

E2. Problem Solution:

This definition of the problem seems too common. However, this was the actual problem definition presented to the building manager. What the building manager did was to have mirrors placed between the elevator openings. Then when people showed up at the elevators they looked at themselves in the mirrors, and they beautify themselves. The complaints stopped, almost totally. The manager had solved the problem with a very ingenious problem definition and solution, and it was probably cheaper than any of the solutions proposed before.

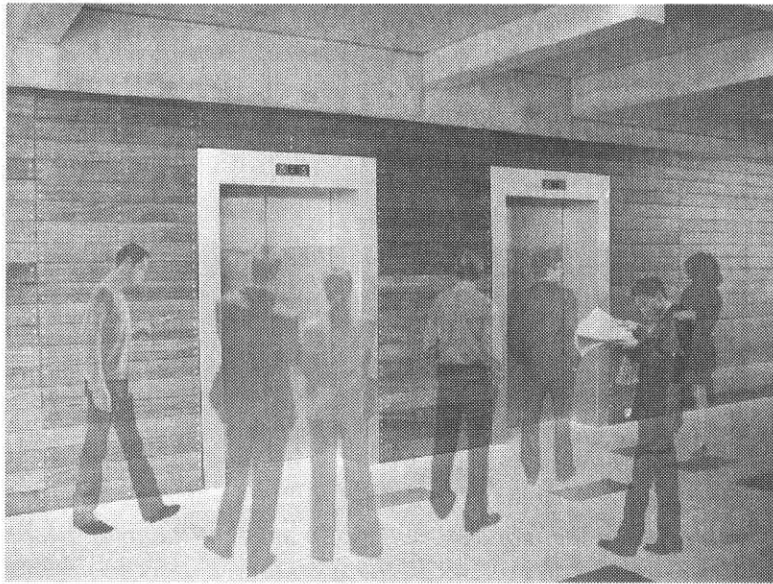


Figure 5.3: Potential problems concerning the use of an elevator.

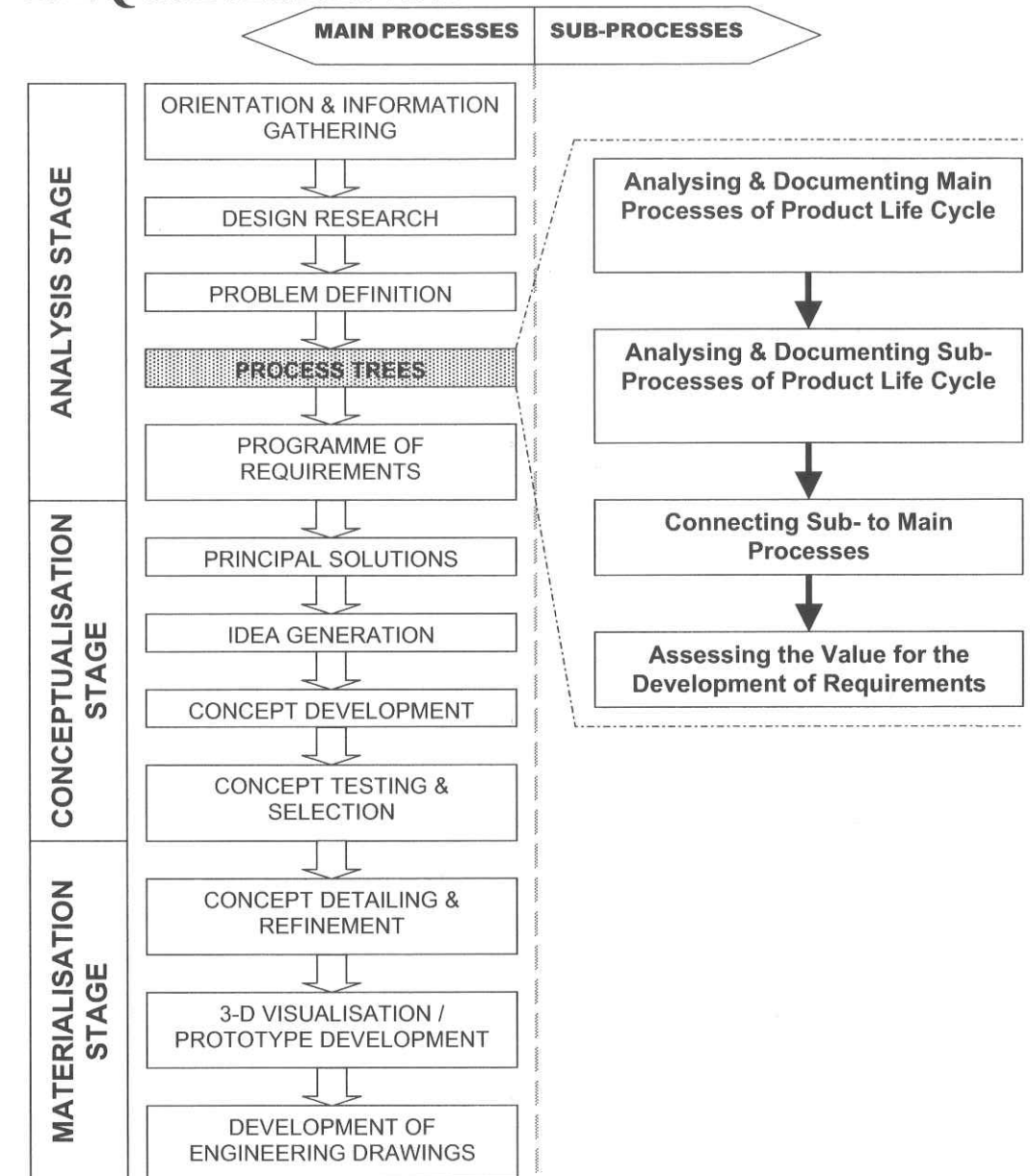
5.4 DISCUSSION

Whenever you have a problem to solve, make sure that you have examined the Problem Definition critically.

If you have the opportunity to change the definition, do so in any way to the advantage of your design. If you don't have the opportunity to change the definition, then fight for the opportunity to do so. Your goal is to generate a Problem Definition that tackles the real problem.

CHAPTER SIX

PROCESS TREES; A GUIDELINE FOR REQUIREMENTS



6.0 INTRODUCTION

When you are confronted with the term **Process Trees** for the first time, you might think it has to do with something, which is growing; something natural. In this case, growing is not taking place in a natural way. You have to work on it. In this chapter, we would like to explain what are Process Trees, where and how you can use it.

6.1 WHAT ARE PROCESS TREES?

Process Trees are a systematic tool to organise user-requirements according to the life cycle of a product; from conception to when it is being discarded and recycled.

It is a logic structure of processes for a product to go through from early initiation to rejection. The purpose of Process Trees is to know and oversee all aspects and relationships of those processes.

In this chapter, within the context of Process Trees, the term 'Product Life Cycle' is different from the sales and marketing product life cycle earlier discussed in chapter one. This 'Product Life Cycle' discusses the process from conception to rejection from an operational and 'product interactive' perspective. What is meant by 'product interactive' is how the manufacturer, supplier and user directly and physically relates to the product.

6.2 SETTING UP PROCESS TREES USING THE PRODUCT LIFE CYCLE

Let us see how you set up Process Trees. What is simpler, than to follow the life cycle of a product and to see what happens? Everyone can imagine a product's life cycle, and therefore it is easy to communicate with people who are involved in certain stages of this product life cycle, from creation to disappearance. The product will go through four main processes. These are:

1. **Creation**
2. **Distribution**
3. **Use**
4. **Disappearance**

After a product is manufactured and assembled, it has to be distributed. When the product is sold, it will be used and at a certain day it will be dismantled

thrown away or recycled. It is one of the ways to classify the 'Programme of Requirements, which will be elaborated in the next chapter.

Everything we encounter will be classified in one of those main processes. With this in mind, the big cake will be cut into four pieces. Soon, you may notice that you know much about use, but little about creation and distribution of the product. Why do we know more about the process of 'Use' than that of 'Creation'? Simply, because we have a clearer imagination concerning the use than the manufacturing of a product. We can better relate the use of a product to ourselves, while fabrication happens in a factory.

As a result we have a better insight in the different sub-processes of **use**, such as: bringing the object into the house, putting it into operation, maintaining, storing, in certain cases connecting it to an energy source.

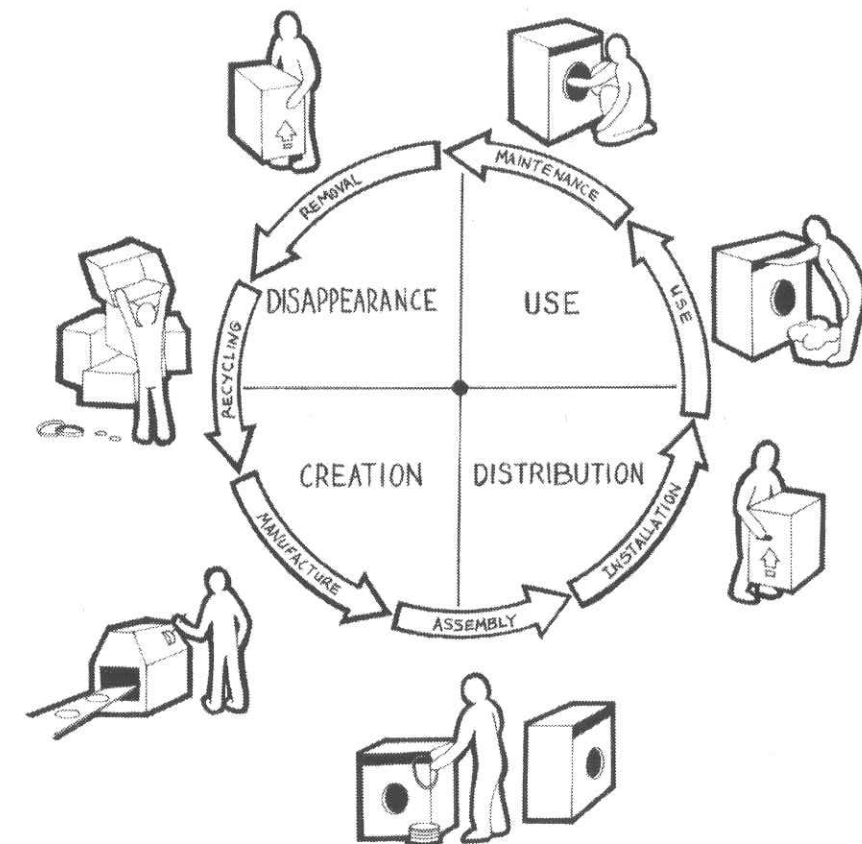


Figure 6.1: The four stages of a product life cycle.

Are we not forgetting something important? This is easy to determine. Write down what you can think of, and check if it is complete.

<u>An example:</u>	<u>Main process:</u>	- Using the product
	<u>Sub-Processes:</u>	<ul style="list-style-type: none"> - To prepare before use - To turn it on - To handle the product - To turn it off - To clean - To maintain - To store

By dividing the main process into sub-processes, you will find out that you do not know much about some of these sub-processes. For example:

- What do we understand under maintenance?
- Preparation before use, where does it start? After buying, or every time you take it out of the cupboard?

You only take the product home once, but you have to prepare it every time before you can start using it. So we have to sub-divide 'home transportation' from 'preparation before use'. In this way, we can continue refining the Process Trees until we are satisfied. The other three main processes: creation, distribution and disappearance should also be divided in the same way.

6.3 WHAT CAN YOU DO WITH PROCESS TREES?

You can use Process Trees for the following purposes:

- As a checklist to determine what information, you already have, and what information is still missing.
- As a guideline for developing the Concept Programme of Requirements. It is not advisable just to sum up requirements, without a systematic approach. The Process Tree is meant to classify the Programme of Requirements according to the 'Product Life Cycle'.

In the following tables, you will find an example of how to schematise Process Trees.

Main-Process	Sub-Process (1st Detailing)	Sub-Process (2nd Detailing)
<u>Creation</u>	Product Development	Product design Prototype development Prototype testing
	Preparation for Manufacturing	
	Manufacturing	To manufacture components To assemble parts To finish the product
	Packing the product	
	Administrating costs	To record material costs To record wages To determine overhead costs

Table 6.1; An example of the main process "Creation".

Main-Process	Sub-Process (1st Detailing)	Sub-Process (2nd Detailing)
<u>Distribution</u>	To determine the price	To determine the selling price To determine a certain discount
	To negotiate	To negotiate about price To negotiate about delivery time To negotiate about quantity
	To prepare for delivery	
	To transport	To load the product To move the product To unload at the site requested
	To store	
	To sell the product	To collect payment To pack the product

Table 6.2; An example of the main process "Distribution".

Main-Process	Sub-Process (1st Detailing)	Sub-Process (2nd Detailing)
<u>Use</u>	To bring inside the home	To load To transport To unload To unpack To assemble To position in the environment
	To make it ready for use	
	To use the product	
	To de-activate the product	To stop To break the electrical connection To empty
	To store the product	To bring the product into storage position To place it in the store room
	To repair the product	

Table 6.3: An example of the main process "Use".

Main-Process	Sub-Process (1st Detailing)	Sub-Process (2nd Detailing)
<u>Disappearance</u>	To cancel further usage for repair or replacement	
	To de-activate completely	

Table 6.4: An example of the main process "Disappearance".

6.4 CASE STUDY: PROCESS TREES OF A FOLDABLE CHAIR

This case study illustrates the use of 'Process Trees' in the design of a foldable chair. Main processes are classified into two levels of detailed sub-process. Selected are Process Tree 'Distribution' and 'Use'. The 2nd detailed sub-process forms the guideline for the formulation of requirements.

In this case study, Problem Definition and Requirements are included in the tables 6.5 and 6.6 for reference. However in practice, these should be presented as separate documents. As mentioned earlier the Problem Definition should be written in essay format.

Main Process	Sub-Process, 1 st Detailing	Sub-Process, 2 nd Detailing	Problem Definition	Specifications/ Requirements
<i>Distribution</i>	<ul style="list-style-type: none"> To determine the price of the foldable chair 	<ul style="list-style-type: none"> To determine Price To determine Discount 	<ul style="list-style-type: none"> Affordable selling price? 	<ul style="list-style-type: none"> The selling price should not exceed S\$ 50.00
	<ul style="list-style-type: none"> To negotiate 	<ul style="list-style-type: none"> To negotiate on price To negotiate on delivery time To negotiate on quantity 		
	<ul style="list-style-type: none"> To prepare for delivery 			
	<ul style="list-style-type: none"> To transport the chairs 	<ul style="list-style-type: none"> To load the chairs To unload the chairs To move the chairs to the site requested 	<ul style="list-style-type: none"> Weight of chairs? Size of chairs? Grip on packed chairs or group of chairs? Stackable? 	<ul style="list-style-type: none"> The chair should not weigh more than 1kg. The chairs should be designed for bulk transport. The chairs should be clustered and packed so that it can be lifted by at least a P5-male.
	<ul style="list-style-type: none"> To Store 		<ul style="list-style-type: none"> Stackable? 	<ul style="list-style-type: none"> The cluster of chairs should be stackable at least three layers vertically.
	<ul style="list-style-type: none"> To sell the chairs individually 	<ul style="list-style-type: none"> To unpack the chairs To re-pack the chairs individually. To collect payment 	<ul style="list-style-type: none"> How compact is the chair, when packed or folded? 	<ul style="list-style-type: none"> The chair must be carried easily with one hand. The size should not exceed an envelope of: 50 x 300 x 500 mm.

Table 6.5: An example of the main process "Distribution" of a Foldable Chair

Main Process	Sub-Process, 1 st Detailing	Sub-Process, 2 nd Detailing	Problem Definition	Specifications/ Requirements
Use	<ul style="list-style-type: none"> To bring inside the home 	<ul style="list-style-type: none"> To unpack To assemble To Position in environment 	<ul style="list-style-type: none"> Is the foldable chair easy to unpack? Does it need assembly? 	<ul style="list-style-type: none"> The chair should be assembled by the user in not more than 3 major steps using added hand tools.
	<ul style="list-style-type: none"> To make the chair ready for use 		<ul style="list-style-type: none"> How to unfold the chair for use? 	<ul style="list-style-type: none"> The chair should be unfolded in one action
	<ul style="list-style-type: none"> To use the chair 		<ul style="list-style-type: none"> Who will sit on the chair? Weight and Size of person? Is it comfortable and safe? 	<ul style="list-style-type: none"> The chair should accommodate the P5-female – P95 male population range The chair must be able to withstand a vertical weight of at least 200kg. The chair should be suitable for at least 1 hour continuous seating.
	<ul style="list-style-type: none"> To store the foldable chair 	<ul style="list-style-type: none"> To fold the chair into storage position To place it in a store room 	<ul style="list-style-type: none"> How to fold the chair? Size of chairs? How to store the chair(s) as efficient as possible, given a limited space? 	<ul style="list-style-type: none"> The chair should be folded in 1 action When folded, at least 20 chairs should fit in an envelope of 1 x 1 x 1m
	<ul style="list-style-type: none"> To repair the chair 	<ul style="list-style-type: none"> To bring the chair for repair. To repair the chair oneself 	<ul style="list-style-type: none"> Is it worth bringing the chair for repair? Should the chair be easily repaired by the user? 	<ul style="list-style-type: none"> The chairs must be easily repaired using basic hand tools, such as screwdrivers, pliers, etc.

Table 6.6: An example of the main process "Use" of a foldable chair

CHAPTER SEVEN

DEVELOPING A DETAILED PROGRAMME OF REQUIREMENTS

