

Report of a 2-day workshop on
Innovation Tools & Techniques,
Design Driven Innovation
and
Framework Creation for Final Year Engineering Projects
29th & 30th July, 2013

Background:

Gujarat Technological University (GTU) had organized a 4-day workshop on 27th & 28th April 2013, 4th & 5th May 2013. (The Call for the 4-day Workshop is at <http://www.gtu.ac.in/circulars/13Jul/3072013.pdf>. Its report is available at http://www.gtu.ac.in/circulars/13Apr/22042013_GTU.pdf.) Another one-day workshop was organized on 19th July 2013. (Its report was published at <http://www.gtu.ac.in/circulars/13Jul/29072013.pdf>.) These workshops paved the way for framework-creation through intervention of Design Driven Innovation for engineering projects. Innovation & Research Foundation (IRF) conducted these workshops for GTU. Based on the findings of these workshops, the IRF team developed a framework as well as initial steps of Project Idea/Problem Scouting (search) and Project Idea/Problem filtering.

The need:

Final Year projects are the capstone of engineering education. It is the learning from these projects that helps students connect their academic understanding with industry's requirements. The engineering fraternity is fast noticing a visible change in the needs and requirements of the industry.

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In the past engineers were expected to possess strong technical understanding of concepts, and, an understanding of the applications of machines or processes to industry's requirements. Today young engineers are also required to develop new technologies and applications continuously.

This requires development of skill – thinking – attitude towards newer disciplines that may address this need for **engineers to be problem solvers, decision makers and original thinkers.**

Through extensive research, the top technology schools and industry have learnt that design temperament and innovation are two domains that will directly address these requirements.

The workshop

The GTU workshop was conducted by IRF and was attended by more than 25 faculty members from various engineering colleges of Gujarat. Majority of the participants were Faculty members from LD College of Engineering, Ahmedabad.

The two- day “co creation” workshop focused upon,

- Sensitizing faculty members towards the why, what & how of design, design thinking and design driven innovation. Sharing Global Best Practices.
- Sharing the framework for engineering projects based on design driven innovation
- Discussing the framework, initial stages of project such as, problem scouting, problem identification, problem selection and problem articulation.
- Taking inputs from faculty members upon the same, and fine tune the framework for direct implementation.

The 6 broad stages of the Co Creation Workshop involved,

1. Sensitizing faculty members towards these disciplines and need for the same
2. Orienting faculty members towards these disciplines and global best practices
3. Sharing & Fine tuning of framework for Engineering Academic projects

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4. Explanation and discussion upon the various stages of the framework
5. Suggesting necessary tools and techniques for problem scouting, selection and articulation
6. Discussion and gathering of views of faculty members about the framework, processes, tools and techniques.

Session Outline

Day 1:

Session I :

- Need for Design Driven Innovation for Engineering projects
- Discussion on Constraints
- Discussion on Current basis of Academic Project
- Gap identification
- Video on Global need for Design Driven Innovation in Engineering disciplines
- Case Study: Innovation, Culture of Innovation & Habits

Session II:

- Sharing of Global Best Practices and few existing models,
 - Stanford : “User”
 - IDEO : “Product” & “Material”
 - Steven Johnson : “Nature”
- Discussion upon the existing models and views of faculty upon need for indigenous model for contextual requirements.

Session III:

- Workshop on “Innovators & Inventors Mind” – Case study of Walt Disney & Thomas Edison

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- SCAMPER as an Innovation Tool

Session IV:

- Sharing of Framework created by IRF

Day 2

Session I :

- Discussion upon the Framework

Session II:

- Sharing of Initial stages for Project Problem scouting, identification, selection & articulations
- Sharing of processes, tools & techniques for the same

Session III:

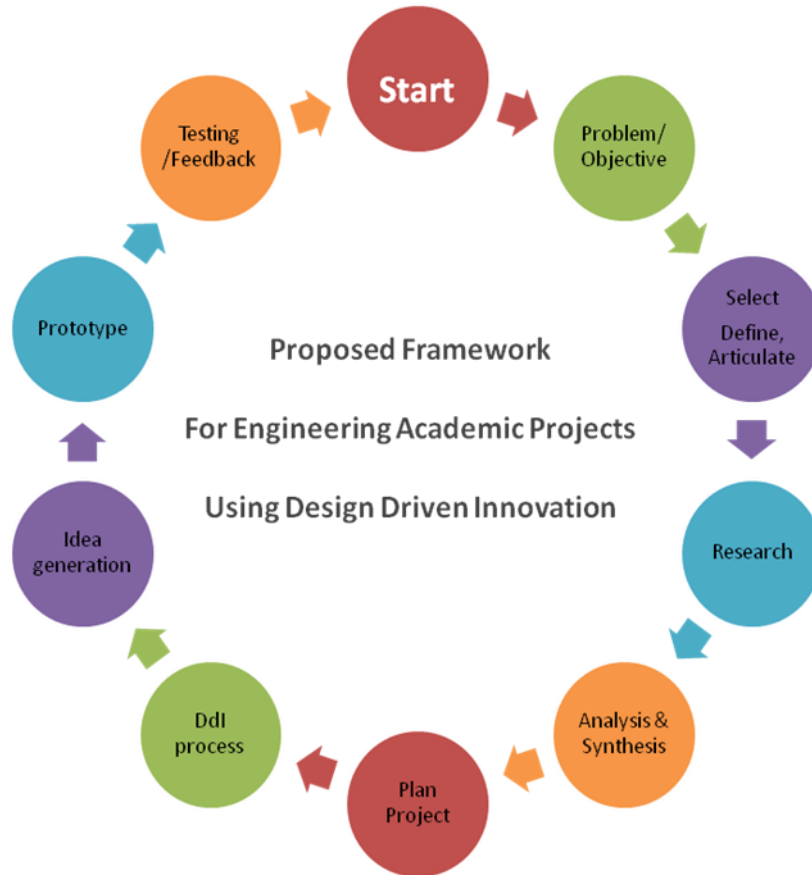
- Discussion upon the proposed processes, tools and techniques
- Working in groups to come up with unique applications for contextual requirements

Session IV:

- Encapsulation of workshop
- Participants sharing of views and findings

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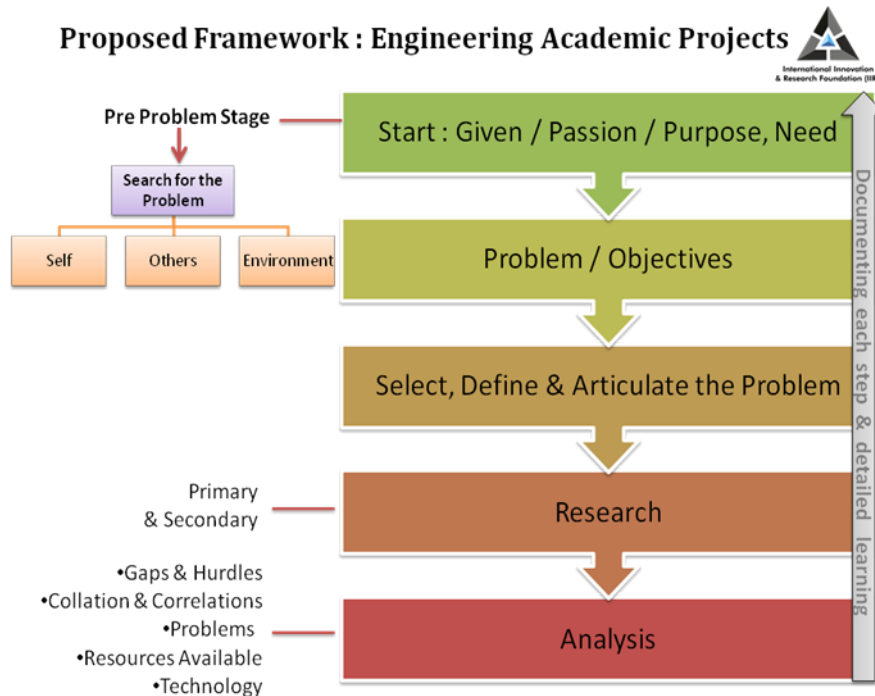
Final Agreed framework for Final Year Engineering Projects



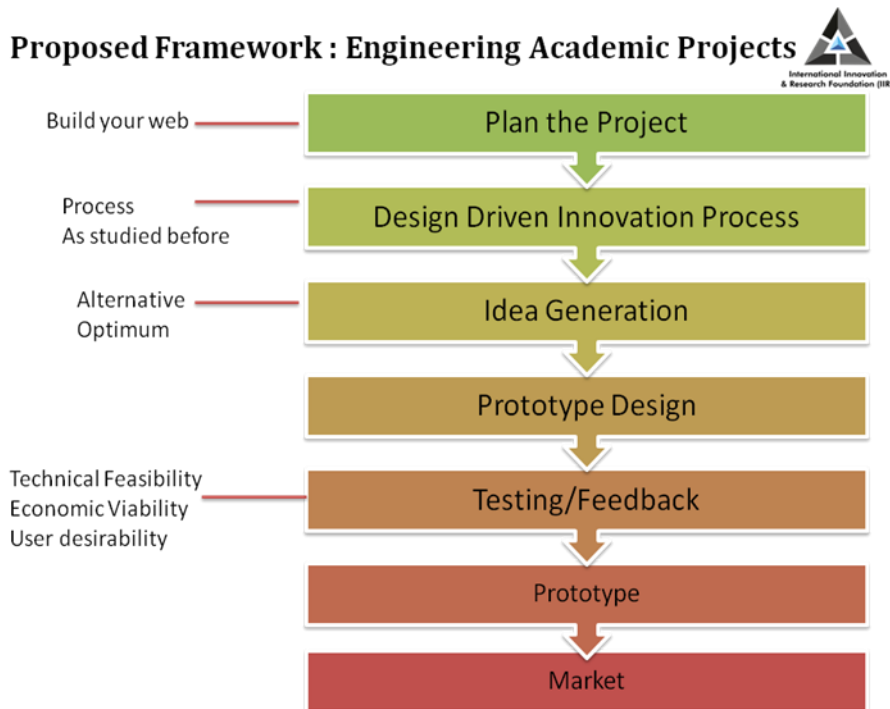
The above framework was finalized by the team after an exhaustive session of debates, discussion and presentations of various groups of faculty.

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Proposed Framework : Engineering Academic Projects



Proposed Framework : Engineering Academic Projects



Reflections on framework

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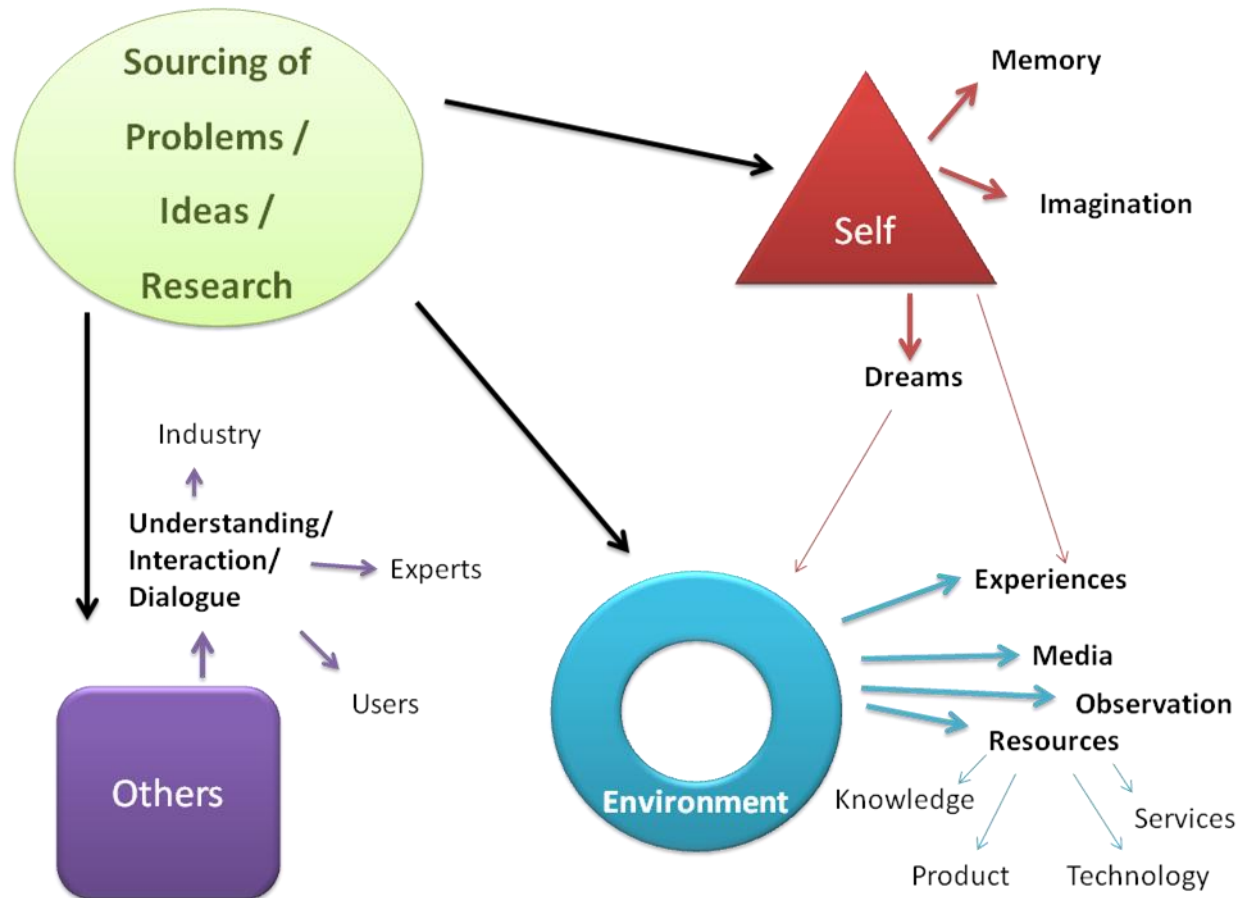
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We need to develop our unique model suited to discipline, student aptitude & passion, resources available, expected outcome,

1. Initiator (Self – other – environment)
2. Steps (Depending upon the kind of project)
3. Layers within Steps (sub points & uniqueness)
4. Horizontal breadth (Holistic – Multidisciplinary)
5. Sequence (Emphasis upon which step)
6. Different models for different context (cost etc.)

The focus was on how to make students PROACTIVE from being REACTIVE

- Moving from INDIVIDUAL SOURCING to SHARING and NETWORKING for, expansion and enrichment (5 students doing different project interact with each other throughout the process) (Building one's own web inside and outside for all steps)
- **The Innovation Value Chain** (I do everything v/s understanding that I & others too have a part to play in the whole chain)
- Concept of **Design & Launch : Concept of Redesign & Re launch**



The First stage of Sourcing of Problems/Ideas/Research was explained and discussed.

Faculty members could relate to their specific needs and based on the proposed stage, could come up with 3 examples each of the methods : Self – Others – Environment.

This exercise led to on the spot generation of ideas for projects related to different disciplines.

Memory



Problems

- Failures
 - Complains
 - Unsatisfied customer
 - Defective/less efficient product
- Success
 - Appreciations
 - Satisfied customer feedbacks
 - Very well doing product

Solutions

- Juggad
- Logical answers

Passion / Interest

Promising Ideas
Marginal Ideas
Rejects

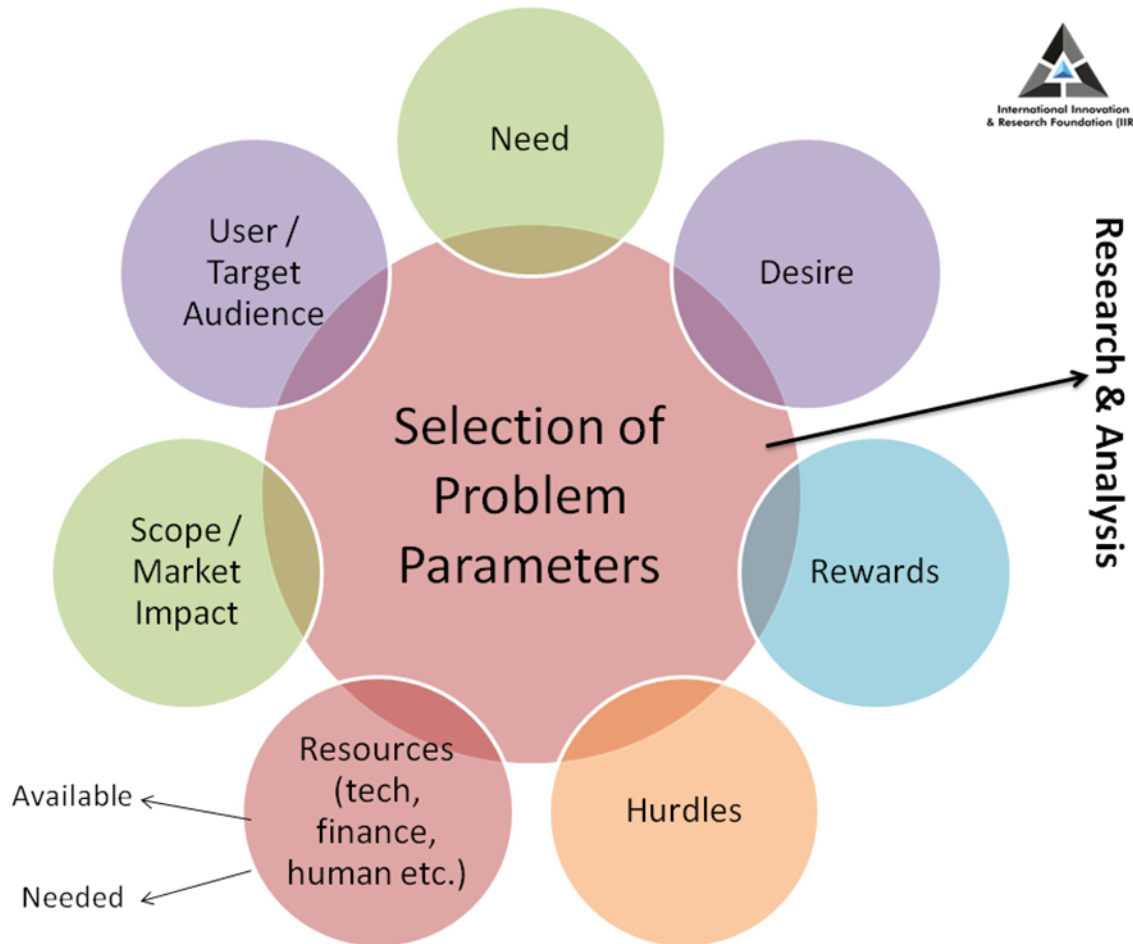
How can memory be used as a tool for idea generation.

Imagination



- Brain writing, Brainstorming (Collective Impact)
- Natural
- Perspective of product
- Deciding forms and functions (Random Creativity)
- Attribute Listing (Graphic Organizers)
- Forced Relationships
- New contexts for the same product/service
- 5W, 1H
- Analyzing Visuals
- Connect and Combine
- SCAMPER
- Mind map
- Studying similar existing products
- Differences when compared
- Technology and material
- Represent product/service Idea into a concept
- Who will use this product/service?
- What Primary benefits this product/service should provide?
- When will people consume/use the product/service?
- Random
- Metaphorical thinking(making comparisons)
- PROVOCATION (Do experiments)
- Reversal(improving)
- Attribute listing
- Reframing

Exercises on using Various tools, techniques and methods of using imagination for idea generation: A few exercises were carried out, using tools such as SCAMPER , for generating project ideas.



A brief discussion took place upon how to select a problem.

Filtering ideas



Sample Ways:

- Research for past design
- Self * Design Team * Peers * Mentor * Multidisciplinary experts
- Industry
- Forum
- Rapid prototyping
- e.g. **Judgment on** : **Quantity** of ideas, **Quality** (technical feasibility & Viability) of idea, **Novelty** of idea (most unique / uncommon), **Variety** of Idea (no. of different categories that this idea can be classified).

Define & Articulate a problem



Communication is the KEY : That is why the most miss interpreted.

Few ways:

- *user + need + interesting learning = POV (point of view)*
- Lessons from Mission & Vision Statements
- Observing & describing the product / object / problem story
- Writing a small paragraph about impact (both positive & negative) of your problem on,
 - Specific Customer
 - Specific industry
 - Community
 - Society at large
- Do a rough sketch if possible
- Documenting Audio/video

The workshops could achieve,

1. Feed back as well as sharing of views upon the Framework directly indicates that the faculty could understand and apply the various processes, tools & techniques proposed.
2. Though not a part of the workshop, however, Some 20+ faculty members committed towards directly applying proposed tools & techniques with their students.
3. All faculty members engaged in mini projects & exercises during the workshops.
4. The IIRF team could get a first hand ground realities and practices followed and thus could create the Framework
5. IIRF team could also develop first 2 stages of the Framework i.e. Project Idea/problem Scouting (search) and Project idea/problem filtering.
6. IIRF team could also develop an implementation framework for academic projects.

Some of the faculty members pledged to conduct the following activities in their respective disciplines,

1. Field Trip for holistic learning
2. Idea scouting through user problems from real world (their surrounding)
3. Taking students to industry to interact with manufacturing workers to identify their problems and then take these as project problems
4. Giving more time to students during the projects and adopting a mentoring philosophy over teaching philosophy
5. Sharing personal industry contacts with students and helping them connect with the local industries where faculty had acquaintances.

Some of the Views shared by faculties during the workshop,

- Funding for projects should be looked upon
- Dedicated space for project with facility of different equipment and machines
- Guidance from industry mentors
- Grading for Uniqueness & Innovativeness of the project
- Time allocation for project
 - Emphasis upon subject is higher
 - Should be full time (last semester in all streams of engineering)
- Project definition – habit of spoon feeding, they are not able to get projects from industry
- Central library or localized website
- Lack of faculty support – sometime works against the culture
- Incremental Project spread over a long term
- Develop a culture of project – right from semester I, micro projects, mini projects, major project in Sem 8.
- Very strict system of punishment for copied project – using software for checking with a dedicated central random check team.
- GTU should help in getting projects through public sector (live industry work)
- Sensitizing students towards “what is a project”, “what is expected out of students”
- Orientation of all engineering faculties in Gujarat through such workshops

Faculty members views upon their learning from the workshop,

- i. Enhancement in understanding of creativity, design, design thinking & Innovation as disciplines
- ii. Global best practices in design thinking & innovation (IDEO, Stanford)
- iii. Application techniques that can be directly used in classroom to enhance student learning
- iv. How projects could be made both challenging, interesting in a playful manner
- v. How other subjects could be taught using a hands on, co creation and experiential manner
- vi. How learner centric approach could be used more to make classroom interactive
- vii. Role that process, tools & techniques play in systematic understanding and execution of projects & assignments
- viii. Practical tips for contribution to the innovation ecosystem directly by them and students through projects
- ix. Understanding Engineering projects Framework
- x. Academic framework
- xi. Implementation framework
- xii. Understanding of Stage 1: Idea / problem Scouting
- xiii. Understanding of Stage 2 : Idea / problem Screening
- xiv. Idea / problem Articulation thoughts
- xv. Innovators mind : Case studies of Walt Disney, Leonardo Da Vinci, Thomas Edison
- xvi. Culture of Innovation : Harvard & Indian models
- xvii. Understanding of various Innovation Models
- xviii. Individual & Group learning of tools and techniques for innovation

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Mentors for these workshops,

1. Rohit Swarup (IIRF)
2. Amar Gargesh (MICA)
4. Ninad Shastri (IIRF)
5. Romita Swarup (Design 4 School)

Advisory Members involved in Framework development,

1. Prof. Vijai Katiyar (Academic Chairperson NID)
2. Prof. Subhash Tendle (MICA)

**“Happiness is,
when what you think, what you say and what you do
are in harmony” – Mahatma Gandhi**

Report prepared by: Rohit Swarup