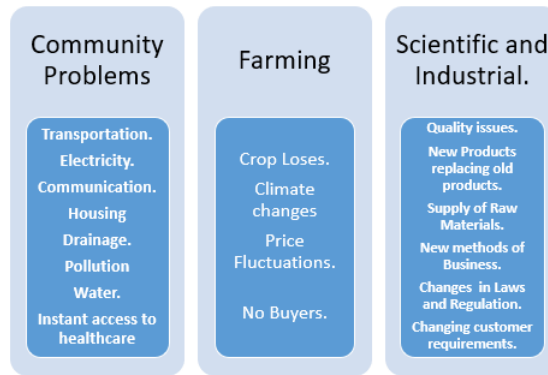
## Day 2 (16.12.2020):

The mentors for the 2<sup>nd</sup> day of the Workshop were Dr. Sanchari Saha and Prof. Kavyashree C. Dr. Sanchari Saha explained to the participants about what is engineering, attributes of an engineer and the usefulness of brainstorming on identification of issues around us.

## Attributes of an Engineer

- ✓ Critical thinking
- ✓ Open mind & positive attitude
- ✓ Resourceful
- ✓ Implementing ideas
- ✓ Cooperative.
- ✓ Strategic designer
- ✓ Ethics practitioner
- ✓ Curious
- ✓ Problem-solving
- ✓ Desire to continuously learn

## Few Problems Around Us



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## Brainstorming Method

- Brainstorming is a group creativity technique to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its members.

### General Rules

- Go for quantity
- Withhold criticism
- Welcome wild ideas
- Combine and improve ideas



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Prof. Kavyashree C elaborated on the importance of stake holders in problem-solving.

## Who can be a stakeholder ?

- Customers
- Employees
- Local communities
- Suppliers and distributors
- Shareholders
- The public in general
- Business partners
- Past and Future generations
- Academics
- Competitors
- Government and Non Government Organisations
- Trade unions or trade associations of suppliers or distributors
- Competitors
- Media

## Who are potential stakeholders?

### Primary stakeholders:

- Direct beneficiaries and direct concerned person (end users, farmers, urban poor, etc.)

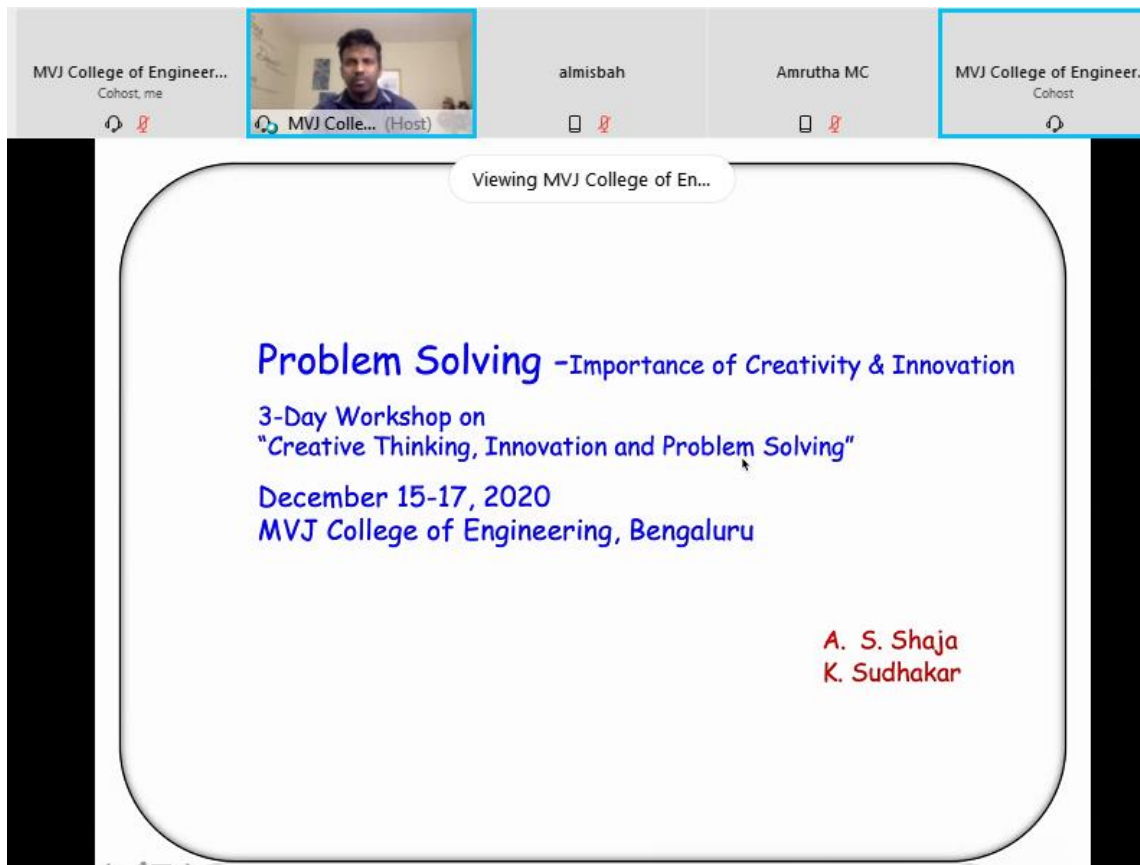
### Secondary stakeholders:

- Intermediaries in the process of delivering aid to primary stakeholders(e.g., professionals, advisers, practitioners, consultants, experts, governmental, NGO and private sector organizations etc.)

### Key stakeholders:

- policy makers (politicians, senior civil servants, district level bodies, governmental bodies, etc )

In the afternoon session, Dr. A S Shaja elucidated the usefulness of brainstorming sessions in improvising the identified problem statement.



The image shows a Zoom meeting interface. At the top, there is a header bar with four participant tiles: 'MVJ College of Engineer... Cohost, me', 'almisbah', 'Amrutha MC', and 'MVJ College of Engineer... Cohost'. Below the header, a large white slide is displayed with the following text:

Viewing MVJ College of En...

**Problem Solving** -Importance of Creativity & Innovation

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A. S. Shaja  
K. Sudhakar

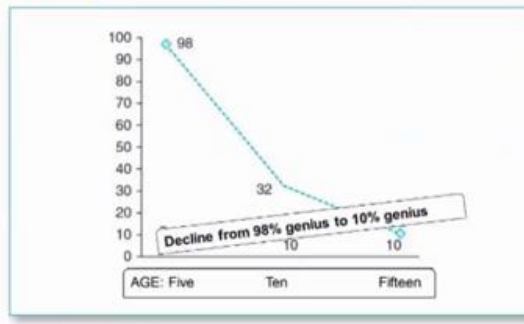


# Do schools kill creativity?



- Public school systems were shaped by the needs of the Industrial Revolution for factory workers

Figure 0.1 Decline of Creativity by Age



SOURCE: Land & Jarman, 1992.



# Torrance Creativity

Viewing MVJ College of En...



	Starting Shapes	Completed Drawing	
		More Creative	Less Creative
Use		Mickey Mouse	Chain
Combine		King	Face
Complete		A fish on vacation	Pot

MVJ College of Engineer... Host, me    MVJ College of Engineer... Cohost    MVJ Co... (Cohost)    GOVARDHAN B R    kumala TarunTeja

# Functionality Framework

Viewing MVJ College of En...

**New Technology**

**Old Technology**

**Process Improvement**  
*Respect*

**Breakthrough Innovation**  
*e*

**Commodity**  
*Camera*

**Product Improvement**  
*Monitoring*

**Old Functionality**  
*bak my Aics*

**New Functionality**

MVJ College of Engineer... Host, me    MVJ College of Engineer... Cohost    MVJ College of Engineer... Cohost    GOVARDHAN B R    kumala TarunTeja

# 'Write' function - Improvement with new, new technology

Invention (by injective new ways)	Year
Cave/Rock art	40,000 BCE
Clay tablets	4,000 BCE
Papyrus/Palm leaf	3,500 BCE
Paper	200 CE
Printing (Guttenberg)	1450 CE
Pencil	1790 CE
Fountain pen	1830 CE
Ballpoint pen	1888 CE



## Source of Innovation



### Within the Industry

- ❑ Innovation based on process need
  - ❑ Weak link is evident in a particular process but people work around it instead of doing something about it
- ❑ The unexpected
  - ❑ Success, failure, outside event
- ❑ Changes in industry or market structure
  - ❑ Shift in the underlying foundation of the Industry or market structure



## Source of Innovation



### In societal environment

- ❑ Demographics
  - ❑ Changes in population's size, age, structure, composition, employment, level of education and income, literacy, double income parents, increase in life expectancy
- ❑ Changes in perception, mood and meaning
  - ❑ Shift in society's general assumptions, attitudes and beliefs
- ❑ New Knowledge
  - ❑ Advances in scientific and non-scientific knowledge
  - ❑ Big possibility when advances in two different areas can be integrated to form a basis for a completely new product

MVJ College of Engineer...  
Host, me

kurmala TarunTeja

MVJ Co... (Cohost)

MVJ Co... (Cohost)

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Viewing MVJ College of En...

Document3

Home Insert Draw Design Layout References Mailings Review View Zotero

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BoS-4

1. State the problem (Reword it.  
Keep in mind what we all told you)
2. List the stakeholders
3. List what each stakeholder will expect?



**Day 3 (17.12.2020):**

On the third day of the Workshop, the students were asked to formulate a feasible solution for the identified problem statement, and also to identify possible stakeholders. Throughout the third day of the Workshop, the students were mentored by Dr. A S Shaja and Dr. K Sudhakar.

Speaking: Amrutha MC

MVJ College of Engineering Host, me	MVJ College of Engineering Cohost		almisbah	Amrutha MC 
Aravind kp	ARPITA CHOWDHURY	Ashwini B C	GOVARDHAN B R	b mahammad sirajuddin
CHANDAN GOWDA R	Chelvaraj	dheeraj	harshitha v	HIMANSHU UPADHYAY
kurmala TarunTeja	Likhitha M V	Likhitha	Manoj	Mohammed numaan khan
Nihitha	Nishchinth T N	Rajath	Sripriya K	Theertha



BoS-4: Step-1 from 'draft problem statement'  

Questions Responses **2**

You can explain the problem in details (If you wish to)

Too much of plastic disposed alternative method should be made to control the disposal of plastic & garbage non bio degradable in railways as India being the 2nd largest network in Asia s it plays very important role as a large part of population travells using railways

List some stakeholders. Each stakeholder in a new line. \*

Primary stake holder : passengers  
Secondary stakeholders : railways  
Tertiary stakeholders : government


List what each stakeholder may expect. Give at least one expectation from each stakeholder. Each in a new line. \*


Positive & happier atmosphere for passengers with safe environment .  
Railways authorities : they will have to worry less about the spreading of diseases among the passengers.  
Government : more passengers will contribute to the economy growth of the country

Tell us how you all felt while brainstorming. \*

It was great experience to discuss ideas from our team members to get to know different problems.

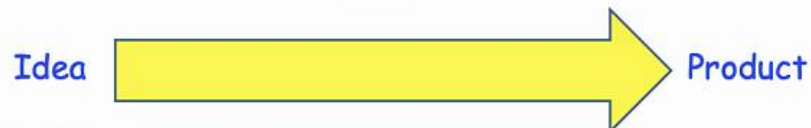
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 almisbah

 MVJ Co... (Cohost)

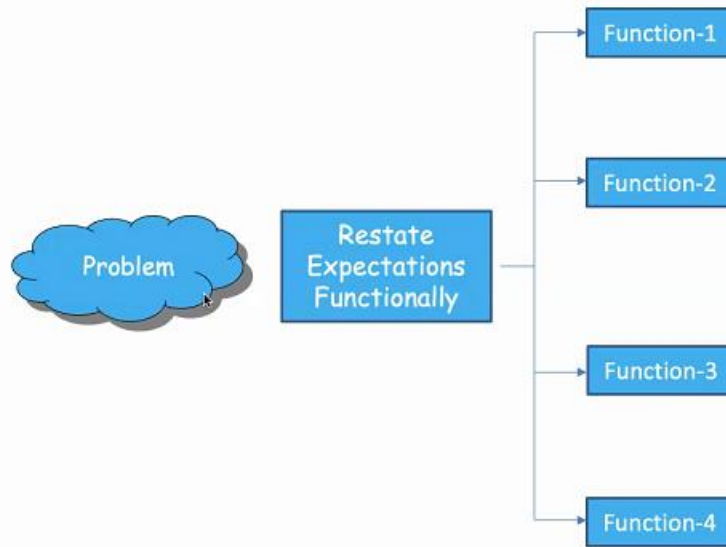
## Concept Generation Process



1. Identify problems
2. Pick a problem that is most promising
  - You have expertise required to solve it
  - You have good understanding of the problem and can gain better understanding



## Simple Need Vs Complex Need

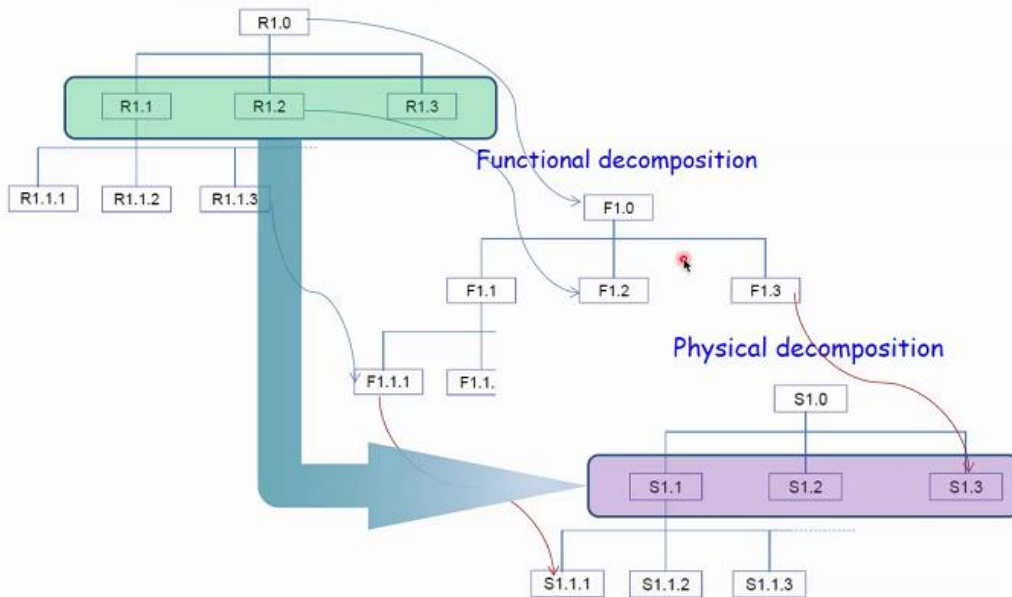


Viewing MVJ College of En...

## System Views

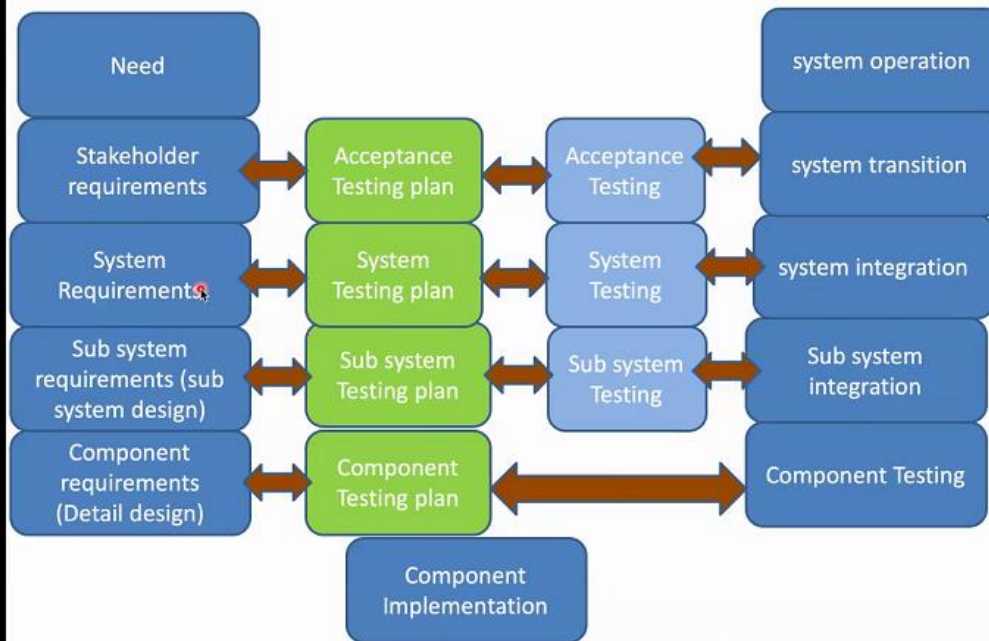


### Requirement decomposition





## System development stages



## Example : Need → Pen to write



Student "Need a pen to write"

What all shall a user (student) need from a pen

Need
Easy to hold
Consistent line thickness
No smudging
No breaks while writing
Last for at least one notebook



System Requirements
maximum diameter 8-10 mm
line thickness within $0.7 \pm 0.02$ mm
shall not spread outside $\pm 0.05$ mm
shall write without breaks for writing speeds up to 2 meters per second
shall write without breaks for 2 km length



Viewing MVJ College of En...

## Example: Need a pen to write

Student "Need a pen to write"

System Requirements	Component Requirements
maximum diameter 8-10 mm	Outer shell dimension ....
line thickness within $0.7 \pm 0.02$ mm	Wall thickness
shall not spread outside $\pm 0.05$ mm	Plastic tube dimensions
shall write without breaks for writing speeds up to 2 meters per second	Steel tube dimensions
shall write without breaks for 2 km length	Ball dia $0.9 \text{ mm} \pm 0.002 \text{ mm}$

Test Plan

Test Plan

The Workshop concluded with vote of thanks and E-certificates were distributed to all the participants.

### **Outcome:**

Students gained awareness on the various thinking skills which they need to apply, for improving their solution ideas. They also understood the importance of thinking out-of-the-box, instead of following the traditional approach in solving a problem.