



Certification Course on Design Thinking & Product Innovation

Resource Person: Sri J .Suresh Babu

Co-ordinator: Sri. R. Mahesh

Date(s) of Event: 17/05/21 to 08/06/21

Organizing department: Mechanical Engineering



K.S.R.M.COLLEGE OF ENGINEERING
(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India-516 005.
Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.

Cr./KSRMCE/(Department of ME)/2020-2021

Date: 10/05/2021

To
The Principal,
KSRM College of Engineering,
Kadapa.

Respected Sir

Sub: KSRMCE-(Department of ME) permission to conduct certification course on "Design Thinking and Product Innovation"-Request-Reg.

It is brought to your kind notice that, with reference to the cited, the ME department is planning to conduct Certification Course on "Design Thinking and Product Innovation" for B.Tech, VIII Sem Students from **17 May 21 to 08 June 21**. In this regard I kindly request you to grant permission to conduct the certification course. This is submitted for your kind perusal.

Thanking you sir,

Yours Faithfully

Mahesh
Sri R. Mahesh

Asst. Prof, Dept. ME

KSRMCE, Kadapa.

*Forwarded to principal
Siv
W. Jaital*

*Permitted
K. S. S. Murali*

To the Director for Information
To All Deans/HoD's/IQAC



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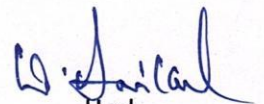
Date: 10/05/2021

Circular


All the B.Tech VI Sem ME students are hereby informed that department of MECHANICAL is going to conduct certificate course on "Design Thinking and Product Innovation" interested students may register their names on or before **17-05-2021, 5 PM**

For any queries contact faculty coordinator:

Sri R. Mahesh, Asst.Prof, Dept.ME, KSRMCE, Kadapa.


Hod

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Department of Mechanical Engineering
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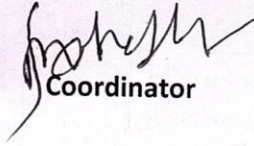
Department of Mechanical Engineering
Certification Course on Design Thinking and Product Innovation

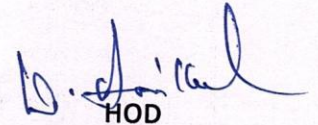
List of Participants

S.no	Roll No	Name of the Student	Email Id's
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Coordinator


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Syllabus

DESIGN THINKING AND PRODUCT INNOVATION

OBJECTIVE : The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

UNIT I INTRODUCTION Need for IPPD-Strategic importance of Product development - integration of customer, designer, material supplier and process planner, Competitor and customer - behavior analysis. Understanding customer-promoting customer understanding-involve customer in development and managing requirements - Organization process management and improvement

UNIT II CONCEPT GENERATION, SELECTION AND TESTING Plan and establish product specifications. Task - Structured approaches - clarification - search-externally and internally-Explore systematically - reflect on the solutions and processes - concept selection - methodology - benefits. Implications - Product change - variety - component standardization - product performance - manufacturability - Concept Testing Methodologies.

UNIT III PRODUCT ARCHITECTURE 8 Product development management - establishing the architecture - creation - clustering - geometric layout development - Fundamental and incidental interactions - related system level design issues - secondary systems -architecture of the chunks - creating detailed interface specifications-Portfolio Architecture.

UNIT IV INDUSTRIAL DESIGN Integrate process design - Managing costs - Robust design - Integrating CAE, CAD, CAM tools - Simulating product performance and manufacturing processes electronically - Need for industrial design-impact - design process - investigation of customer needs - conceptualization - refinement - management of the industrial design process - technology driven products - user - driven products - assessing the quality of industrial design.

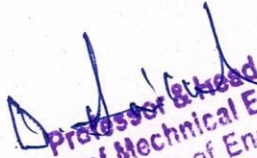
UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 11 Definition - Estimation of Manufacturing cost-reducing the component costs and assembly costs - Minimize system complexity - Prototype basics - Principles of prototyping - Planning for prototypes - Economic Analysis - Understanding and representing tasks-baseline project planning - accelerating the project-project execution.

TEXT BOOK 1. Product Design and Development, Karl T.Ulrich and Steven D.Eppinger, McGraw -Hill International Edns.1999 **REFERENCES:** 1. Concurrent Engg./Integrated Product Development. Kemneth Crow, DRM Associates, 6/3,ViaOlivera, Palos Verdes, CA 90274(310) 377-569,Workshop Book

2. Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992,ISBN, 1-55623-603-4 3. Tool Design - Integrated Methods for successful Product Engineering, Stuart Pugh, Addison Wesley Publishing,

OUTCOMES: On completion of the course the student will be able to

- understand the integration of customer requirements in product design
- Apply structural approach to concept generation, selection and testing
- Understand various aspects of design such as industrial design , design for manufacture , economic analysis and product architecture


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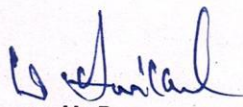
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Department of Mechanical Engineering
Certification Course on Design Thinking and Product Innovation
Schedule

Timing: 4:00pm – 6:00pm

S.No	Date	Course Coordinator	Topic Covered
1	17-05-2021	Sri J .Suresh Babu	Need for IPPD-Strategic importance of Product development - integration of customer
2	18-05-2021	Sri. R.Mahesh	material supplier and process planner, Competitor and customer - behavior analysis
3	19-05-2021	Sri J .Suresh Babu	Organization process management and improvement
4	20-05-2021	Sri. R.Mahesh	clarification - search-externally and internally-Explore systematically - reflect on the solutions and processes
5	21-05-2021	Sri J .Suresh Babu	concept selection - methodology - benefits. Implications - Product change
6	22-05-2021	Sri. R.Mahesh	Product development management - establishing the architecture
7	24-05-2021	Sri J .Suresh Babu	secondary systems -architecture of the chunks
8	25-05-2021	Sri. R.Mahesh	creating detailed interface specifications-Portfolio Architecture.
9	28-05-2021	Sri J .Suresh Babu	DESIGN Integrate process design - Managing costs - Robust design - Integrating CAE, CAD, CAM tools
10	31-05-2021	Sri. R.Mahesh	Managing costs - Robust design - Integrating CAE, CAD, CAM tools
11	02-06-2021	Sri J .Suresh Babu	Simulating product performance and manufacturing processes electronically - Need for industrial design-impact
12	04-06-2021	Sri. R.Mahesh	Estimation of Manufacturing cost-reducing the component costs and assembly costs
13	05-06-2021	Sri J .Suresh Babu	management of the industrial design process - technology driven products
14	07-06-2021	Sri. R.Mahesh	Estimation of Manufacturing cost-reducing the component costs and assembly costs
15	08-06-2021	Sri J .Suresh Babu	Understanding and representing tasks-baseline project planning - accelerating the project-project execution.


Coordinator


HoD
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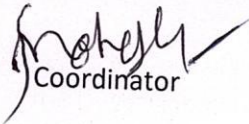
Department of Mechanical Engineering

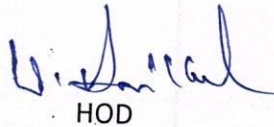
Activity Report

Name of the Event	: Design Thinking and Product Innovation
Duration of the Event	: 17/05/21 to 08/06/21
Scheduled Time	: 4.00 to 6.00PM
Target Audience	: B.Tech VIII Sem Students
Course Coordinator	: R. Mahesh

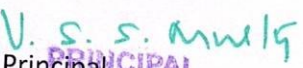
Activity Description:


Design Thinking and Product Innovation is one of the Advanced topic for Mechanical students, the,Department of Mechanical organized a certification course on “: Design Thinking and Product Innovation”. Head of the Department, faculty & participants inaugurated with all good spirit. Resource persons began with the Introduction to Design Thinking and Product Innovation followed by Strategic importance of Product development, finally valedictory. Students were issued participation certificates by the Head of the Department.


Coordinator


HOD

**Professor & Head
Department of Mechanical Engineering
K.S.R.M. College of Engineering
KADAPA - 516 003.**


Principal
**K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)**

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Certificate Course on

"Design Thinking and Product Innovation"

17/05/2021 to 08/06/2021

Organized by

DEPARTMENT

OF

MECHANICAL ENGINEERING



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Department of Mechanical Engineering
Certification Course on Thinking Product Innovation

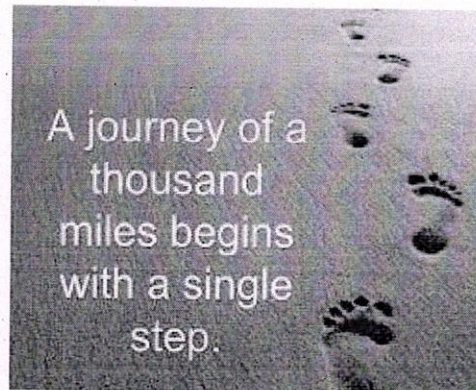
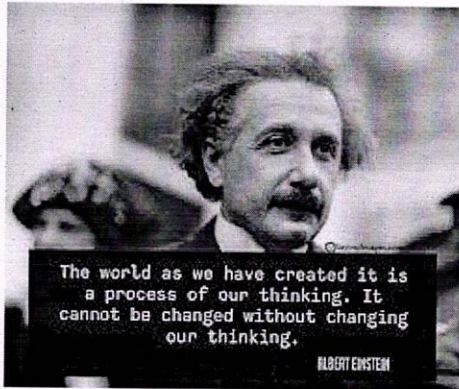
Attendance Sheet

No	Name of the Student	Roll List	17May	18/5	19/5	20/5	21/5	22/5	24/5	25/5	28/5	31/5	02/6	04/6	05/06	07/6	08 June
1	ACHUKATLA SHAIK FAZAL	179Y1A0301	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
2	ALAMURI IMAMBASHA	179Y1A0302	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓
3	BASIREDDY RAVI JYOTHI KUMAR REDDY	179Y1A0303	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓
4	BAYANA BOINA SURENDRA YADAV	179Y1A0305	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	A
5	BELLAM MAHESH	179Y1A0306	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓
6	BODIGARI RAMA KRISHNA REDDY	179Y1A0307	✓	✓	✓	✓	A	✓	✓	A	✓	✓	A	✓	A	✓	✓
7	BOLLINENI HARIKRISHNA	179Y1A0308	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
8	BOYA NAVEEN	179Y1A0309	✓	✓	A	✓	✓	A	A	✓	✓	✓	✓	✓	✓	✓	A
9	CHANDRAGIRI NARENDRA REDDY	179Y1A0310	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓	✓	A	✓	✓
10	INDLA VENKATA HARI PRASAD REDDY	179Y1A0321	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	A
11	J PAVAN KUMAR	179Y1A0322	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	KALLA VASU	179Y1A0323	✓	✓	✓	✓	✓	✓	A	✓	✓	A	✓	✓	✓	✓	✓

Design Thinking and Product Innovation

Unit-1

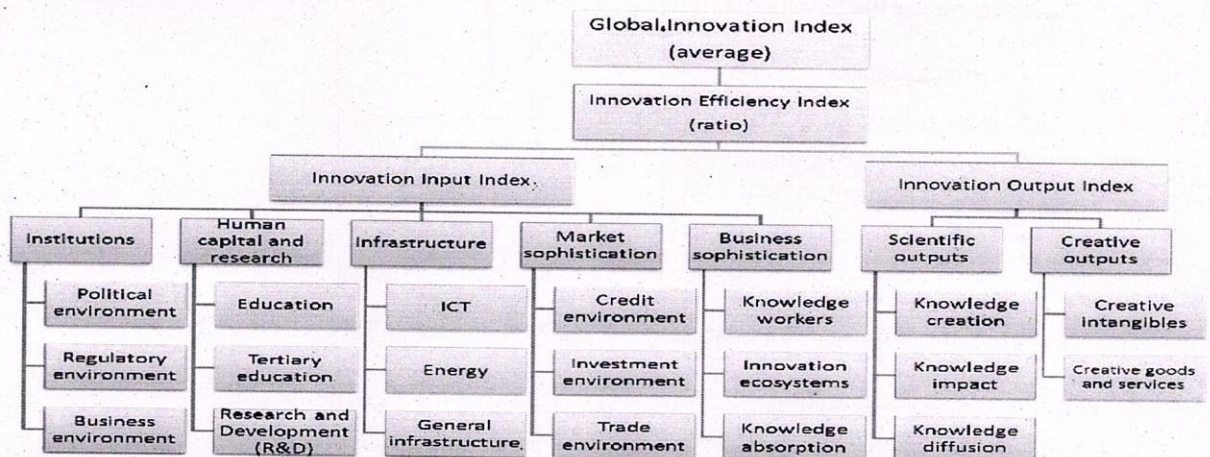
Preface:

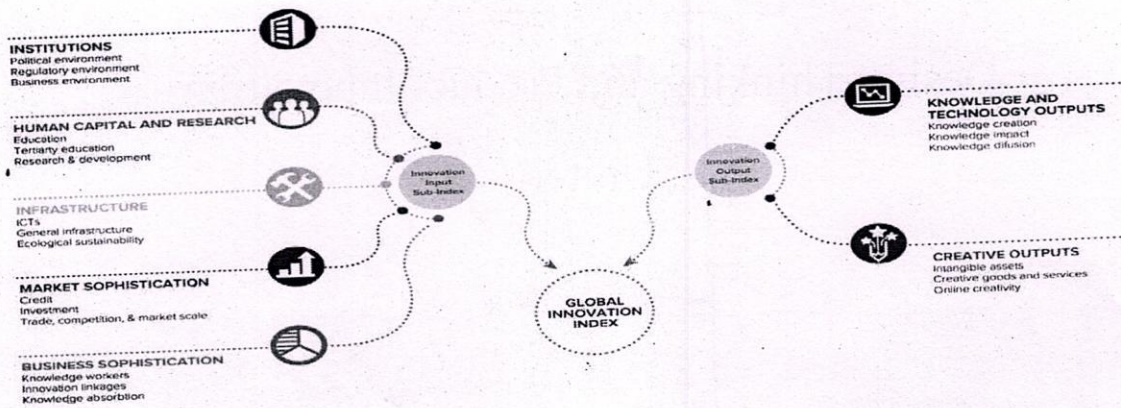


GLOBAL INNOVATION INDEX

- The global innovation index aims to capture the multi dimensional facets of innovation and provide the tools that can assist in tailoring policies or promote long term output growth, improved productivity, and job growth.
- The global innovation index is annual report.
- It gives the annual ranking of countries by their capacity for and success in innovation.
- Published by Cornell University (New York), INSEAD (business school) and world intellectual property organization.
- **Data taken sources:** international Telecommunication union, World Bank, world Economic Forum.
- Started in :2007

Frame works:





Global Innovation Index 2019 rankings

Country/Economy	Score (0-100)	Rank	Income	Rank	Region	Rank	Median 33.86
Switzerland	67.24	1	HI	1	EUR	1	██████████
Sweden	63.65	2	HI	2	EUR	2	██████████
United States of America	61.73	3	HI	3	NAC	1	██████████
Netherlands	61.44	4	HI	4	EUR	3	██████████
United Kingdom	61.30	5	HI	5	EUR	4	██████████
Romania	36.76	50	UM	8	EUR	33	██████████
Chile	36.64	51	HI	40	LCN	1	██████████
India	36.58	52	LM	4	CSA	1	██████████
Mongolia	36.29	53	LM	5	SEAO	11	██████████
Philippines	36.18	54	LM	6	SEAO	12	██████████
Costa Rica	36.13	55	UM	9	LCN	2	██████████

In this contest NITI (National Institution for Transforming India) Aayog released the India Innovation Index (III) 2019.

The India Innovation Index 2019 is calculated as the average of the scores of two dimensions – Enablers and Performance.

The enablers are the factors that underpin innovative capacities, grouped in five pillars

- Human capital
- Investment
- Knowledge workers
- Business environment
- Safety and legal environment

Performance dimension captures benefits that nation derives from inputs, divides into

- Knowledge output
- Knowledge diffusion

India innovation ranking for top 10 states (2019)

Top 10 states	Rank	Enablers Rank	Performance rank
KARNATAKA	1	3	1
TAMILNADU	2	5	2
MAHARASHTRA	3	1	3
TELANGANA	4	9	4
HARYANA	5	2	7
KERALA	6	4	8
UTTAR PRADESH	7	15	5
WEST BENGAL	8	11	6
GUJARAT	9	6	9
ANDHRA PRADESH	10	8	10

In this direction government starts working to improve rank in the global index.

- On March 2019 prime minister of India said that India is aiming to rank in top 25 of Global Innovation index in coming 4 years through air news.

According to skill India report 2019

WHICH DOMAINS HAVE MORE EMPLOYABLE TALENT?

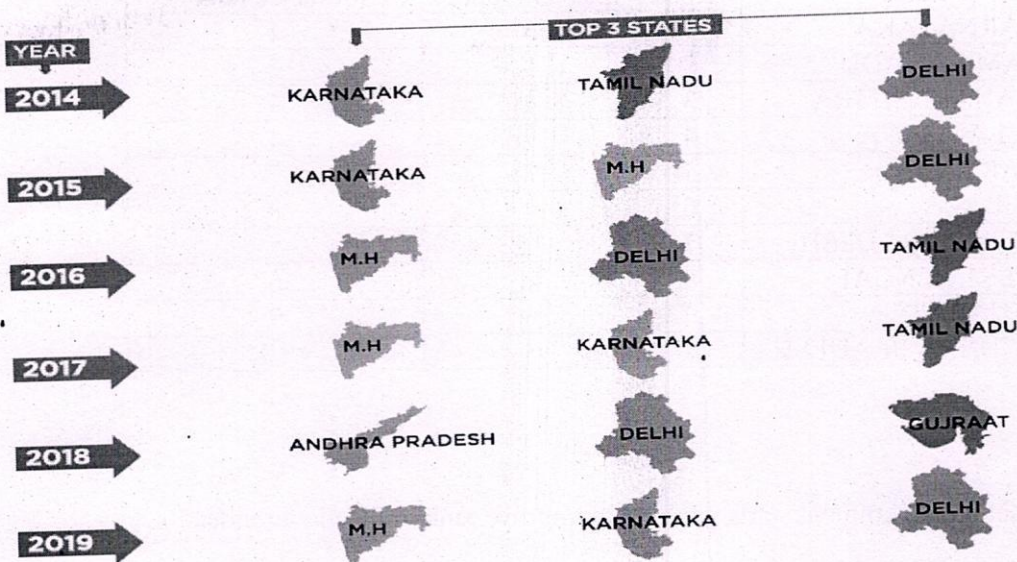
|-----| YEARS |-----|

SKILLS	2014	2015	2016	2017	2018	2019
B.E/B.Tech	51.74%	54.00%	52.58%	50.69%	51.52%	57.09%
MBA	41.02%	43.99%	44.56%	42.28%	39.4%	36.44%
B.Arts	19.10%	29.82%	27.11%	35.66%	37.39%	29.3%
B.Com	26.99%	26.45%	20.58%	37.98%	33.93%	30.06%
B.Sc	41.66%	38.41%	35.24%	31.76%	33.62%	47.37%
MCA	43.62%	45.00%	39.81%	31.36%	43.85%	43.19%
ITI	46.92%	44.00%	40.90%	42.22%	29.46%	NA
Polytechnic	11.53%	10.14%	15.89%	25.77%	32.67%	18.05%
B.Pharma	54.65%	56.00%	40.62%	42.30%	47.78%	36.29%

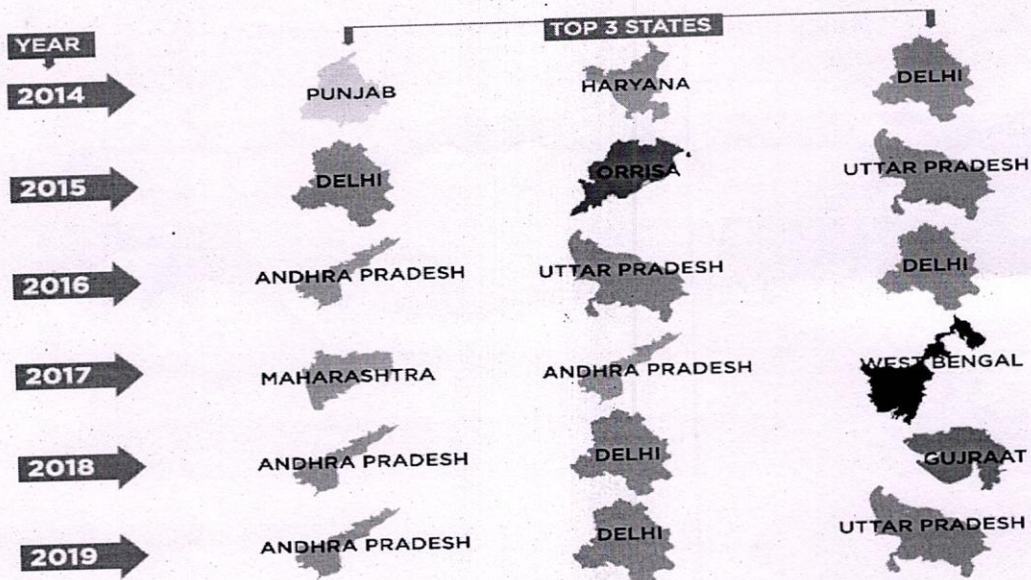
WHICH SECTORS HAVE HIRED THE MOST?

YEAR	TOP SECTORS
2014	BFSI, Pharma & Healthcare, Telecom
2015	Hospitality (Including Aviation , Tour Travels), BFSI, Core Sector (Oil, Gas, Steel etc.)
2016	Retail ,E-commerce & Transport, Pharma & Healthcare
2017	Core Sector(Oil & Gas, Steel Minerals), Software/Hardware, Auto Ancilliary
2018	BFSI, Retail
2019	BFSI, Software/Hardware, Manufacturing

WHICH WERE THE STATES WITH MAXIMUM HIRING ACTIVITY?



WHICH WERE THE STATES WITH MAXIMUM SUPPLY OF EMPLOYABLE TALENT?



- In the inaugural function of 107th session of Indian Science congress which was held in Bangalore on Jan-2020 prime Minister of India urges the young scientists to "Innovate, Patent, Produce and prosper. These four steps will lead country towards faster development"
- Based on the skill India Report and government policies the technical and higher educational institutes take the measurable steps to enhance the frame work (human capital and research) of innovation model for further development.
- So people seeking for innovation globally in all aspects in every domain.

- The Department of science and technology within the government of INDIA has developed the **INDIA INNOVATION INITIATIVE (I3)** to create an innovation network ,encouraging and promoting innovators and commercialization across the country
- **India innovation initiative :**
This programme is jointly promoted by the confederation of India industry, the Department of science & technology, Government of India and the **All India council for Technical Education (AICTE)**
- Not only are innovation initiatives underway at the national level , but many companies have developed innovation centers to drive new product, process and service development
- Companies like Microsoft ,Procter &Gamble , Accenture, IBM, AT&T ,computer sciences corporation, Qualcomm (wireless technology), Verizon(smart phones, internet) etc have all opened innovation centers focused on developing key scientific and technological innovations
- Central Board of Secondary Education (CBSE) is introducing three new subjects at class 11 from the session 2020-2021. The CBSE said the subjects 'Design –thinking', physical activity trainer and artificial intelligence have been introduced keeping view what has been mentioned in the **Draft New Education Policy 2019**
- The **Draft national Education policy 2019** prepared by a committee chaired by **Dr .K. Kasturirangan** has been shared by Ministry of Human Resource and Development for public comments. The **policy** aims at making India a knowledge superpower by equipping students with necessary skill and knowledge.
- The national Education policy was framed in 1986 and modified in 1992.in this context that the education sector modifies towards the demands of the 21th century.
- Quality ,Innovation and research will be the pillars for this new policy
- The Government had initiated the process of formulating a new education policy through considering expert opinions, filed experience, empirical research, stakeholder's feedback, as well as lessons from best practices.
- Meeting with State Education Secretaries of school Education and with state secretaries of higher & technical Education were held.
- Education Dialogue with honorable Mps of Andhra Pradesh, Telangana ,Tamil Nadu, Kerala ,Karnataka and odisha

TOP 6 METHODS OF INNOVATION TO COME UP WITH UNIQUE PRODUCT IDEA ARE:

❖ Innovation is the process of generating new and unique ideas or solutions and applying them to create value for the service.

1. Brainstorming
2. Six sigma DMAIC
3. **DESIGN THINKING**
4. Lean Canvas
5. Consumer trend canvas
6. Other methods



Kangaroo pouch



Baby pouch



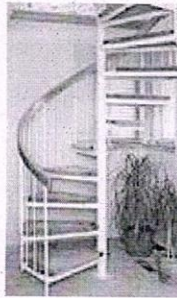
Snail



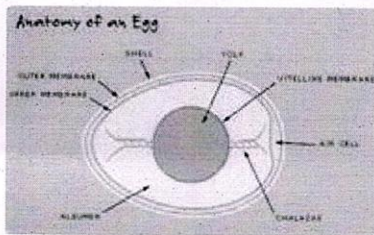
Cd track



Spiral climber



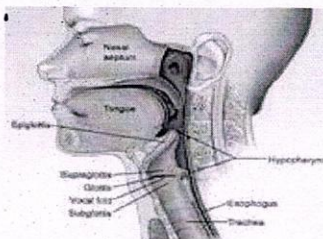
Stair case



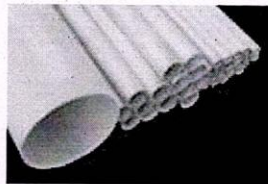
Egg



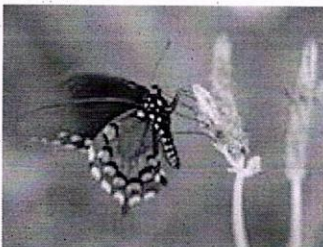
Medicine capsules



Human anatomy



Pipes



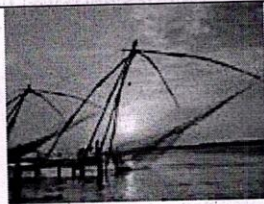
Butter fly



Industrial pipe lines



Spider net



Fishing net



Basket ball net



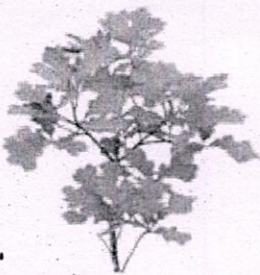
Soccer ball net



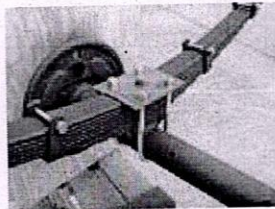
Pelican



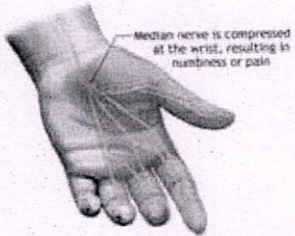
Pouch bags



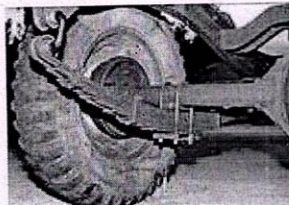
Sapling



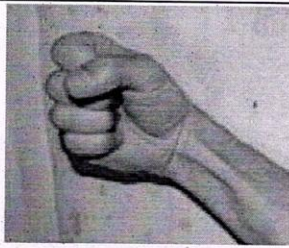
Leaf spring



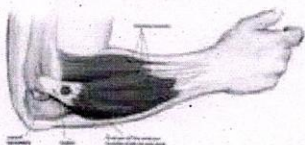
Joints of Finger (Flexing)



Automobile



Closed Fist (Bending)



Elbow joints



Machine part joints



Blister on skin



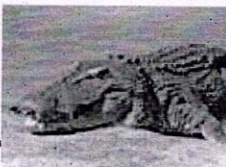
Medicine pack



Pen drives pack



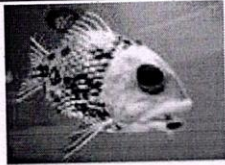
Lion fur



Crocodile skin



wrapped baby



Scales



Wrapped suitcase

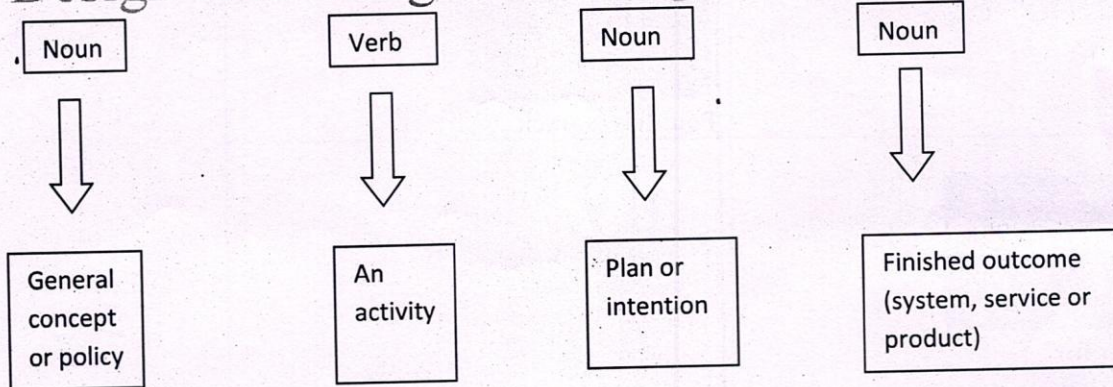
Definition of design:

- ❖ “The future is best found in the opportunities that go un noticed in the present”—*peter drucker* (Father of Management Thinking)
- ❖ ‘Everything that needs to be said has already been said. But since no one was listening ,everything must be said again’

According to Dictionary Design means

“A plan or drawing produced to show the look, the function or working of a building, garment, or other object before it is made”

Design is to design the design of a design



➤ Design(Noun):

Blue print of something—a plan for change

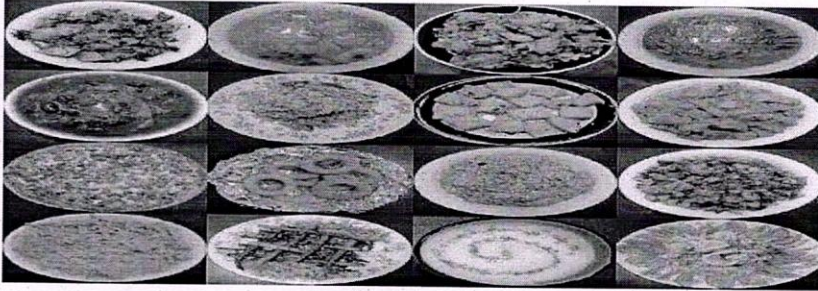
Undesirable situation (present) + Implemented plan= Desirable situation (future)

- Whether a situation is undesirable and what aspects are desirable depends on matter of perception
- Whose perception, where it is perceived, and when it is perceived plays important role.

➤ Deign(verb):

- Understanding & solving a problem:: termed as Designing
- **Problem understanding:** process or activities for identifying undesirable situations and desirable situations.
- **Problem solving:** Developing a plan with the intent of changing undesirable situations to desirable situations
- **Designing involves both problem understanding and problem solving**
- Designing becomes easier when problem is understood thoroughly

Example: cooking



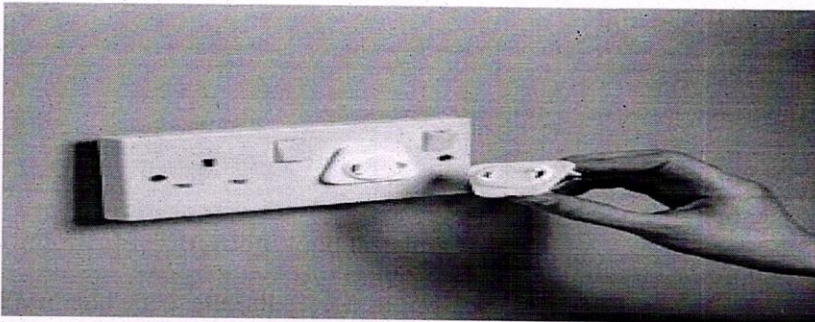
Undesirable situation: food tasteless

Plan: add adequate salt

Implementation: salt added

Desirable situation: tasty food

Example: Electric sockets



Undesirable situation: open sockets accessible to children is unsafe

Plan: to cover the sockets

Implementation: make and use socket cover

Desirable situation: socket covered and safe

What is Design?

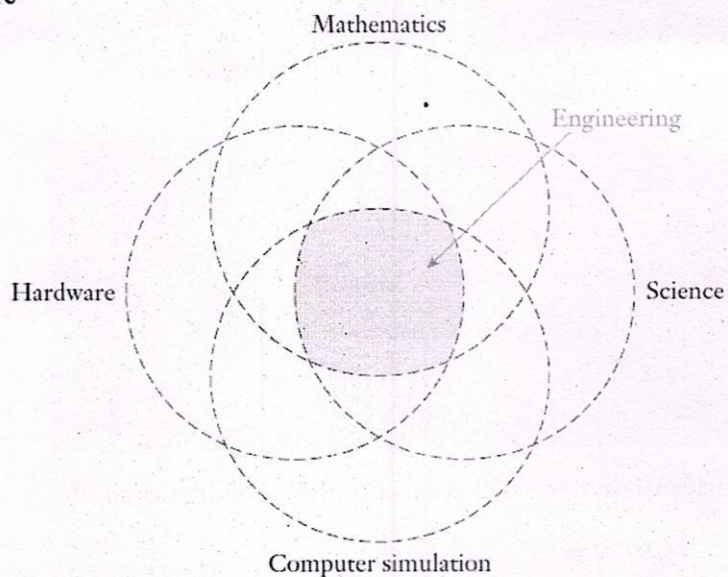
Design: plan of a system, its implementation and utilization for attaining a goal (change undesired to desired)

Designing: How a design is developed (Both Goal and Plan)

Designs can be for: Technical systems, Educational systems, aesthetic systems (logo design, advertisements), legal systems, social, religious or cultural systems, theories, Models etc.

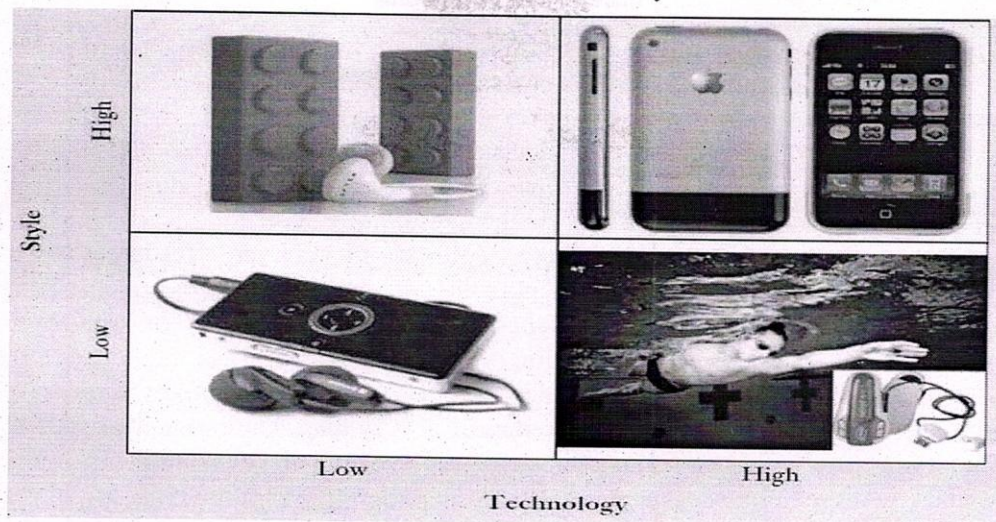
Design Vs Engineering Design

- Engineering is the practical endeavor in which the tools of mathematics and science are applied to develop cost effective solutions to the logical problems facing society.
- Engineers design many of the consumer products that needed in everyday life.
- Engineering is all about making useful things that work and impact lives
- The word “Engineering” derives from the Latin root *ingeniere*, meaning to **design or to devise**, which also forms the basis of the word “ingenious
- Engineering is essentially a bridge between scientific discovery and product applications
- Engineers apply their knowledge of **mathematics, science, and materials**—as well as their skills in **communications and business**—to develop new and better technologies
- Engineers combine their skills in mathematics, science, computers, and hardware



- “Engineer creates the new things and makes the old things better and better”

Style Vs Technology chart for digital music players:



- The above chart shows style on the vertical axis and technology on the horizontal axis.
- This chart provides a frame work to strategically develop innovative products for a wide range of customers.
- In each quadrant is a different digital music players
- **In the lower left:**
The low-style/low-technology is standard affordable player designed for customers who want just to play music. The player, while not the most stylish or high technology, provides solid, expected playback of digital music
- **In the lower right:**
The low style/high tech version is the SwiMP3 player from FINIS. This player integrates water proof technologies with revolutionary bone conduction of sound to provide swimmers with clear sound in under water
- **In the upper left:**
The high style/low tech version is a standard player shaped like a Lego Block, designed for customers who are very style conscious.
- **In the upper right :**
The high style/high tech version is and APPLE i phone for customers who want the latest technologies along with stylish features.

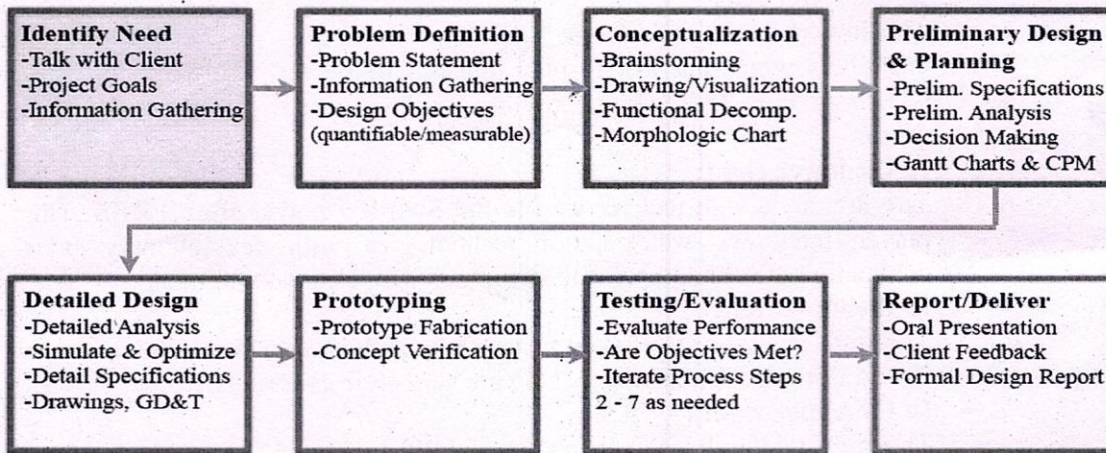
Conclusion:

- Developing technically effective, consumer safe, globally aware and environmentally friendly product to meet wide range of social, cultural demands, for that Engineers can think innovatively.
- Effective Design through innovation is one of the skills that Engineers will be acquiring during graduation.

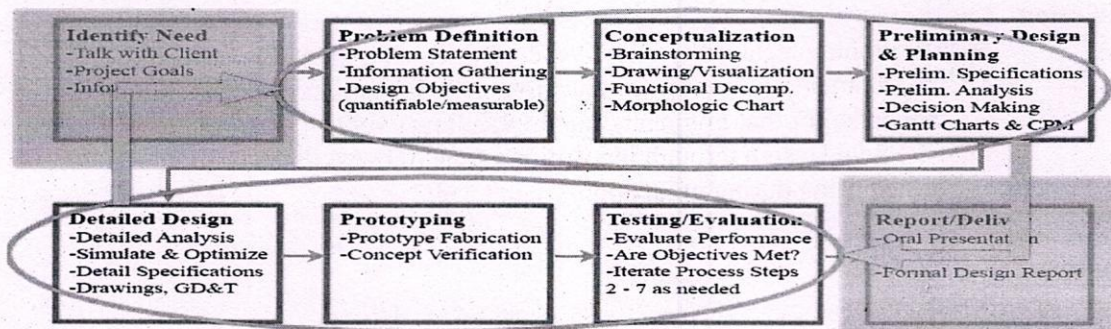
❖ Difference between Design and Engineering Design

Design	Engineering Design
The specification of an object manifested by an agent, intended to accomplish goals in a particular environment using a set of primitive components, satisfying a set of requirements subjected to constraints	Engineering Design is the process of devising a system, component or process to meet desired needs. It is decision-making process (often iterative), in which the basic sciences, mathematics and Engineering sciences are applied to convert resources optimally to meet the stated objective
Design is often used in two different contexts: Action or understanding (verb) Physical construct of object of plan (noun)	The fundamental elements of the Engineering design process include: the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation.
There are many ways to define design and they may depend on a specific context or field of design	The formal definition of engineering design depend on the specific engineering

❖ The “General Design” process Model.



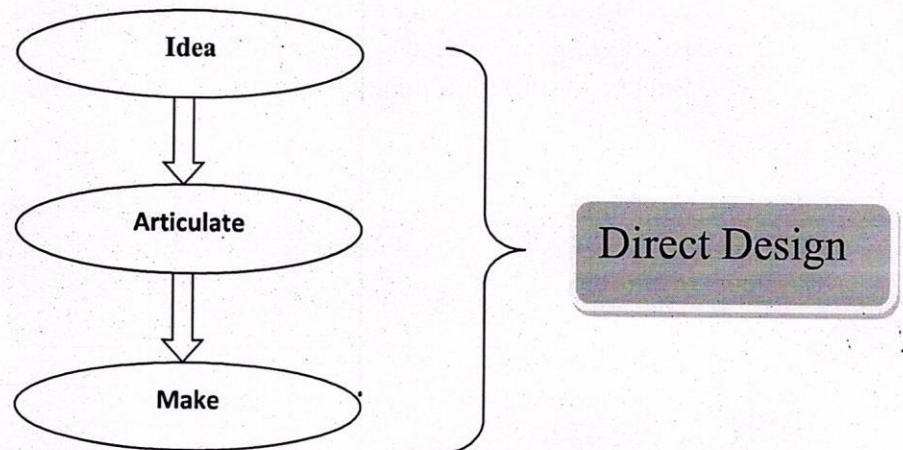
Design Process Iteration



Origin of Design thinking:

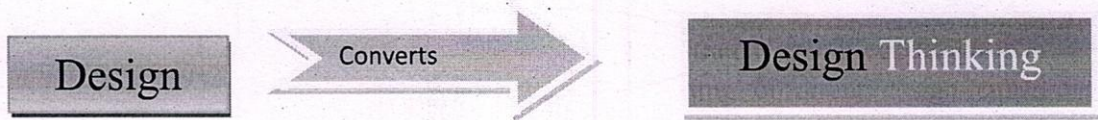
Design to Design thinking

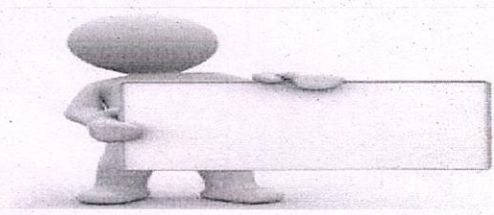
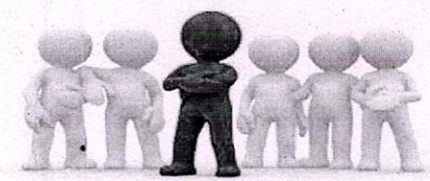

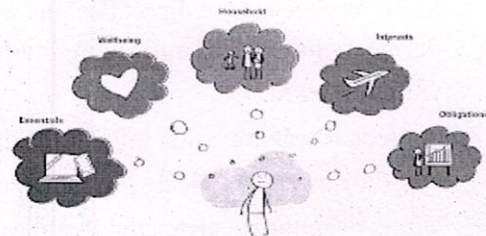
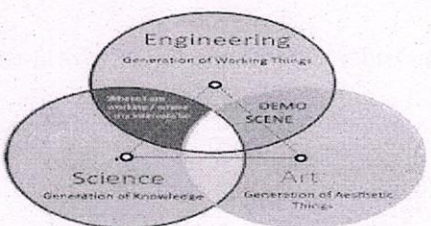
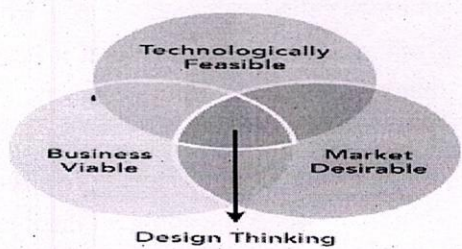
- Design or making , has been classically understood to be a process of turning ideas into things
- In this design process there is a vision or an idea, it can be figured out by some drawings work with fabrications of crafts and if everything worked out right then it be materialized.
- So, there is a direct correspondence between ideas, drawings, and finished products. This design process called as Direct Design
- This is what most people understand design to be, and what they understand designers to do that they turn their creative ideas into things.



- The primary issue to direct design is preeminence to ideation. The core logic of direct design is that ideas come first and then making comes after.
- While doing the direct design it marginalizes and ignores the agency of things, environments, users and relations.
- In 21st century these direct designs were taught as type of closed design process where designers have ideas and figure out how to realize separately from a deep engagement with the world.
- It becomes obvious that human making could not effectively happen separate from the world of users, practices, problems, needs, politics so on.
- Direct designs are criticized that these are not responsive to real world conditions.
- From an awareness of the power of engagement ,a new and expanded form of design emerged called as Responsive design
- Responsive design is just that it begins in a considered response of the world rather than an idea comes from designers.
- Responsive design at its best shifted the focus of design way from the narrow idea of designers and design as being focused on independently making beautiful things.
- Design now become about all the interactive processes needed to make anything come into being. Responsive design came in many from environmental design to human centered design
- In responsive design the most popular form is “Design thinking”

- “Design thinking is simply a form of human centered responsive design broad name “Design Thinking”
- The simplest way to understand how responsive design transforms direct design is to see that it adds a new critical step prior to beginning of direct design called Consultation. Responsive design does not replace direct design so much subsumes it.
- During consultation the design thinking variants of design asks: what are up to? What are the problems? Then the phase of ideation becomes collective: brain storming, group improvisation and other collaboration exercise are added to mix.
- Then response design works as iterative loop. This loop is significant because it allows the object to evolve through testing and use and not come out of designers thought.
- Response design has had an enormous impact for good. Environmentally centered design is of great value as is user centered design
- A huge part of design thinking appeals that it claims to be an exceptional source of innovation



 <p style="text-align: center;">individual</p>	 <p style="text-align: center;">Teams</p>
 <p style="text-align: center;">Products</p>	 <p style="text-align: center;">Experience</p>
 <p style="text-align: center;">Design is a combination of Engineering + science + Art</p>	 <p style="text-align: center;">Design thinking is a combination Technology(Engg) + Business + Humans</p>

Definitions of Design Thinking:

- Design thinking is a methodology that designers use to brainstorm and solve complex problems related to Designing and Design engineering.

Or

- Design thinking is a human- centered approach to innovation that draws from the designer's toolkit to integrate the needs of people , the possibilities of technology, and the requirements for business success—Tim Brown CEO of IDEO

Or

- There is no general agreement on precise definition of design thinking. There are variations across disciplinary cultures, and different meanings depending on its context

Or

- A process that results in a plan of action to improve situation

Or

- An approach that frames problems creatively and generates innovative solutions , strategies , systems and paradigms at the nexus of domain

Or

- Design thinking is a human centered innovation process that emphasizes observations, collaboration, fast learning, visualization and rough prototyping. The objective is to solve not only the stated problems at hand, but the real problems behind the obvious—Thomas Lockwood

Or

- Design thinking refers to creative strategies designers utilize during the process of designing

Or

- Design thinking can be described as a discipline that uses the designer's sensibility and methods to match peoples' needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity---Tim brown

Time line of Design thinking:

Year	context
1963	The idea of using Design as a way of solving complex problems in a simplified manner in sciences originated in the book ' The science of the Artificial' authored by Herbert A. Simon
1973	The idea of design was achieved for Design Engineering by the book 'experiences in visual thinking' authored by Robert McKim
1982	Design methodology is defined by "cross" the study of the principles ,practices and procedures of design are developed .and includes the study of how designers work and think
1987	Peter Rowes Book Titled " design thinking" describes methods and approaches that planners, designers and architects use
1980s to 1990s	The work of Robert Mckim was consolidated by Rolf Faste at Stanford university during this period
1991	David M Kelly Founded IDEO and adapt Design thinking to business interests
2009	The design thinking process itself is human centered ,offering methods for inspiration, ideation and learning to designers --Brown
2012	Apply the study of design thinking principles in engineering.
2015	Verbal protocol analysis ,cognitive ethnography , controlled laboratory experiments, and other formal methods from cognitive science have been rigorously applied in engineering
2017	Design thinking reflected in many applications like prototyping, solution based method is often useful way to encourage inspiration, ideation and organization learning and human centered methods.

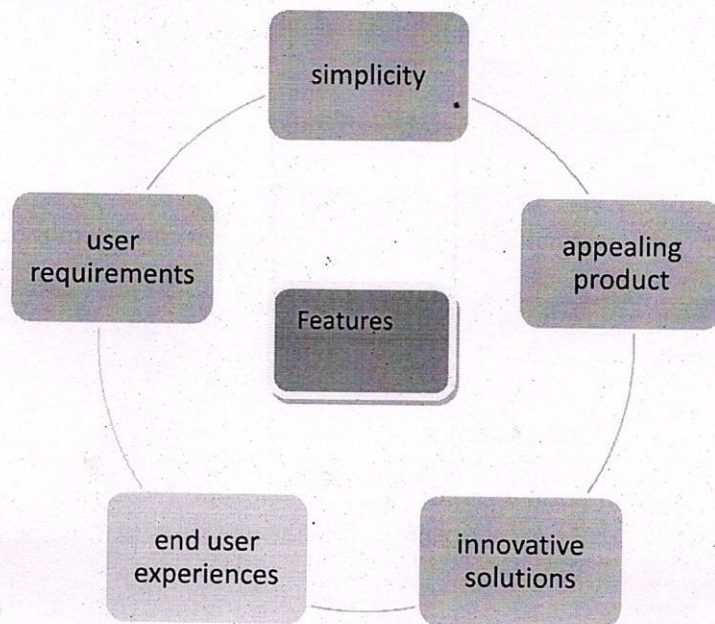
- The term design thinking has been applied in two different approaches related to areas of conceptual development.
- The first established body of knowledge, starting in the late 1960's investigates how designer (architects, industrial designers, graphic artists) perform their craft and seeks to identify the skills, abilities and knowledge of expert designers.
- The second use of design thinking is related to business management .since the mid 1980's interest within the business community grew in exploring how "designer" thinking could be applied to business challenges, and be performed by employees and leaders not trained formally as designers.
- Design thinking is a **blend of logic, powerful imagination, systematic reasoning** and intuition to bring to generate the ideas that consists to solve the problems of the clients with desirable outcomes .it helps to bring creativity with business insights.
- Design thinking helps to **gain a balance between the problem statement and the solution** developed

Features of design thinking:

Design thinking provides multi dimensional solutions to the problems.

Features are:

- Finding simplicity in complexities
- Having a beautiful and aesthetically appearing products
- Improving clients and end users quality of experience
- Creating innovative, feasible and viable solution to real world problems.
- Addressing the actual requirements of the end users.



Use of design thinking:

- The basic principle of design thinking is that innovation can be disciplined

Design thinking helps to learn the following

- How to optimize the ability to innovate
- How to develop a variety of concepts, products, services, processes etc for end-users.
- How to leverage the diverse ideas of innovation
- How to convert useful data , individual insights and vague ideas into feasible reality
- How to connect with the customers and end-users by targeting their actual requirements.
- How to use the different tools used by designers in their profession for solving customers problems

Design Thinking helps in

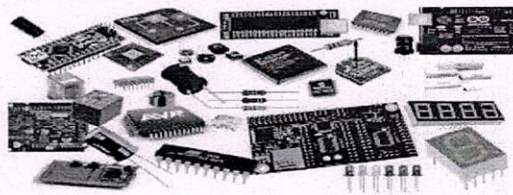
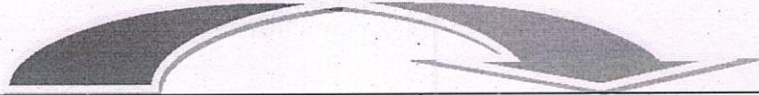
Optimization of capabilities

Feasibility and viability analysis

Addressing the needs of end users

Changing paradigms:

- Changing paradigms can be essential to achieving and attracting what you desire into your life
- A paradigm by definition is: 'a typical example or pattern of something' or a model. Paradigm is a pattern or programming through constant repetition of a thought, phrase, belief or habit.
- Some paradigms that takes place over the last few decades



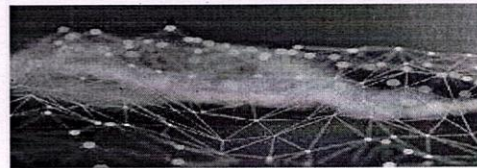
Components



systems



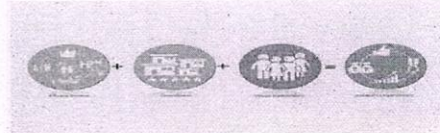
Sensors



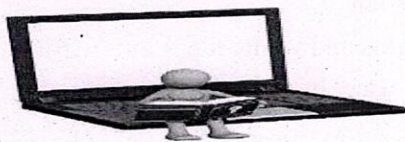
Smart networks



Products



Services & experiences



Stand alone system



Cloud

Conclusion: all these shifts take place not by Doing the right things but Doing the things right

Doing the right things shows path to the problem finding ways

Doing the things right shows path to problem solving ways

Doing the things right be one of the strategy for design thinking

- Design thinking draws upon logic ,imagination, intuition and systemic reasoning , to explore possibilities of what could be and to create desired outcomes that benefit the end user (customer)
- A design mindset is not problem-focused; its solution focused and action oriented. It involves both analysis and imagination.

❖ Thinking of Design



To imaging, visualizing, dream -up, new understanding, new practice and new applications

❖ Thinking about Design



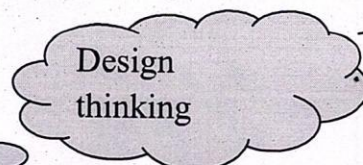
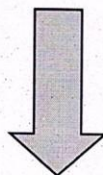
To consider, expectations, capabilities and collaborations

❖ Thinking through design



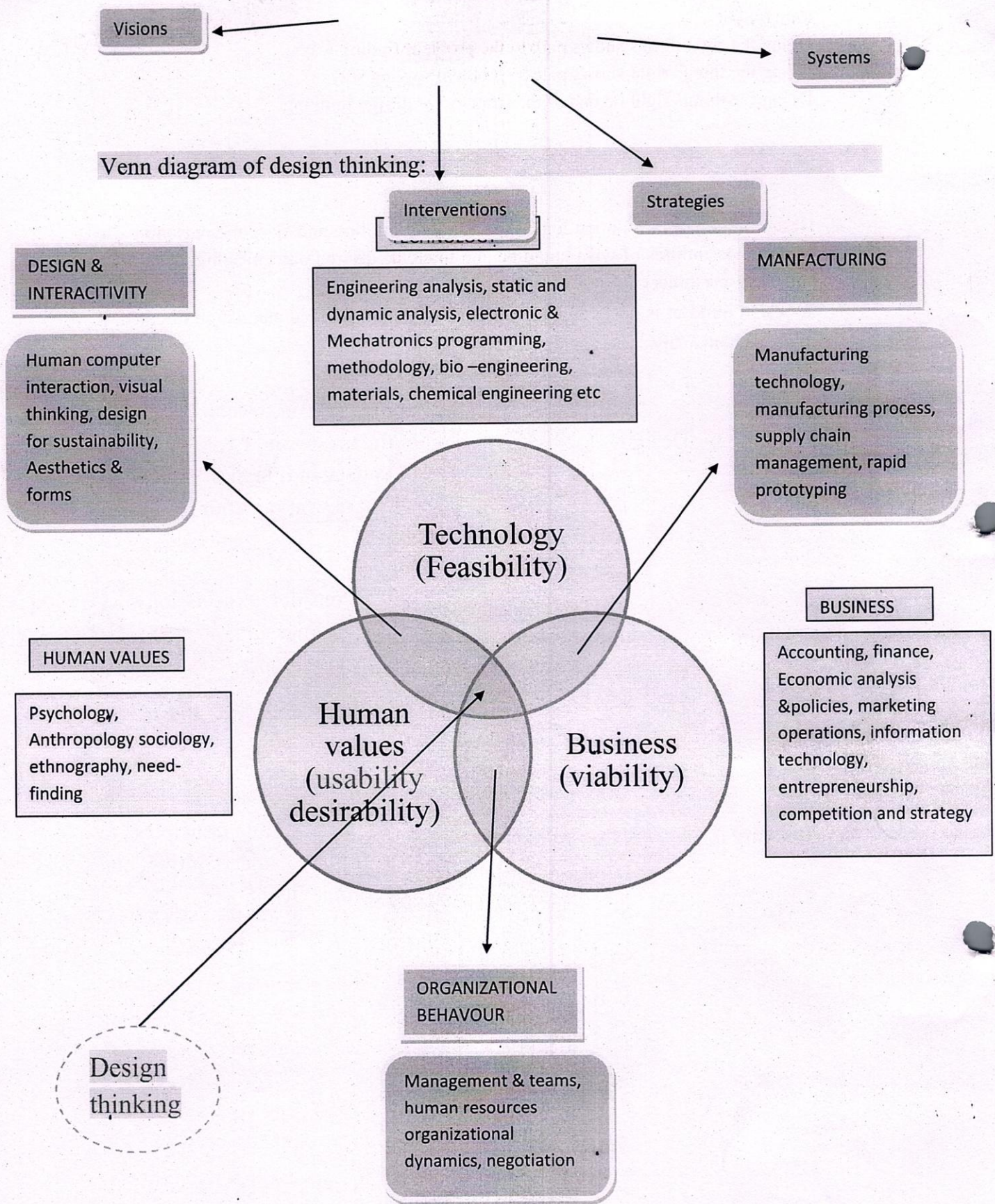
The ability to use design methods and principles to address uncertainty and complexity

❖



Experiences

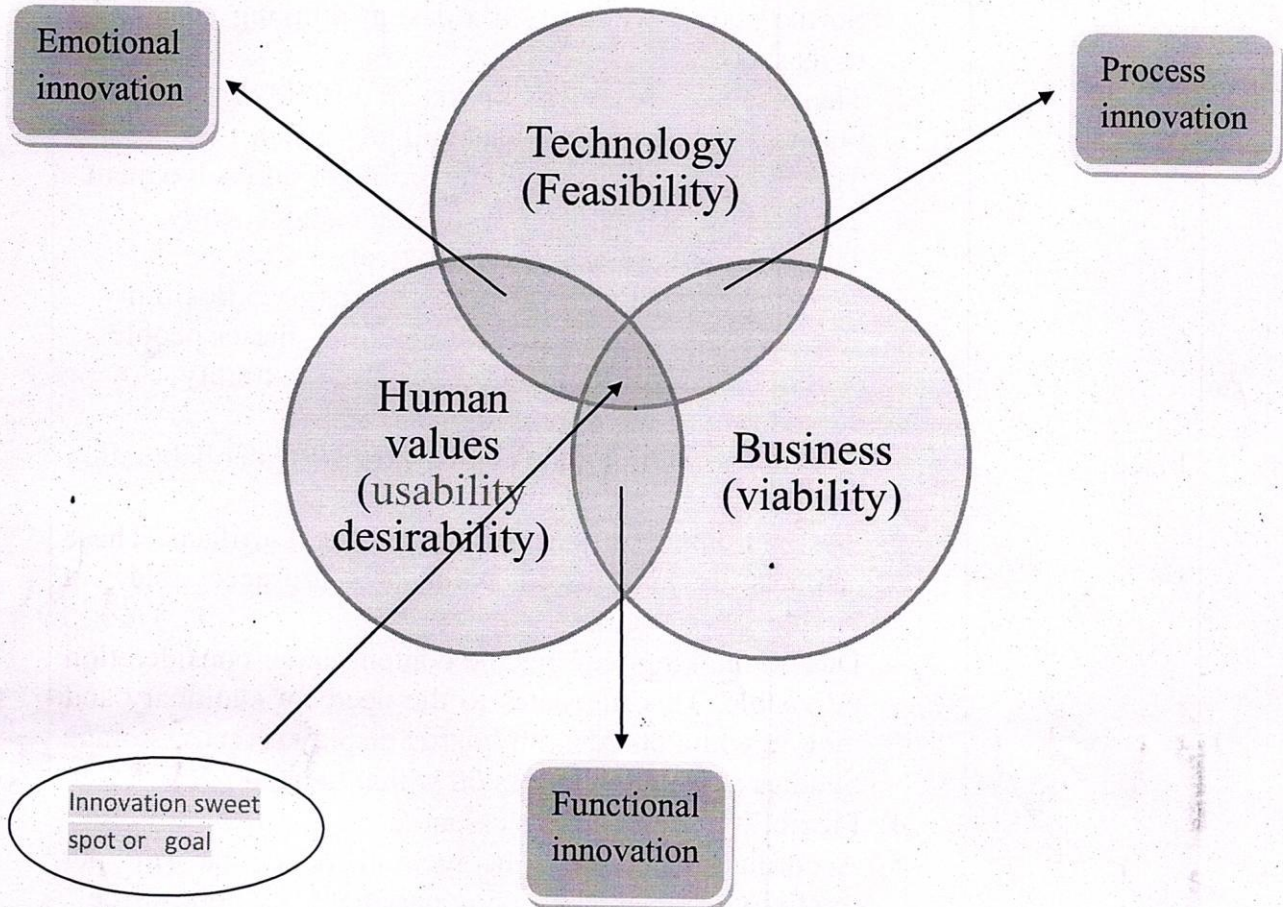




➤ Desirability tests whether the innovation is solving the customer problem rightly

- Feasibility tests whether the innovation strengthens the business or not
- Viability tests the value chain for long term sustainability

❖ Design thinking & value creation (innovation)






- Desirable, feasible and viable are three important lenses for innovation through design thinking
- Desirable (people want it), feasible (what can actually do it) and it has to be viable (don't go break)

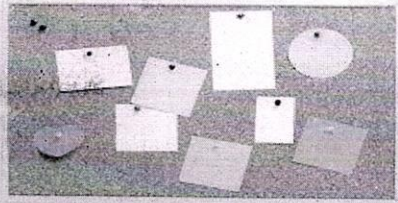


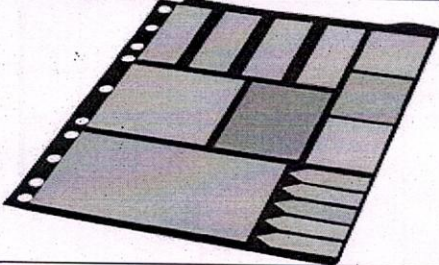
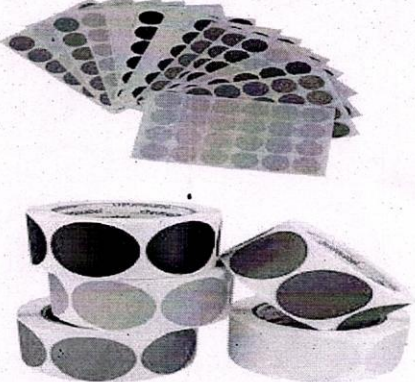

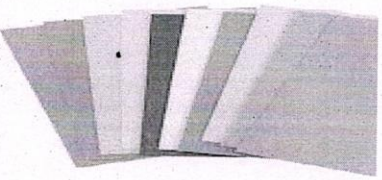
Design thinking resources:


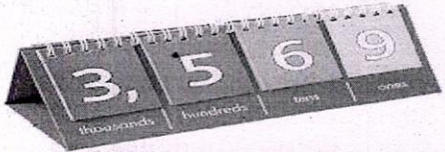
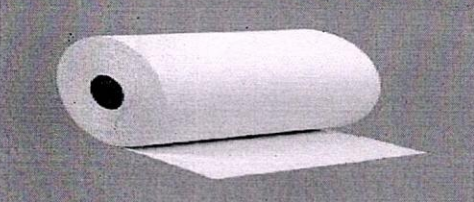


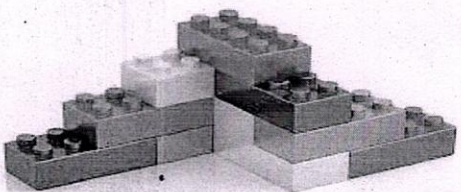
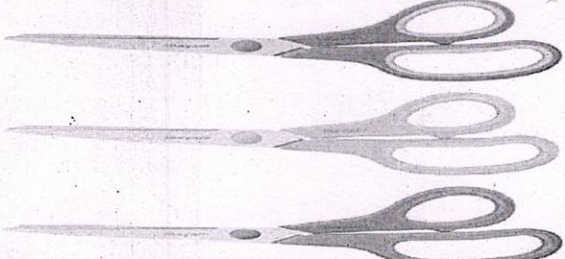
- In order for design thinking to succeed, the right ingredients need to be assembled. The desirable workspace, the materials often used in design

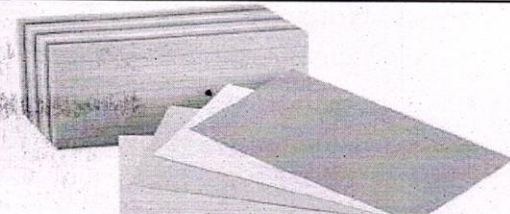


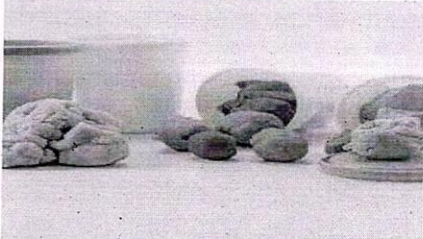
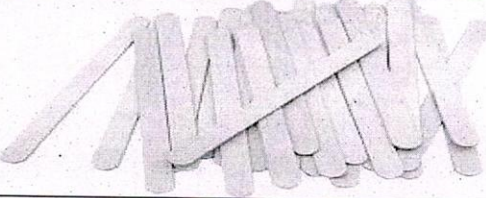
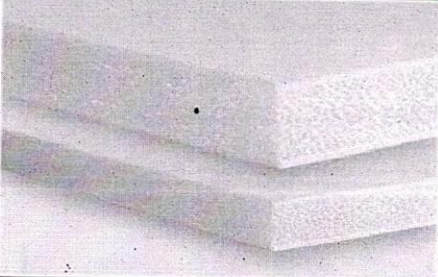
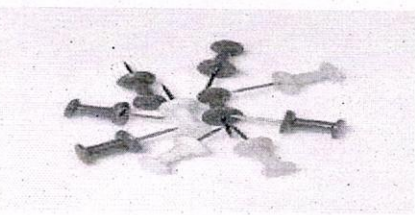
thinking, and finally the needed integration and cooperation between the design –thinker’s team and the organization.

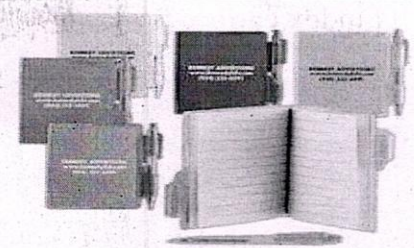
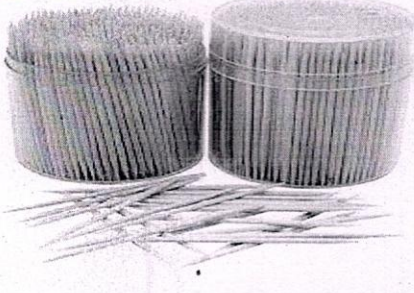
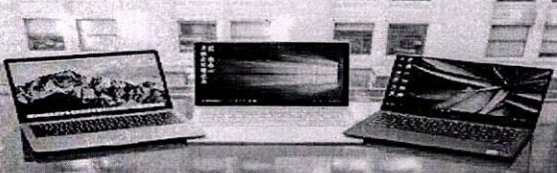

➤ The resources are 1. **People** 2. **Place** 3. **Materials** 4. **Organization**

<p>People</p>	<ol style="list-style-type: none"> 1. The individuals that are needed are those who are willing and able to adopt the design –thinking mindset. So the people working on a design thinking are critical to its success 2. These people are experts in system or field or area of the business. They are observant and they listen 3. They have the ability to frame problems and solve them. 4. They can think strategically and execute tactically. 5. They are both creative and analytical 6. They are communicative and comfortable to flexibility 7. The team that emerges from assembling these people should have a spirit of shared purpose, flexibility, collaboration, and mutual support. 		
<p>Place</p>	<ol style="list-style-type: none"> 1. A space needs to be located that facilitates collaboration and imagination. 2. Design thinking produces many physical artifacts. These artifacts are most useful when they are accessible and visible. 3. Design thinking requires the content under consideration be visible. This translates to the need for stationary and mobile white boards, pin boards display screens, storage buddies and large surfaces on which to hang 4. Flexibility of furniture is essential. 5. According to Lewrick he recommended that 5m² per participant be used as sizing parameter for good space 6. Space, like money and time is often a scarce resource 7. The actual size of the space may become a limiting factor on how large the team and collaborative activities can be. 		
<p>Materials</p>	<ol style="list-style-type: none"> 1. Making and visual idea transfer are essential elements of design thinking, for that materials are needed 2. list of materials typically needed <table border="1" data-bbox="483 1585 1374 1816"> <tr> <td data-bbox="483 1585 746 1816"> <p>white boards</p> </td> <td data-bbox="746 1585 1374 1816">  </td> </tr> </table>	<p>white boards</p>	
<p>white boards</p>			

pin boards	
whiteboard markers	
colored pencils	
sticky notes of various shapes and colors	
colored adhesive dots	
Hanging strings	
colored sheets of paper (A4)	

pipe cleaners	
flip charts	
large rolls of paper	
tape (cellophane, masking)	
Glue	
Lego blocks	
Scissors	

index cards	
audio and video capture tools and analyzers	
Paper	
play dough	
popsicle sticks,	
foam core	
Push pins	

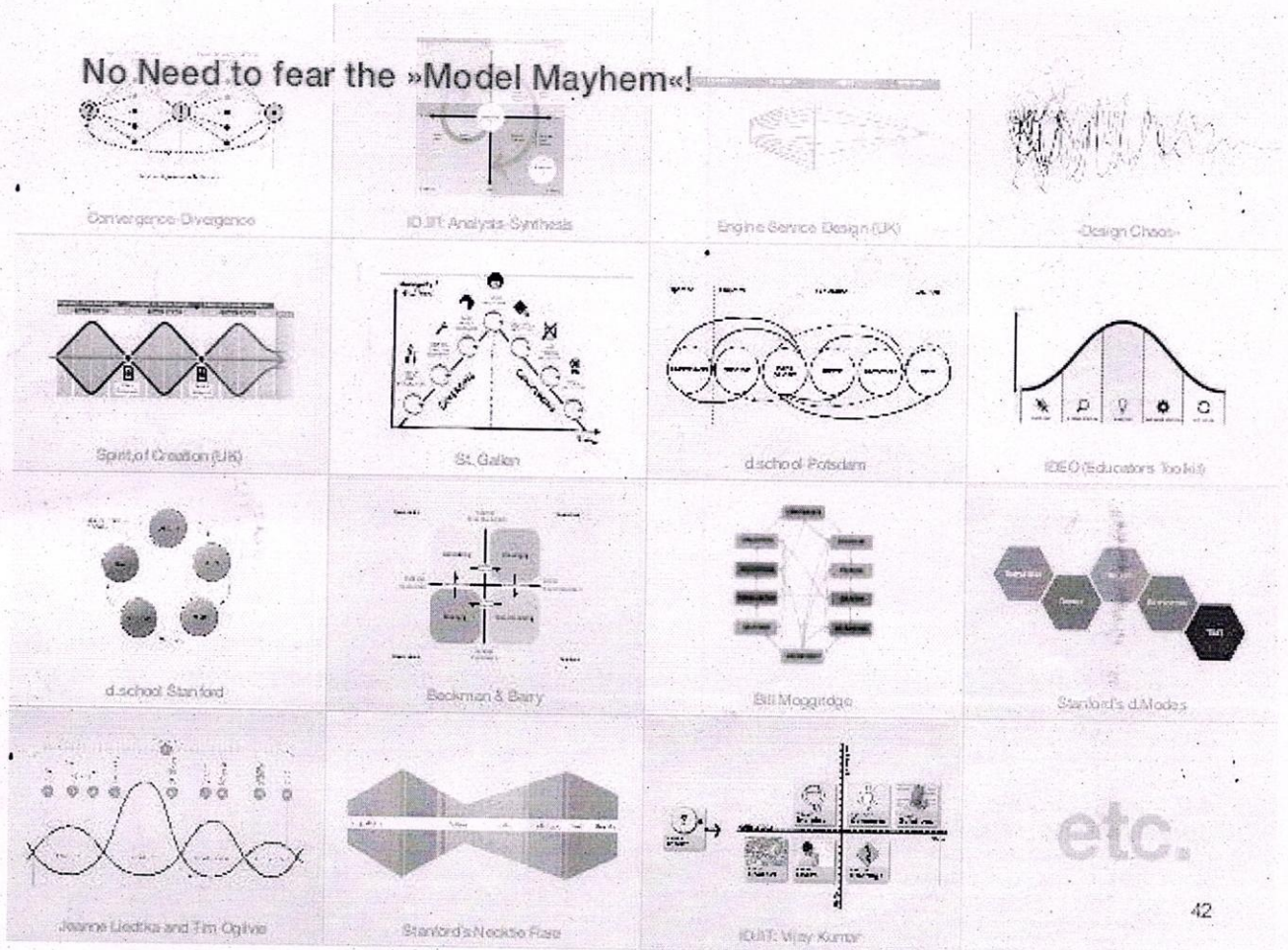
	Notepads & pens	
	Tooth picks	
	Laptops	
		
organizations.	<p>Locating and accessing design thinking people may require the organization to permit the functional structure to relent and allow enterprise benefit to supersede design thinking objectives</p>	

Design thinking process Models:

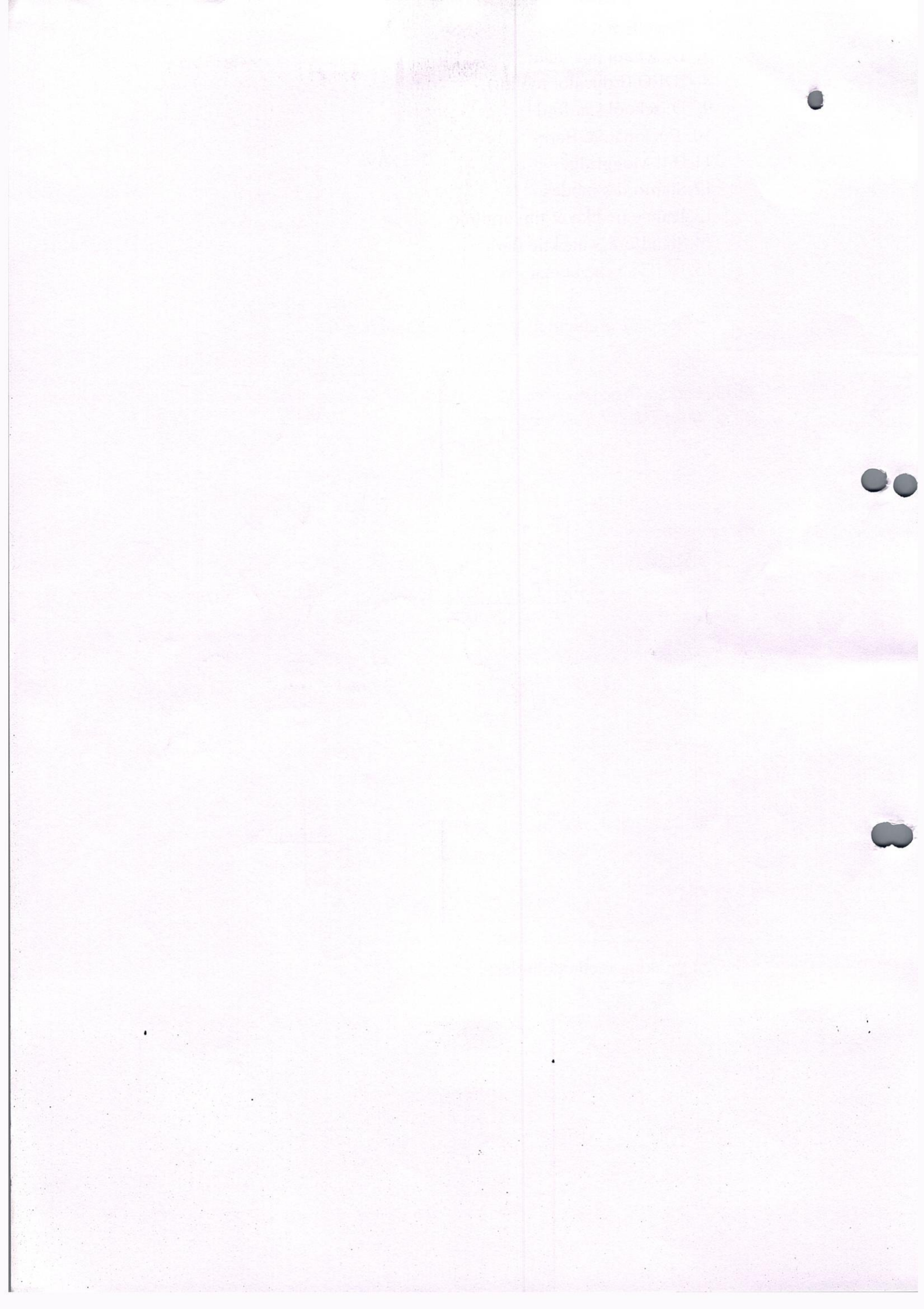
- "Some people think design means how it looks. But of course ,if you dig deeper ,it's really how it works" ----steve jobs, Apple
- Models:
 1. convergence –divergence
 2. Id.iit-analysis –synthesis model
 3. Engine service design (uk)
 4. Design chaos
 5. Spirit of creation

6. St galle
7. D. school post dam
8. IDEO (Educator toolkit)
9. D. school stanford
10. Beckman & Barry
11. Bill Moggridge
12. Stanford's modes
13. Jeanne Liedtka & Tim Orgilnie
14. Stanford's necktie flare
15. IIT: Vijaykumar

➤ Innovate problem solving = design thinking

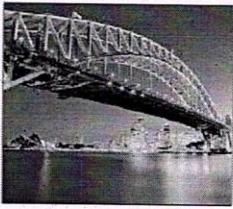


Design thinking methodologies:



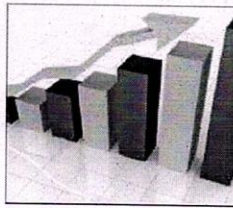
DIFFERENT KINDS OF THINKING:

ENGINEERING THINKING



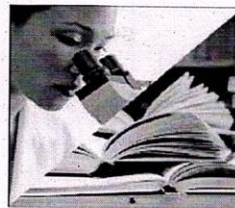
Solve your way forward

BUSINESS THINKING



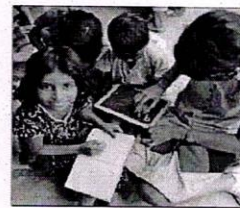
Optimize your way forward

RESEARCH THINKING



Analyze your way forward

DESIGN THINKING



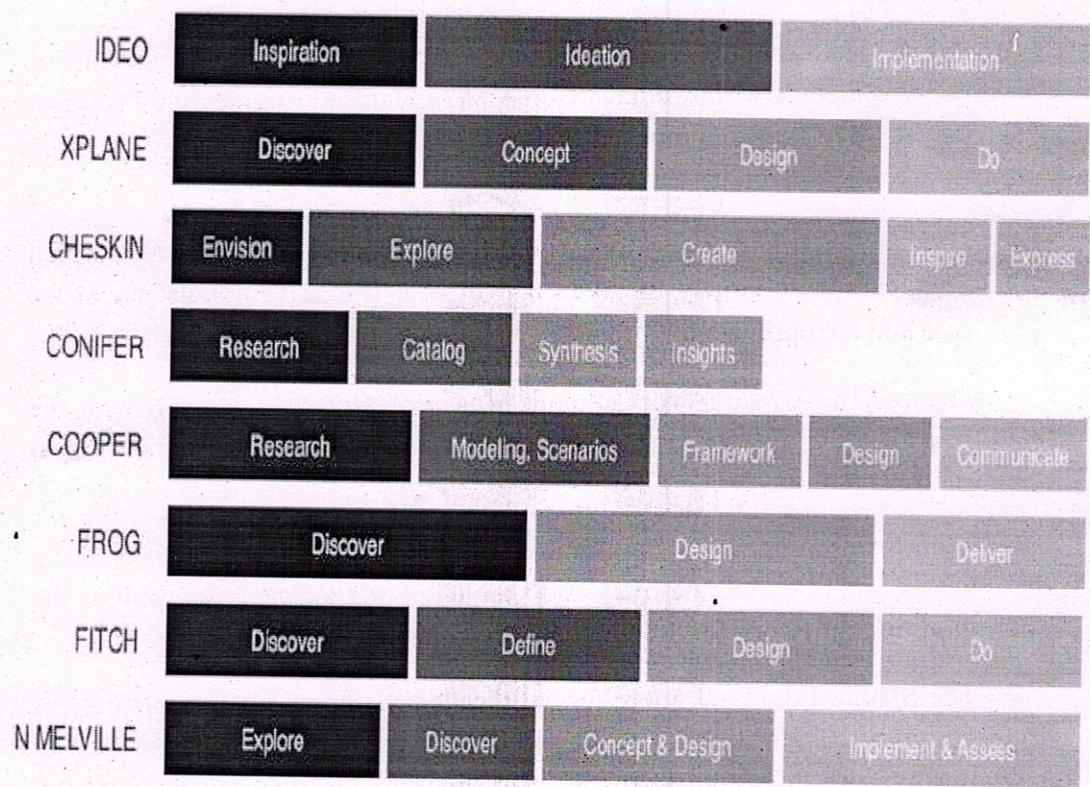
Build your way forward

5-Stage d.School Process:

- In 1958, four months after Sputnik (first artificial Earth Satellite) launched and President Eisenhower created NASA, a Stanford Engineering Professor named John Arnold proposed that design engineering should be human-centered.
- This was a strange thing for Arnold to introduce. It was an era in which Engineers were largely focused on twin cold war driven goals: the space race and the optimization of hydrogen bomb.
- Inspired by Arnold's work, Engineering professor Bob Mckim, with the help of art professor Matt Kahn, created an Engineering Program called Product Design.
- Within this program Mckim and others helped create a design thinking process that became the foundation for Stanford's d.school, as well as the guiding framework for design-driven companies like IDEO.
- The Stanford d.school, more formally called the Hasso Plattner Institute of Design at Stanford, is an academic collaboration between Hasso Plattner Institute in Potsdam, Germany and Stanford University in Stanford, California.
- The Stanford d. school was one of the first d.schools or design schools formed around design-thinking approaches to design.

Stanford	Empathize	Define	Ideate	Prototype	Test
Frog CAT	Seek	Build	Imagine	Plan	Make
IDEO Ed.	Discovery	Interpretation	Ideation	Experimentation	Evolution

DIFFERENT MODELS TO DO DESIGN THINKING



	into an actionable problem statement or design vision tailored for the users.
Ideate	Within the context of the problem statement , the team generates many radical design alternative that explore the solution space
Prototype	At this stage ,promising design alternative are made tangible with which the team, users and others will experience and interact
Test	Prototypes are placed into appropriate contexts of user's lives the goal of gathering thoughtful feedback, learning and refining solutions.

➤ Beyond suggesting the 5-stage process model, Stanford d.school advocates for six attributes of the design-thinking mindset.

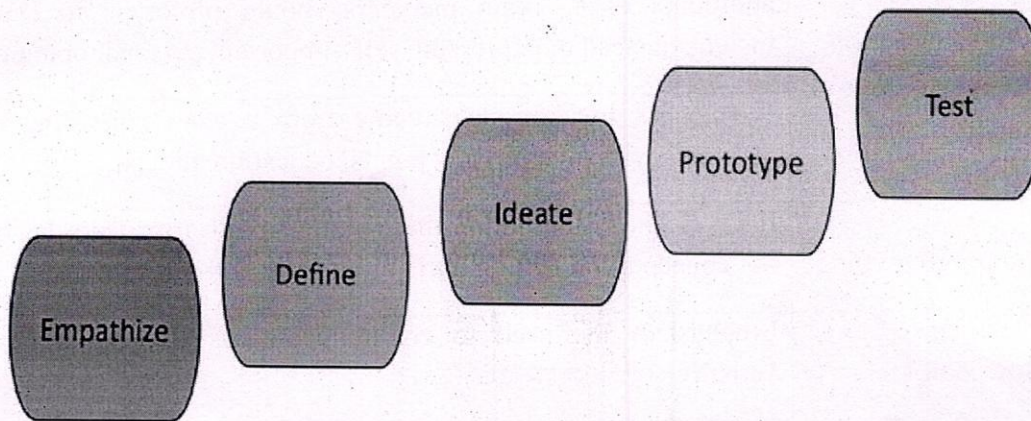
➤ Those are

- Human centered
- Bias towards action
- Radical collaboration
- Culture of prototyping
- Show, don't tell
- Mindful of process.

Human centered	It is the idea that design thinkers should identify with the users challenges and develop solutions that address their needs.
Bias towards action	It directs design thinkers to solve problems instead of finding additional ones. Team members should prototype to learn insights instead of expressing self –important personal opinion.
Radical collaboration	It suggests breakthroughs come from a team consisting of members with diverse view points, education and experiences.
Culture of prototyping	It is related to the notion that solutions will arise from trying out concepts and getting users input early and often.
Show ,don't tell	Emphasizes the need to communicate visually rather than verbally
Mindful of process	It encourages teams to be aware of stage the project is in, and what needs to accomplish in the current stage.

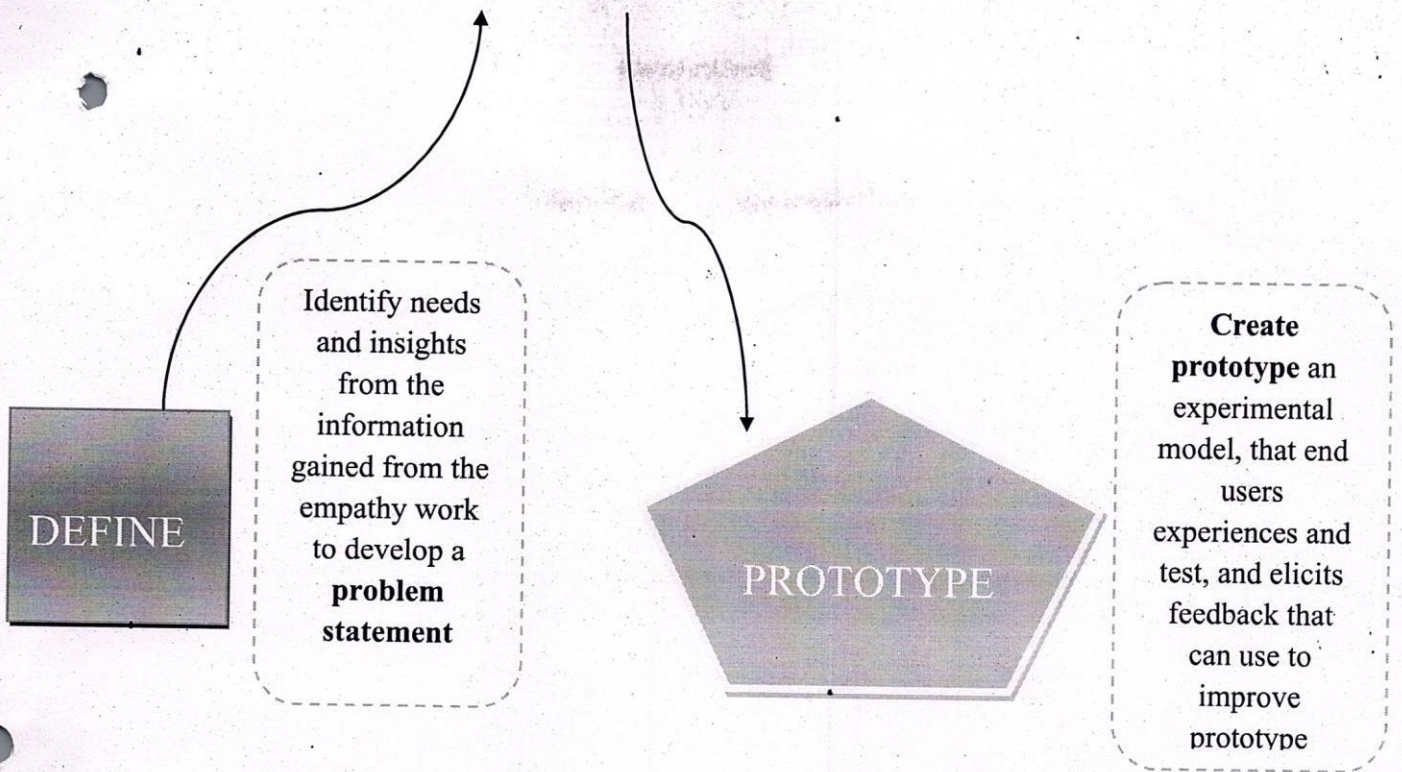
❖ In addition to the above mind sets views the following points are also considered for good designing thinking process

- Their process model has changed from 6 stage model of understand, observe, point of view, ideate, prototype, and test to a 5-stage process model of Empathize, Define, Ideate, Prototype and test.
- The stages of understand and observe were consolidated to Empathize according to Lewrick. The stage titled point of view was adjusted to become define in 5-stage model
- Design thinking brings everyone into the process, not just designers: using the design process helps companies to solve the wicked problems with clear eyes
- Design thinking is making organizations think about how to move faster ...with iterative speed
- The organizations that use the toolset of design thinking can confidently create better, human-centered user experiences and disruptive products.
- The design thinking process is not necessarily linear nor is there one canonical way to approach it. It is an iterative system with many variations. However, **stand ford's d.school teaches a framework that can help to start the process for almost any problem**



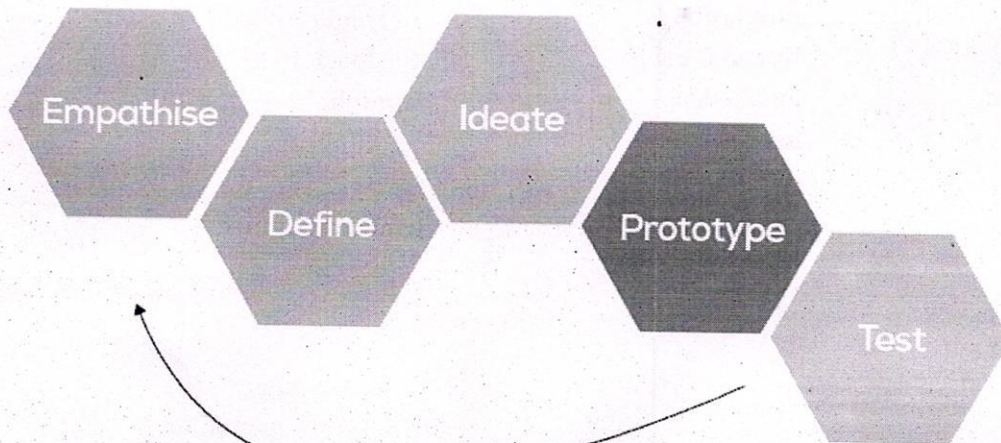
- In the Stanford d school's process model, the stages have the following objectives

Empathize	The stage is oriented towards understanding the intended users and the problem from their viewpoint by observation, engagement and immersion.
Define	At this stage the needs and insights discovered in empathize are transformed



Some more light on 5stage Stanford



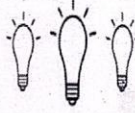
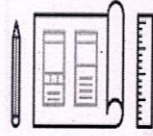
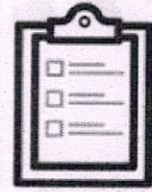
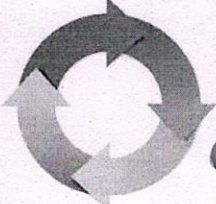
An iterative cyclic proces



Those are

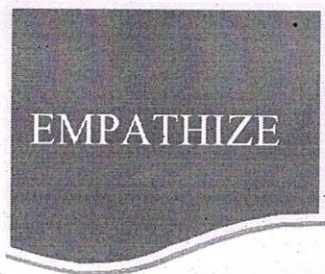
- Improve and learn from failure
- Creative confidence
- Growth mindset
- Beginner's mindset

5 stages of Stanford:

1	2	3	4	5	
Empathize	Define	Ideate	Prototype	Test	Iterate
	Define 	Ideate 	Prototype 	Test 	Iterate 

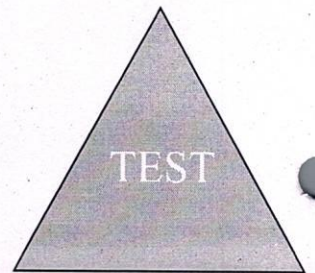
Supporting points of Stanford d school frame work.

Design thinking is toolkit for creating problem-solving. The **process does not have to be linear**. It can jump from one phase to any other phase based on need.

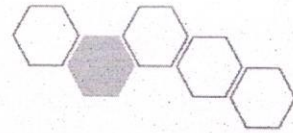


Perform **empathy work** interviews, observations, research etc to gain a deep understanding of end users and challenges

Have end users experience the prototype, test it out and provide feedback to help bring light new understandings to make the prototype better



Sketch as many ideas as possible at the start. Focusing on quantity and then choose the most intriguing and **optimal ideas** to move forward in making them into



Define

Process and synthesise the findings in order to form a user point of view that you will address

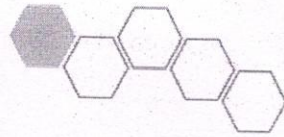
- **User:** develop an understanding of the type of person you are designing for
- **Needs:** synthesise and select a limited set of needs that you think are important to fulfil
- **Insights:** express insights you developed and define principles



Ideate

Focus on idea generation. You translate problems into solutions. Explore a wide variety and large quantity of ideas to go beyond the obvious solutions to a problem.

- **Creativity:** combine the un/conscious with rational thoughts and imagination
- **Group synergy:** leverage the group to reach out new ideas and build upon other's ideas
- Separate the generation and **evaluation** of ideas to give imagination a voice



Empathise

Understand the experience, situation and emotion of the person who you are working for

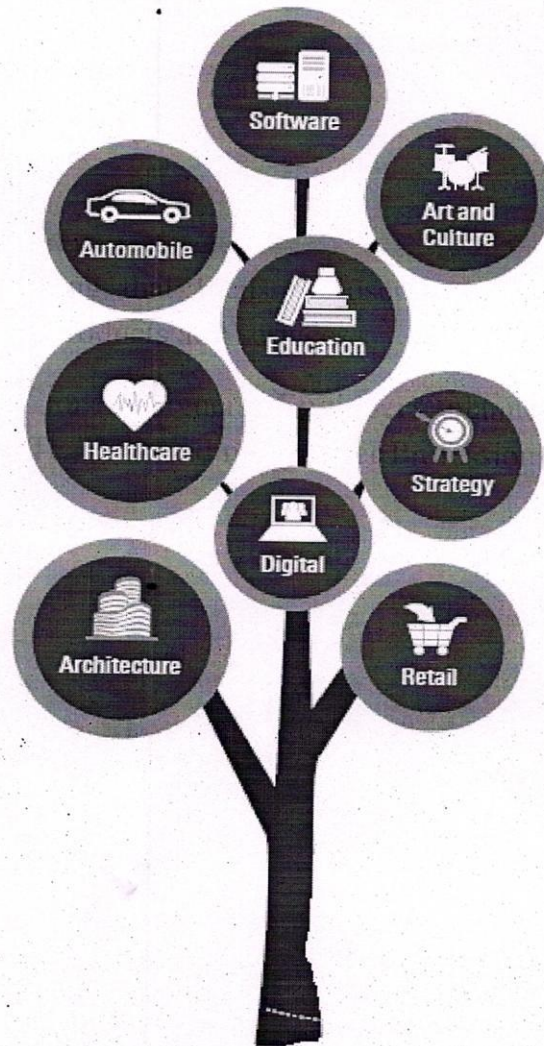
- **Observe** users and their behaviour in the context of their lives.
- **Engage** with people in conversations and interviews. Ask why.
- **Watch and listen:** ask someone to complete a task and tell you what they are doing

Application of Design thinking:

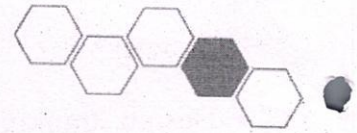
- Design thinking is a problem solving that focus on users and their emotional needs while experiencing products and services.
- Design thinking approach is useful for Designers, **Engineers**, planners, Managers, strategists, Economists, Teachers and many other Professions

Design thinking having wide range of applications across different domains:

- Automobile
- Health care
- Architecture
- Software
- Education
- Digital
- Retail
- Art and culture
- strategy



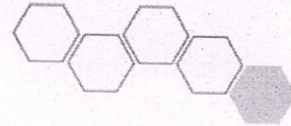
Applications of DT



Prototype

Build to think. A simple, cheap and fast way to shape ideas so you can experience and interact with them.

- **Start building:** Create an artefact in low resolution. This can be a physical object or a digital clickable sketch. Do it quick and dirty.
- **Storyboard:** create a scenario you can role play in a physical environment and let people experience your solution



Test

Ask for feedback on your prototypes. Learn about your user, reframe your view and refine your prototype.

- **Show:** let people use your prototype. Give it in their hands and let them use it. Listen to what they say.
- **Create experiences:** let people talk about how they experience it and how they feel

❖ **The more discussion on the above steps will learn on the subsequent chapters**

- Design thinking and Engineering systems thinking are two complementary approaches to understanding cognition, organization, and other non technical factors that influence the design and performance of Engineering systems
- Design thinking methods have been applied to industrial design and product development, while engineering systems thinking is used in professional systems engineering practice and large-scale, complex system design.
- System dynamics is a foundation method in system engineering – an interdisciplinary field of formalized approaches for designing and managing large-scale, complex engineered systems throughout the life cycle.
- Systems engineering methodology offers a process for technical management of sophisticated quantitative techniques are used to organize and coordinate work activities, evaluate technical systems interactions, and assure system quality and performance.
- Systems engineering has drawn from operations research and management science to develop mathematical models of human performance. Example of classical quantitative approaches to management includes Markov analysis, linear /dynamic programming, decision theory, and game theory etc.
- Systems engineers are well-trained to manage technical system consolidation, but the associated between social and organizational are more difficult to govern in practice.
- Existing analytical methods hard OR methodology are in applicable or ineffective for solving problems associated between social and organization. Nonetheless ,systems engineering are expected to play ambidextrous roles and have the professional responsibility of “system thinking” i.e **designers who manage technical as well as social and organizational constraints in dynamic environments**
- Understanding how systems engineers evaluate technical and social relationships- and leverage this information to successfully design and manage complex systems – is a challenge in modern systems engineering practice.

❖ **Business:**

- Design thinking helps in business by optimizing the process of product creation, marketing, and renewal of contracts.
- All these processes require a companywide focus on the customers and hence, design thinking helps in these processes immensely.
- Design thinking helps the design thinkers to develop deep empathy for their customers and to create solutions that match their needs exactly.

❖ **Information technology:**

- The IT industry makes a lot of products that require trials and proof of concepts.
- The industry needs to empathize with its users and not simply deploy technologies.
- IT is not only about technology or products, but also it is process.
- The developers, analysts, consultants, and managers have to brainstorm on possible ideas for solving the problems of the clients. This is where design thinking helps a lot.

❖ **Education :**

- The education sector can make the best use of design thinking by taking feedback from students on their requirements, goals and challenges they are facing in the classroom.
- By working on their feedback, the instructors come up with solutions to address their challenges.

❖ **Health care:**

- Design thinking helps in health care as well as the expenditure on healthcare. The cost of healthcare facilities is growing day by day.
- Experts worldwide are concerned about how to bring quality healthcare to people at low cost
- Using design thinking, the efficiencies in the system and the perennial crises were addressed

➤ **Design thinking for Engineering:**

- The inclusive concept model describes engineering systems thinking as a specific application of design thinking, in which design thinking principles, methods and processes are applied to complex systems design problems.
- Integrative concept model suggests that design thinking might be the critical skill for design at both the product and system level and the Engineering system thinking might (EST) not be practically distinguishable from design thinking (DT)
- These models do not suggest single correct representation of the design thinking and Engineering system thinking relationship. Further research and studies are going on these models.

The Distinctive Concept Model:

- The distinctive concept model of design thinking and engineering systems thinking describes two unique concepts with different histories, values, themes, and applications

Design thinking

- **Origins:** Industrial design, Engineering design/product development, psychology
- **Capture human process:** inspiration, ideation, and implementation.
- **Values:** practicality, empathy, innovation

Engineering systems thinking

- **Origins:** cybernetics, management science, operation research, system engineering
- **Captures system process:** inputs, outputs, and feedback loops
- **Values:** interaction, emergence, interdependent

- Design thinking has origins in psychology, industrial design, and product development, and is a method for generating innovative,

- Engineering systems thinking shares a foundation with systems science, thus values and applications bear strong resemblance to those of general systems theory, cybernetics and systems dynamics.
- Systems receive inputs from the environment, execute processes that transform these inputs into outputs, and send these outputs back into the environment in feedback loop.
- Engineering systems thinking is system-centered, i.e it is used for conceptualizing systems, their individual components, and interactions between those components to help designers anticipate emergent features and design robust and resilient systems.
- Contemporary research in Engineering system thinking seeks to make the approach more human-centered (design thinking approach)

Concept models for comparing design thinking and engineering systems thinking:

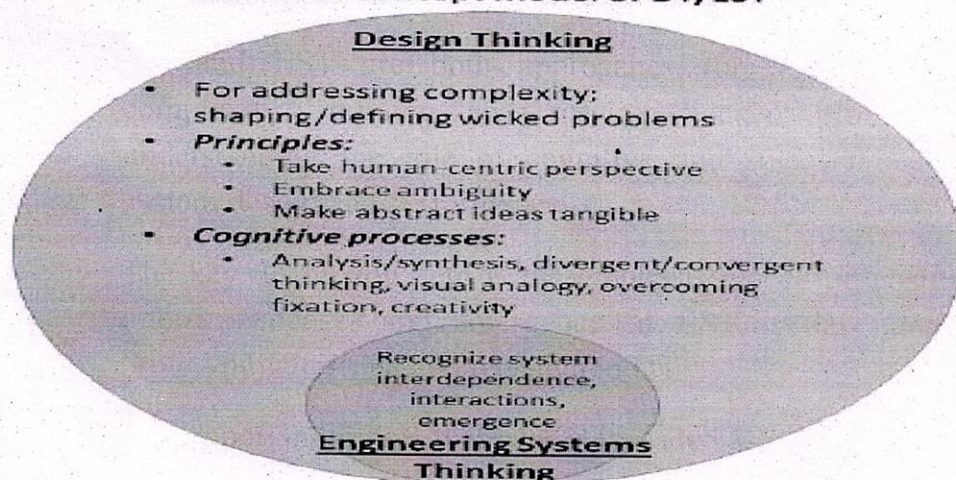
- ❖ Design thinking and engineering systems thinking are using four general themes: history, values, applications and methods.
- ❖ By organizing these themes into models called “concept models”.
- ❖ Concept models visually represent different perspectives on the relationship between design thinking and engineering systems thinking.
- ❖ The models are
 - I. Distinctive concept model
 - II. Comparative concept model
 - III. Inclusive concept model
 - IV. Integrative concept model
 - The Distinctive concept model, positions design thinking (DT) and Engineering system thinking (EST) as separate concepts, each with unique history, set of values, practical application and methods
 - The comparative concept model, suggests that design thinking (DT) and Engineering system thinking (EST) are similar underlying concepts with different applications and methods

- While DT and EST have different origins, applications and approaches, both require a similar cognitive skill set in practice
- Design thinkers and engineering systems thinkers alike must be creative, flexible, curious, and emotionally intelligent.
- Design thinkers and engineering systems thinkers both utilize divergent and convergent thinking strategies, use analogical, visual, and spatial reasoning, and embrace ambiguity and emergence

The Inclusive Concept Model:

- The inclusive concept model suggests that engineering systems thinking might not be a standalone methodology.
- the specific application of design thinking principles to the design of large scale, complex engineering systems such as software enterprise systems, aerospace vehicles, or nuclear power stations etc
- DT and EST are both approaches for addressing design complexity, defining and solving wicked problems, and understanding the role of cognitive and social processes on system design and performance.
- The key distinction here is the emphasis placed on abstraction, interdependence, and emergence in EST, versus tangibility, prototyping, testing, and redesign in DT.
- It is important to note that EST is included as a subset of DT and not the other way around

Inclusive Concept Model of DT/EST

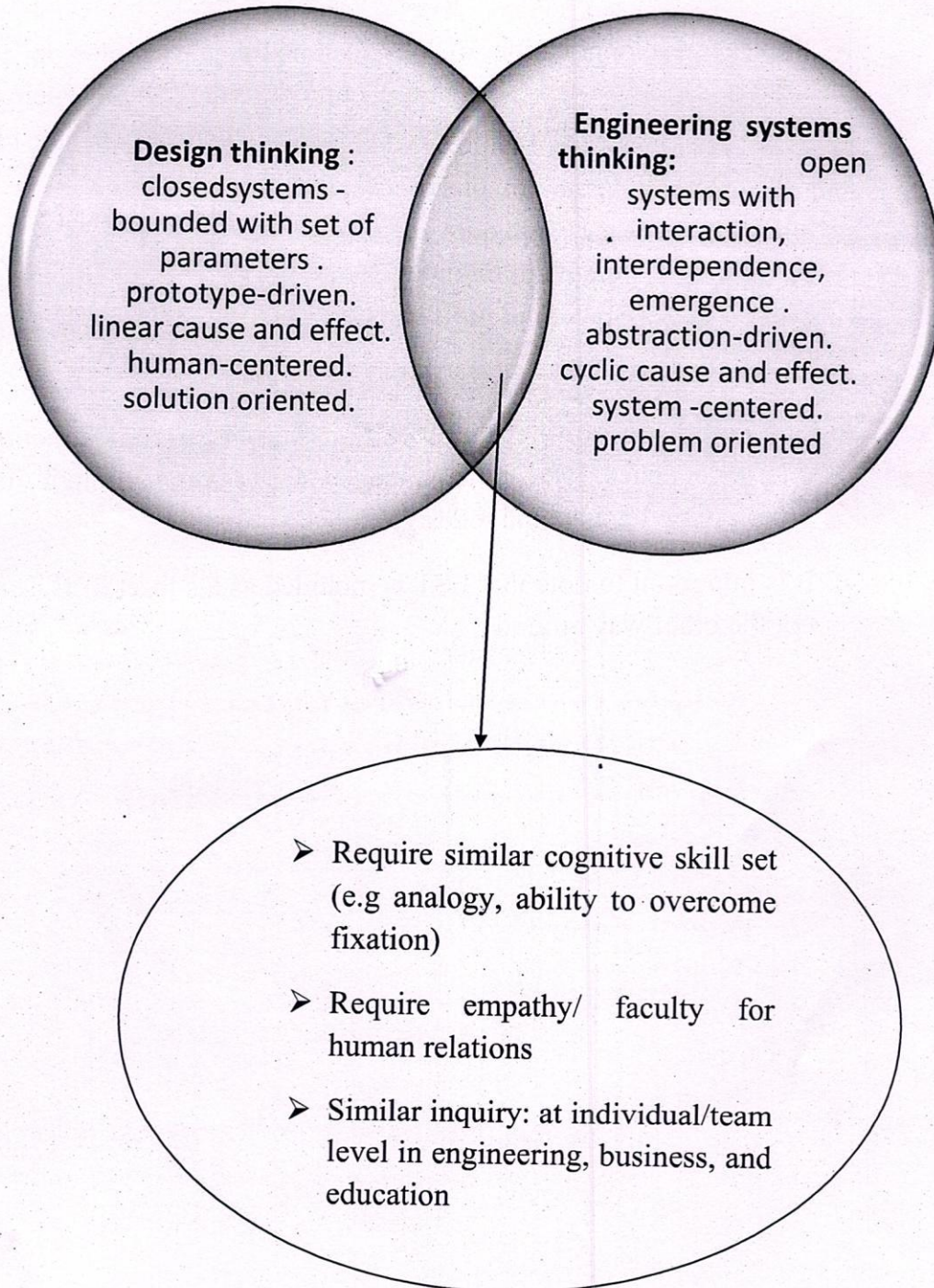


user-centered products and services. Empathy is a key driver of the design thinking process.

- Systems thinking, on the other hand, originated from cybernetics and operations research and are intended to capture stock and flow structures and feedback loop dynamics. It is system focused and used for identifying potential interactions between system elements that might result in unintended system performance.

The Comparative Concept Model:

- Design thinking and Engineering systems thinking positions the two concepts as distinct, but with several major overlaps



Summary

- Design thinking is more than a methodology; it represents a philosophy that places end users firmly at the centre of innovation process and the development of new products and services.
- **This is a win-win scenario.** Where the end users benefits, so too does the creative organization. Importantly design thinking has a powerful strategic element, which needs to be firmly aligned with an organization's culture and brand.
- The concept of design thinking can be applied across diverse disciplines. From education, law, and medicine to ICT, business management, human resource management and design it, design thinking principles enable and empower a professional to approach the problem statement in a step-by-step manner and take into account all the necessary factors for arriving at the best solution.
- The entire flow of design thinking is generally broken down into five components. These components are:
 - Empathize or Understand
 - Define
 - Ideate
 - Prototype
 - Test or Verify
- In **Empathize stage**, the design thinker puts himself or herself into the shoes of the end user and tries to understand the needs of the customer.
- The **Define stage** helps to frame the problem definition. Problem shaping occurs in this phase itself
- In the **Ideate phase**, a design thinker brainstorms on the ideas suggested by others and also brings forward his/her own ideas
- In the **Prototype phase**, a design thinker focuses on testing the ideas on the grounds of feasibility and viability.
- In the **Test phase**, the prototype or the **model is presented to the customer** and the customer experiences it completely on a full scale
- The concept of **iteration** is hence central to the process of design thinking.

Design thinking not only helps to come up with innovative solutions, but also helps to address the exact problems faced by the customer and target the customer's requirements in the best possible manner

The Integrative Concept Model:

- the philosophies of design thinking and engineering system thinking might be better understood as part of a single overarching framework

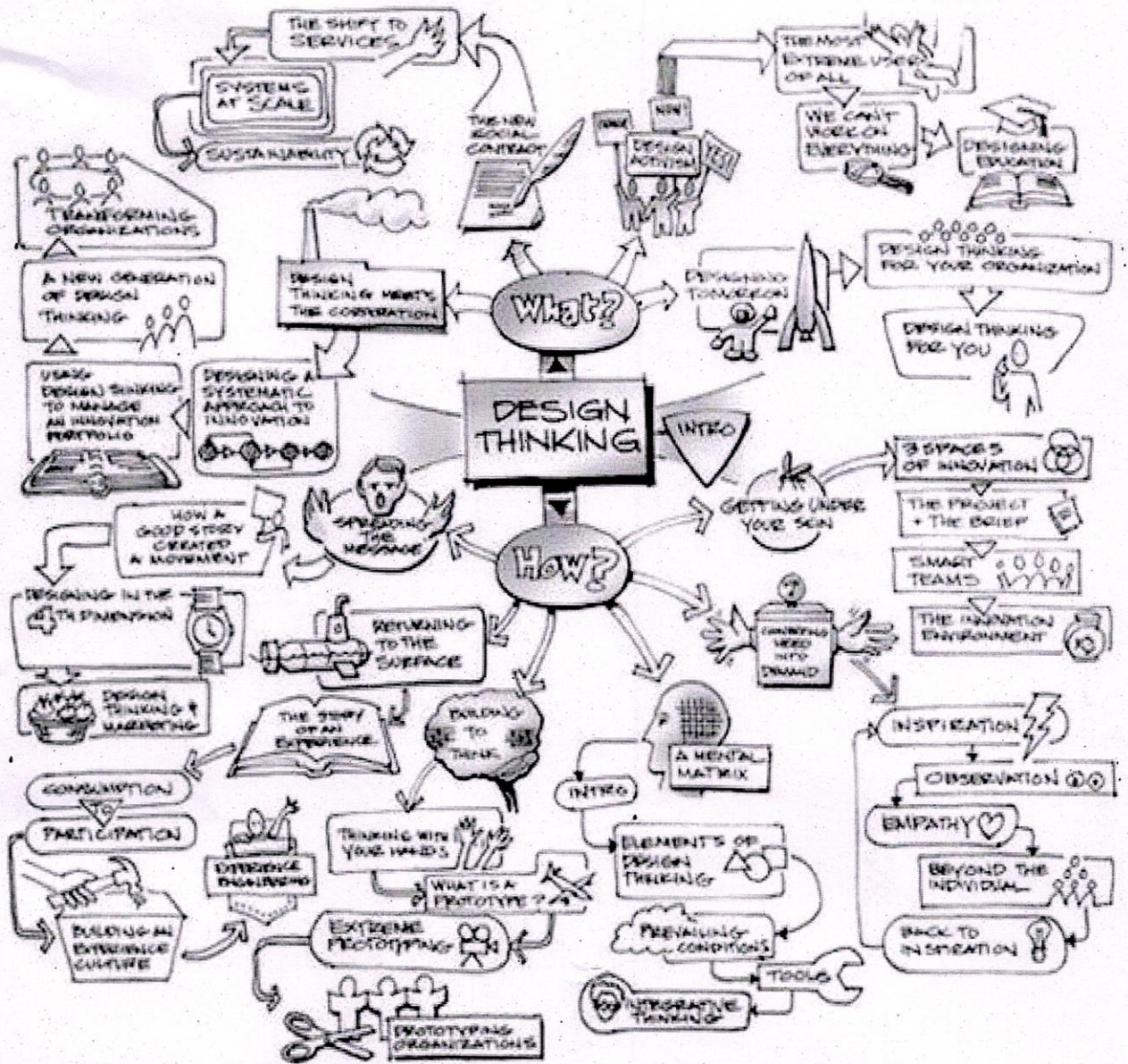
Design thinking/ Engineering systems thinking:

- Design thinking: required for successful design, of consumer products, complex systems etc.
- Similar inquiry, definition, purpose, cognitive/social process
- Findings from empirical studies on designer thinking likely apply to engineering system and its design

- Design thinking could be the fundamental skill required for design across all contexts and levels of complexity; engineering systems thinking might not be distinguishable from design thinking in practice.

Conclusion:

- Design thinking and engineering systems thinking are similar frameworks for exploring principles and processes of engineering design.
- Exploring contemporary applications and methods is useful for identifying opportunities to share knowledge and tools between communities in the future





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KADAPA, AP - 516 005

Certificate of Completion

This is to certify that

Mr./Ms. J. PAVAN KUMAR

Bearing the Roll No 179Y1A0322

has Successfully completed certification course on

DESIGN THINKING & PRODUCT INNOVATION

From 17-05-2021 to 08-06-2021, Organized by Department of

Mechanical Engineering

[Signature]
Coordinator

[Signature]
Head Of Department

[Signature]
Principal



K.S.R.M. COLLEGE OF ENGINEERING

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KADAPA, AP - 516 005

Certificate of Completion

This is to certify that

Mr/Ms. M. MAHESH REDDY

Bearing the Roll No 179Y1A0329

has Successfully completed certification course on

DESIGN THINKING AND PRODUCT INNOVATION

From 17-05-2021 to 08-06-2021, Organized by Department of

MECHANICAL ENGINEERING

[Signature]
Coordinator

[Signature]
Head Of Department

[Signature]
Principal



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KADAPA, AP - 516 005

Certificate of Completion

This is to certify that

Mr/Ms. R. NAGARJUNA

Bearing the Roll No 189Y5A0323

has Successfully completed certification course on

DESIGN THINKING & PRODUCT INNOVATION

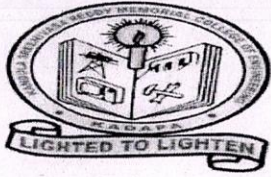
From 17-05-2021 to 08-06-2021, Organized by Department of

MECHANICAL ENGINEERING

[Signature]
Coordinator

[Signature]
Head Of Department

[Signature]
Principal



K.S.R.M. COLLEGE OF ENGINEERING
(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India-516 005

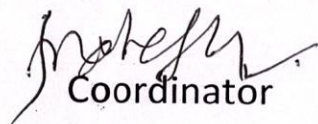
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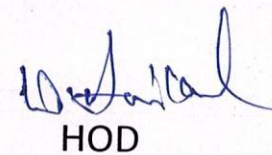
Department of Mechanical Engineering
Certification Course on Design Thinking Product Innovation

S.No	Name of the Student	Roll List	Is the Course content meet your expectation	Is the lecture sequence well planned	Is the level of course high	Is the course exposed you to the new knowledge and practices	Rate the Knowledge of the Speaker	Rate the value of Course in increasing your skills	Any Issues
1	ACHUKATLA SHAIK FAZAL	179Y1A0301	yes	Agree	Strongly Ag	Yes	4	5	Nil
2	ALAMURI IMAMBASHA	179Y1A0302	yes	Agree	Agree	Yes	5	5	Need extra Explanation
3	BASIREDDY RAVI JYOTHI KUMAR REDDY	179Y1A0303	yes	Agree	Agree	Yes	4	5	Nil
4	BAYANA BOINA SURENDRA YADAV	179Y1A0305	yes	Agree	Agree	Yes	5	5	Nil
5	BELLAM MAHESH	179Y1A0306	yes	Agree	Agree	Yes	5	5	Provide PPT
6	BODIGARI RAMA KRISHNA REDDY	179Y1A0307	yes	Agree	Agree	Yes	5	4	Nil
7	BOLLINENI HARIKRISHNA	179Y1A0308	yes	Agree	Agree	Yes	5	4	Nil
8	BOYA NAVEEN	179Y1A0309	yes	Agree	Agree	Yes	4	5	Nil
9	CHANDRAGIRI NARENDRA REDDY	179Y1A0310	yes	Agree	Agree	Yes	5	5	Nil
10	INDLA VENKATA HARI PRASAD REDDY	179Y1A0321	yes	Agree	Agree	Yes	5	5	Nil
11	J PAVAN KUMAR	179Y1A0322	yes	Agree	Agree	Yes	5	5	Nil
12	KALLA VASU	179Y1A0323	yes	Agree	Agree	Yes	5	5	Nil
13	KAMBHAM SREENATH REDDY	179Y1A0324	yes	Agree	Agree	Yes	5	5	Nil
14	KONDA LOKESWAR REDDY	179Y1A0325	yes	Agree	Agree	Yes	5	5	Nil
15	KOTAPATI DINESH KUMAR	179Y1A0326	yes	Agree	Agree	Yes	5	5	Nil
16	KUMMITHI MADDILETI REDDY	179Y1A0327	yes	Agree	Agree	Yes	5	5	Nil
17	LOMATI VEERA LOKESH REDDY	179Y1A0328	yes	Agree	Agree	Yes	5	5	Nil
18	MACHIREDDY MAHESH REDDY	179Y1A0329	yes	Agree	Agree	Yes	4	5	Nil
19	MANGALI SRINIVASULU	179Y1A0330	yes	Agree	Agree	Yes	5	5	Nil

20	MUDE SURYAPRAKASH NAIK	179Y1A0335	yes	Agree	Agree	Yes	5	5	Nil
21	MUMMADI SUMANTHREDDY	179Y1A0336	yes	Agree	Agree	Yes	5	5	Nil
22	ODETI SHARIEF	179Y1A0338	yes	Agree	Agree	Yes	5	5	Nil
23	PALAMPALLI VENKATA RAVINDRA REDDY	179Y1A0339	yes	Agree	Agree	Yes		5	Nil
24	PALLAPOTHULA VINOD KUMAR REDDY	179Y1A0340	yes	Agree	Agree	Yes	5	5	Nil
25	PALLE MAHENDRA REDDY	179Y1A0341	yes	Agree	Agree	Yes	5	5	Nil
26	PERAM SRI MOHAN REDDY	179Y1A0343	yes	Agree	Agree	Yes	5	5	Nil
27	PICHIPATI RAM KISHORE REDDY	179Y1A0344	yes	Agree	Agree	Yes	5	5	Nil
28	SHAIK MOHISIN AHMED	179Y1A0355	yes	Agree	Agree	Yes		5	Nil
29	SHAIK NAZAR HUSSAIN	179Y1A0356	yes	Agree	Agree	Yes	5	5	Nil
30	SHAIK SAMEER AHAMMAD	179Y1A0357	yes	Agree	Agree	Yes	5	5	Nil
31	SHAIK SUHAIL UR REHAMAN	179Y1A0358	yes	Agree	Agree	Yes	5	5	Nil
32	SHAIK ZAHEER AHAMMAD	179Y1A0359	yes	Agree	Agree	Yes	5	5	Nil
33	SOMISETTY VENKATA SAI JASWANTH	179Y1A0361	yes	Agree	Agree	Yes	4	5	Nil
34	TALARI ABHISHEK	179Y1A0362	yes	Agree	Agree	Yes	5	5	Nil
35	TALARI BOYA SRINIVASULU	179Y1A0363	yes	Agree	Agree	Yes	5	5	Nil
36	BALAVENKATAGARI SIVA REDDY	189Y5A0301	yes	Agree	Agree	Yes	5	5	Nil
37	BARIKA EERANNA	189Y5A0302	yes	Agree	Agree	Yes	5	5	Nil
38	BEDADHALA AMARNATH REDDY	189Y5A0303	yes	Agree	Agree	Yes	4	5	Nil
39	BELLALA VENKATA CHAITANYA KUMAR	189Y5A0304	yes	Agree	Agree	Yes	5	5	Nil
40	BODI PRADEEP	189Y5A0305	yes	Agree	Agree	Yes	5	5	Nil
41	BOYA MADHU	189Y5A0306	yes	Agree	Agree	Yes	5	5	Nil
42	CHENNURU MOULA	189Y5A0307	yes	Agree	Agree	Yes	5	5	Nil
43	CHINNABOINA MAHESH	189Y5A0308	yes	Agree	Agree	Yes	4	5	Nil
44	DERA ASHOK KUMAR	189Y5A0310	yes	Agree	Agree	Yes	5	5	Nil
45	GURRAM CHINNA GIDDAIAH	189Y5A0316	yes	Agree	Agree	Yes	5	5	Nil
46	GUVVALA SUDHEERKUMAR REDDY	189Y5A0317	yes	Agree	Agree	Yes	5	5	Nil
47	JAGGILI MAHENDRA	189Y5A0318	yes	Agree	Agree	Yes	5	5	Nil
48	KAKANURU UDAY KUMAR REDDY	189Y5A0319	yes	Agree	Agree	Yes	4	5	Nil
48	KARDHAM NARASIMHA PRASAD	189Y5A0320	yes	Agree	Agree	Yes	5	5	Nil
50	KARUMANCHI HARSHAVARDHAN BABU	189Y5A0321	yes	Agree	Agree	Yes	5	5	Nil
51	KATARU VEERA HEMANTH KUMAR	189Y5A0322	yes	Agree	Agree	Yes	5	5	Nil
52	KONETI NAGARJUNA	189Y5A0323	yes	Agree	Agree	Yes	5	5	Nil
53	KONIREDDY SANDEEP KUMAR REDDY	189Y5A0324	yes	Agree	Agree	Yes	5	5	Nil
54	KOTTAPALLI VAMSHIDHAR REDDY	189Y5A0325	yes	Agree	Agree	Yes	4	5	Nil
55	MUDE SRIKANTH NAIK	189Y5A0331	yes	Agree	Agree	Yes	5	5	Nil

56	NAGA MAHESWAR REDDY ETURI	189Y5A0332	yes	Agree	Agree	Yes	5	5	Nil
57	NAGELLA THARUN KUMAR REDDY	189Y5A0333	yes	Agree	Agree	Yes	5	5	Nil
58	NAIB MOHAMMED ABID	189Y5A0334	yes	Agree	Agree	Yes	5	5	Nil
59	NANDYALA MAHESWARA REDDY	189Y5A0335	yes	Agree	Agree	Yes	5	5	Nil
60	NARAPUREDDY PATTABHI REDDY	189Y5A0336	yes	Agree	Agree	Yes	4	5	Nil
61	PAPIREDDYGARI SURYAPRAKASH REDDY	189Y5A0338	yes	Agree	Agree	Yes	5	5	Nil
62	PENTAM HARSHAVARDHAN	189Y5A0339	yes	Agree	Agree	Yes	5	5	Nil
63	POGAKU BALA NARASIMHUDU	189Y5A0340	yes	Agree	Agree	Yes	5	5	Nil
64	SHAIK SHABEEH AHMED	189Y5A0350	yes	Agree	Agree	Yes	5	5	Nil
65	SIRLU JAGAN	189Y5A0351	yes	Agree	Agree	Yes	5	5	Nil
66	SUDDAMALLA SIVANAGADASTAGIRI REDDY	189Y5A0352	yes	Agree	Agree	Yes	5	5	Nil
67	SULLAGALLA PAWAN KALYAN	189Y5A0353	yes	Agree	Agree	Yes	5	5	Nil
68	SYED MOHAMMED MATEEN HUSSAIN	189Y5A0354	yes	Agree	Agree	Yes	4	5	Nil


Coordinator


HOD

Professor & head
Department of Mechanical Engineering
K.S.R.M. College of Engineering
KADAPA - 516 003.