Team 13

KLE Technological University
Creating Value
Leveraging Knowledge

FRESHMAN ENGINEERING PROGRAM

Template for Problem definition

Phase1: Problem definition

This phase of Engineering Design has clients' need statement as input from which design objectives, metrics and constraints has to be derived resulting to revised problem definition. The revised problem definition need to make clear of what is a **must** in a design? what is a **should** ? and what is an **optional feature** in a design?

A designer needs to get clarity regarding what actually client wants so that designer can translate the client needs into the form that the designer requires.

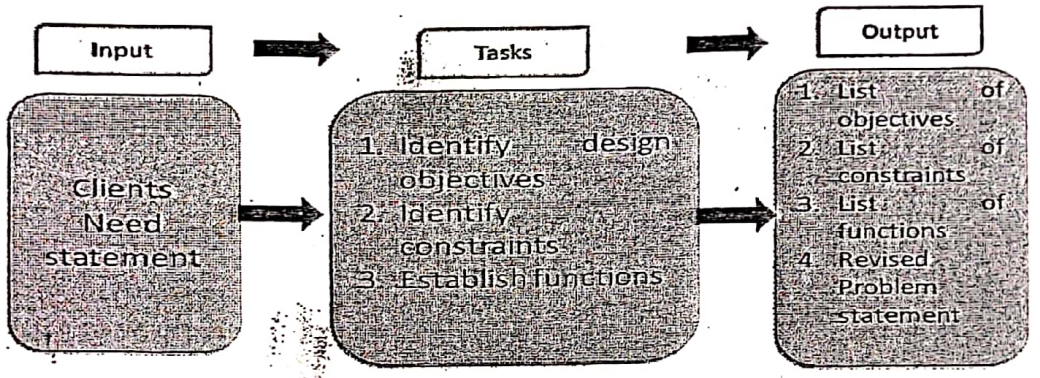

Figure 1 Stage1 of five stage prescriptive model of the design process

In order to understand what client wants, designer needs to do the following

1. Ask questions
2. Brain storming

Asking questions is an integral part of the entire design process and helps designer to understand client's needs in a better way. Answers to those questions help the designer to establish client's objectives, identify constraints and establishing functions in the initial phases of design while the questions also help for establishing requirements, generating design alternatives, modelling the design and evaluation at later stages of design process. This process is demonstrated through the case study in the next section.

Case study

1. Need Statement:**"Active Toy"**
2. Designers: **Aishwarya musale, Bibi mearaj urf umme fatehi, Ranjit chavan,Suma masuti**
3. Clients: **K & K Play home**
4. Users: **Children**

Questions such as	This question helps the designer to
1. How will the toy be used (Entertainment / Learning)?	**Identify client's objective**
2. How much can it cost?	
3. What age group of children is a targeted user?	
4. What does active mean?	
5. What other features is expected?	
1. What's the maximum weight that a toy can be?	**Identify constraints**
2. What shape and materials can the toy be made of?	
3. What can be the size of the toy?	
4. How should the device interact with child?	**Establish functions**
5. What learning is expected for children?	
6. What entertainment is expected for children?	

Brainstorming and basic literature survey helps the design team to understand the problem and helps to arrive at defining problem statement.

Following was the information obtained through basic research and customer interaction

Observation and from Lit.Survey	Requirements
1. Based on the weight of other toys and the weight that a child can easily carry	The toy's total weight should not exceed 400 gms
2. A child starts identifying alphabets, numbers and colours beginning from 2 years	Toy most suitable for the age group of 2-4 years
3. Based on the cost of competing products in the market	Cost of the toy should lie within the range of Rs 300 to Rs 700
4. At the age of 3 years, child starts performing simple mathematical operations	1 digit mathematical operations that includes addition, subtraction,

	multiplication and division
5. Child has tendency to take the attractive and colourful things to mouth	Material used should be non toxic and should not have sharp edges

1.1 Prepare a list of design objectives

a. Toy must be made safe (use of non toxic material, no sharp edges).
b. Toy must be affordable (less initial cost, low maintenance).
c. Toy should be child friendly (easy to use, easy to carry).

1.2 Prioritize the identified design objectives

Priority among various objectives is set through a technique called Pair-wise Comparison Chart (PCC)

Goals	Safety	Cost efficient	User friendly	Score
Safety	****	1	1	2
Affordable	0	****	1	1
User friendly	0	0	****	0

Goals can be ranked in order of decreasing value of importance and hence it is safety, cost and user friendly.

Based on the information gathered through interaction with client, initial survey and completing phase 1.1 the problem statement is formulated as follows

"Design a toy for 2 to 4 years children which should be safe, affordable and child friendly".

1.3 Identify constraints

1. Cost of the toy should not exceed Rs 700/-.
2. Toy should not exceed 400 gms.

Revised Problem definition: "Design a toy for 2 to 4 years children which should be safe, affordable and child friendly". Cost of the toy should not exceed Rs 700/- and weight of the toy should not exceed 400 gms"

1.4 Establish functions

A specific action that a designed device or system is expected to do (perform). Functions should consider 'what' the product does (the problem) and not 'how' it does it (solution).
A function involves the following two components.

- An action verb
- A noun representing the object on which the action verb takes place

Consider active toy example

1. Toy should **perform** 1 digit mathematical operations
2. It should **accept** operand and operator from child and **communicate** result of mathematical operation to child.
3. **Recite** the rhymes

Revised Problem definition: "Design an attractive and interactive toy for 2 to 4 years children that can provide learning platform for 1 digit mathematical operations as well recite rhymes. Material used should be nontoxic and light weight. Weight of the toy should not exceed 400 gms and cost of the toy should not exceed Rs 700/-

Exercise Activity

Complete the phase1 of design process for the below mentioned need statement

Ex 1: "Because of the demanding need of the customers towards hygiene of Paan making, a restaurant in Hubballi is keen at having their own Paan making machine. The machine should sense the betel leaf, add at least two ingredients, fold, pierce a tooth pick and indicate the process completion. "

Ex 2: "In a juice center, the outlet has planned to introduce mock-tails. But, it has been observed that pre-mixing juices to prepare mock-tails cannot be achieved as the resulting liquid loses its taste on storage. Also, there is a shortage of staff to serve at the outlet throughout the day. Hence, provide a solution which dispenses the liquid as per the quantities in the defined recipe and stirs the liquid to ensure consistency. Dispense the liquid in a glass which will be picked up by the customer"

1. Designers: Adnan, Jahnavi
2. Clients: Payal, Pranav
3. Users: Fartade Hotel

Questions such as	This question helps the designer to
1. At one time, How many glasses you want to get?	Establish client's objectives
2. How many juices you want to mix?	
3. Your juice selection is static or dynamic?	
4. What's your budget?	
5. Time constraint?	
6. What type of glass are needed?	cost <15000 no. of glasses=2 no. of juices mixes=4 time=15weeks Identify constraints
7. How should the design be?	
8. Do you want it as remote control or button?	
9. Do you want chilled one or ice?	Establish functions
10. Do you want remote accessibility?	
11. What should be the size of machine?	

Obtain the information through basic survey and customer interaction and arrive at requirements

Observation and from Lit.Survey	Requirements
1.	
2.	
3.	
4.	
5.	

1.1 Identify client's objectives

Step 1: Prepare a list of design objectives

Sl.No	Objectives
01	Hygiene
02	Easy to use
03	Cost effective

04	Quick serving
05	Multiple flavours.

1.2 Prioritize the identified design objectives

Priority among various objectives is set through a technique called Pair-wise Comparison Chart (PCC)

Objectives	Hygiene	Ease of use	Cost effective	Durable	Score
Hygiene	***	1	1	1	3
Ease of use	0	***	1	0	1
Cost effective	0	0	***	0	0
Durable	0	1	0	***	1

Rank the objectives in order of decreasing value of importance and the list is

1.
2.
3.
4.
5.

Based on the information gathered through interaction with client, initial survey and completing phase 1.1 the problem definition is formulated as follows

Problem definition version1.1
1) Design a hygienic mock tailer which is durable, ease to use & may be cost effective

1.3 Identify constraints

1. Cost should be less than 15,000
2. Should have storage compartment of 2 litres for each of 20 juices
3. Should be able to depense 2 glasses at a time

Problem definition version1.2
1) Design a hygienic mock tailer which is durable, ease to use & may be cost effective. The machine should not cost more than Rs 15,000 & the storage compartment should be of 2 litres for each of 20 juices & should be able to depense 2 glasses at a time.

1.3 Establish functions

1. Despensing
2. Remote accessibility
3. Refrigeration

Problem definition version1.3

Design a hygienic mocktailer which is durable, easy to use & may be cost effective. The machine should not cost more than Rs15,000 & the storage compartment should be of 2 litres for each of 20 juices & should be able to despense 2 glasses at a time. It should have remote accessibility with refrigeration function.