

# CHAPTER 4

## DATA COLLECTION AND ANALYSIS

In chapter 3, author has already spent a few pages analysing current situation that is at present going on within the company, however, what author has mentioned in the analysis section of the previous chapter will not be so worthy without a visible evidence to support. Author intends to divide this chapter into two separate finding, where stage 1 represents the “Must-be” attribute and shall talk about both the stage 2 (“One-dimensional”) and stage 3 (“Attractive”) together. Under each stage there are subsection on data collection and analysis, all of which are necessary in assisting author and problem solving team to define the causes and proposing sound solution in the later chapter.

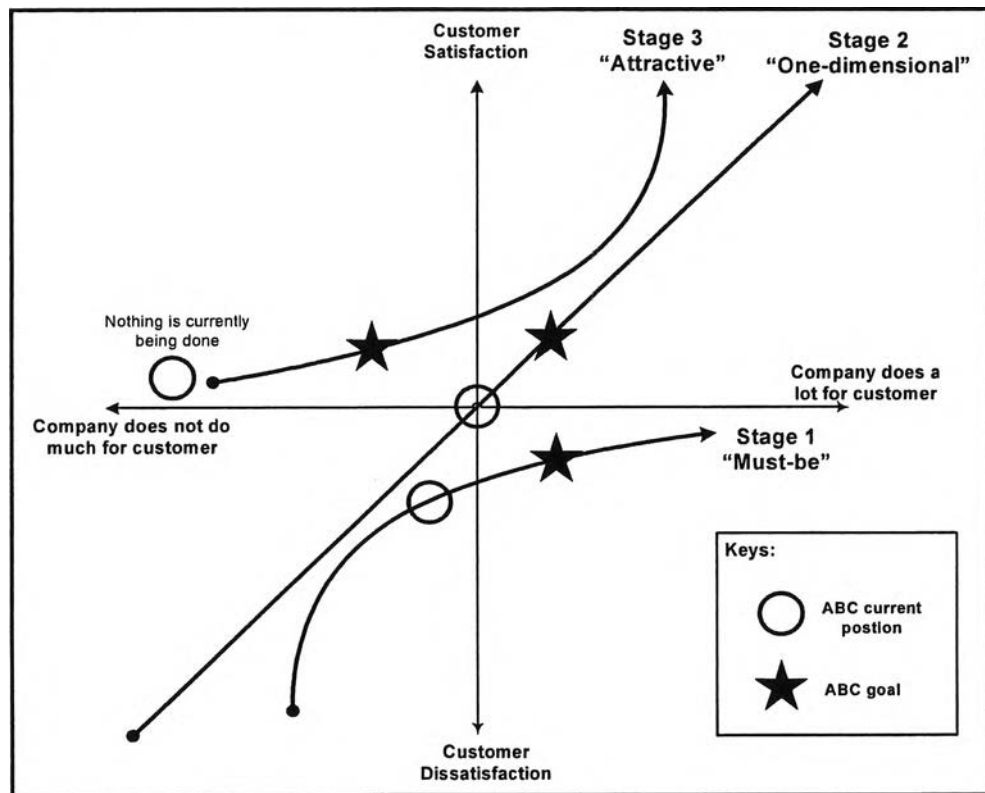


Figure 4.1 – Reproduction of Kano model to represent attributes that needed improvement

## 4.1 STAGE 1

Stage 1 represents “Must-be” attribute, in the first stage author will attempt to resolve only the 20% portion of the total number of problems found. The 20% portions of problems are worth 80% according to their significance and/or frequency (complies with Pareto rule). As time is the constraint factor author is incapable to resolve all of the problems found and thus Pareto comes to play. First, author shall begin the work of this stage by collecting data.

### 4.1.1 Data Collection

#### 1. Past Data

Author was able to collect three years of the past data running from the beginning of the year 2000 through to the end of year 2002 (ending of the year 2002 beginning of the year 2003); at the end of each year the sale function perform the annual summary on the sale of swimming pool types, which is indeed useful for this thesis thus the number of new built concrete type swimming pools at the end of the year are recorded in the table 4.1 below. Author requested further data from the company on the number of problems reported by those customers who bought new swimming pool.

**Table 4.1 - Number of problems found in respect of new pool built in each year**

The proportion in number of New Pool built against The number of Problems reported each year			
<i>Concrete swimming pool:</i>			
Year	00-01	01-02	02-03
<b>No. New Pool</b>	103	149	182
<b>No. Problems</b>	71	76	92

The cumulative frequency of problems, from above table 4.1, over the period of three years came to the total of 239 problems reported. Of all 239 problems author was able to break down, with help from the staffs in technical department, a chunk of data into detailed listing of possible problems, which is shown below in table 4.2. For ease of communication throughout the thesis, each problem is represented by a number, which shall be referred to from time to time in this thesis.

Table 4.2 – Break down of problems

List of problems occurred during the year 2000 to 2002/2003			
Problem No.	Description of problems	Frequency	Remarks
<b><u>Problem with the swimming pool Structure:</u></b>			
1	Swimming pool structure tear apart	1	Occasionally happens due to 4 <sup>th</sup> scenario, thus ABC is not held responsible when occurred.
2	Crack in the structure and water leakage	2	Usual problem for 4 <sup>th</sup> scenario, mixing up concrete, stones, sands, etc is the heart to rigid structure.
3	Crack found on the concrete surface but no leakage	3	A few reasons why it happened: natural cause, concrete ingredient or mixing
4	Cracking of the terrace	2	Both of these problems are rare, but occurred usually as a direct result in natural sagging of soft ground, which do so over time
5	Sagging of the terrace	1	
6	Swimming pool structure sag/collapse	1	Problem occurred to only the swimming pool of vinyl type, which is outside the scope of this thesis
7	Swimming pool built to the wrong dimension or shape	0	Rare case of this happening but usually because of the miscommunication between design and construction engineer

<b><u>Problem with the Water pipeline:</u></b>			
<b>8</b>	<b>Water leakage</b>	<b>7</b>	This happens because the connection of water pipeline is not totally sealed. Sometimes the water pipeline crack because of its positioning, pipes are resting on a sagging structure
<b>9</b>	<b>Water blockage</b>	<b>13</b>	Blockage usually caused by debris left by the construction team
<b><u>Problem with the Equipment:</u></b>			
<b>10</b>	<b>Filter machine breakdown or faulty</b>	<b>5</b>	Some cases are faulty but very rare because the company inspect all the incoming equipments. The usual case is the breaking down of equipments due to mishandling by the end user.
<b>11</b>	<b>Water pump machine breakdown or faulty</b>	<b>51</b>	
<b><u>Problem with the Finishing of the swimming pool:</u></b>			
<b>12</b>	<b>Floor tile fall off</b>	<b>15</b>	Customers are liable to manufacturing warranty against any unsatisfied finishing that has been caused by company.  However, some of these problems may be the direct result of other act, which the company is not held responsible for.
<b>13</b>	<b>Floor tile crack and break</b>	<b>0</b>	
<b>14</b>	<b>Floor tile is not laid down properly/perfectly</b>	<b>55</b>	
<b>15</b>	<b>Uneven floor</b>	<b>3</b>	
<b>16</b>	<b>Imperfect equipments fitting e.g. lighting, gating etc</b>	<b>2</b>	
<b>17</b>	<b>Sharp edges found</b>	<b>0</b>	This problem is caused by several factors.
<b>18</b>	<b>Water in the swimming pool not clean and clear</b>	<b>78</b>	

## 2. Customer survey: Questionnaire

In addition to past data, author along with Head of technician and a few technicians have also designed a customer-friendly survey through the use of questionnaire. In developing a questionnaire there are two important aspects to consider prior the designing can even begins, which are; 1) knowing the focus group and 2) knowing what to ask and where to use the information. Helping author and the team to design own questionnaire, are questionnaires form that are available in the restaurants, coffee express place and other companies.

Author shall elaborate on both the issues but first, focus group: the questionnaire was designed to focus at a group of customers sample size of 20, who own a middle-size swimming pool at home and live within the perimeter of Bangkok. Author and the team had undergone customer screening in selecting a sample group of size 20 customers. Those customers, who took part in the survey, were carefully chosen by author and the team base on the commonality and similarity in customer's personal information that the company had withheld in the database. The fact that the selected customers have similar career background for instance university English teacher, accountant, SME management, manager, and stock broker. The point is that they are non-technical person meaning that they find anything technical side of the scale difficult to handle. Furthermore, one commonality between the chosen customers is given that this is the first swimming pool they own. Making sure that the focus group is from similar background base is necessarily meaning that the customer must have similar background knowledge or career nature, this is to maintain a fair test and to avoid bias information/feedback that would otherwise obtained if some of the participants were from an engineering background, who would be able to handle technical issue more fluently.

Secondly, knowing exactly what to ask and where to use the obtained feedback is one important issue that the designer should stick in mind while composing questionnaire. Some feedback attained from the survey will provide the team a useful source of information database necessary for all three STAGEs. Not all the information obtained by this customer survey would be of use at this point in time to the thesis, however, the information would form useful database especially for the company to further develop and improve company's performance and/or other field outside the coverage of this thesis. The

readers may have noticed that only the seriousness rating of the survey is used for STAGE 1, while the rest of the questions asked may not be directly relevant in STAGE 2 and 3. The reason for including questions that are not totally relevant to this thesis was because since author is required to carry out customer survey anyway in order to collect data for the thesis, the company specifically asked for author to carry out a survey based on company's performance at the same time. The company wanted to know of their customers' thought about current practice on all-round aspects this includes: Skill, Humanity, and Knowledge and etc. Therefore, what reader may find is that some feedbacks from the survey for example: Questions on the Operator, detailed questions relating to Technician and their performance, Financial and part of the questions on the Overall Company, are not mentioned anywhere within this thesis but yet presented in the table later on in STAGE 2 and 3. This information will definitely be useful for the company one way or another for their further reference.

For STAGE 1 author and the technical team needed to know customer's opinion on the level of seriousness on each problem (significance level). The significance will become useful for performing the Pareto analysis in the next section **Data Processing**. Thus, author and the team make list of all the problems, which is presented in the 2<sup>nd</sup> page of the questionnaire, where customers will be asked to rate base on their viewpoint the significance of problems listed.

Base on the result obtained from 20 customer surveys, individual customer has own perception on the seriousness (significance) level of problem. Table 4.3, below, shows a summary on the problem rating, while a copy of the questionnaire is filed at the back of this thesis in the *Appendix 1: Data collection: Customer Survey on Service* section. For each particular problem, author specifies in the near by column the amount of customers vote for the significance level from their viewpoint.

Table 4.3 – Summary on customer survey

<b>Customer rating on the significance of individual problem</b>	
<i>Description of the problems</i>	<i>Customers viewpoint on significance level of each problem</i>
<b><u>Problem with the swimming pool Structure:</u></b>	
1. Swimming pool structure tear apart	All 20 customers rated level 3
2. Crack in the structure and water leakage	All 20 customers rated level 3
3. Crack found on the concrete surface but no leakage	1 customers rated level 3 2 customers rated level 2 17 customers rated level 1
4. Cracking of the terrace	1 customers rated level 3 18 customers rated level 2 1 customer rated level 1
5. Sagging of the terrace	18 customers rated level 3 2 customers rated level 2
6. Swimming pool structure sag/collapse	All 20 customers rated level 3
7. Swimming pool built to the wrong dimension or shape	15 customers rated level 3 5 customers rated level 2
<b><u>Problem with the Water pipeline:</u></b>	
8. Water leakage	3 customers rated level 3 15 customers rated level 2 2 customers rated level 1
9. Water blockage	1 customer rated level 3 3 customers rated level 2 16 customers rated level 1

<b><u>Problem with the Equipment:</u></b>	
10. Filter machine breakdown or faulty	1 customers rated level 3 16 customers rated level 2 3 customers rated level 1
11. Water pump machine breakdown or faulty	1 customers rated level 3 16 customers rated level 2 3 customers rated level 1
<b><u>Problem with the Finishing of the swimming pool:</u></b>	
12. Floor tile fall off	14 customers rated level 2 6 customers rated level 1
13. Floor tile crack and break	17 customers rated level 2 3 customers rated level 1
14. Floor tile is not laid down properly/perfectly	16 customers rated level 2 4 customers rated level 1
15. Uneven floor	17 customers rated level 3 3 customer rated level 2
16. Imperfect equipments fitting e.g. lighting, gating etc	15 customers rated level 3 3 customers rated level 2 2 customers rated level 1
17. Sharp edges found	18 customers rated level 3 2 customers rated level 2
18. Water in the swimming pool not clean and clear	1 customers rated level 3 18 customers rated level 2 1 customers rated level 1



### 4.1.2 Data Processing

From the customer survey summarised in the table 4.3, author is able to pick out the *MODE* significance voted by the majority of customers for each problem listed. The concept of ‘Mode’ is to pick out the value that occurs most often, however as for this case it is the amount of times out of 20 that the significance level (or the seriousness) of that particular problem is rated for, the calculated rating values are presented more clearly in the table 4.4. Which significant level of that particular problem has the highest rating is the mode significant of that problem.

Furthermore, since author is dealing with both units at the same time: frequency and significance of the problem, it is therefore important to take into consideration the weighting value of the outcome from both units by multiplying the mode significance and frequency together in order to obtain the problem rating, as shown below in the fourth column of Table 4.4, which can only then be plotted on the axis to define the Pareto trend. Thus problem rating is given by:

$$\text{Mode Significance} \times \text{Frequency} = \text{Problem Rating}$$

Table 4.4 – Calculation of Problem Rating

<i>What are the problems?</i>	<i>Mode Significance of problem</i>	<i>Frequency of problem</i>	<i>Problem Rating (Mode significance x frequency)</i>
<b><u>Problem with the swimming pool Structure:</u></b>			
1. Swimming pool structure tear apart	3	1	3
2. Crack in the structure and water leakage	3	2	6
3. Crack found on the concrete surface but no leakage	1	3	3
4. Cracking of the terrace	2	2	4
5. Sagging of the terrace	3	1	3

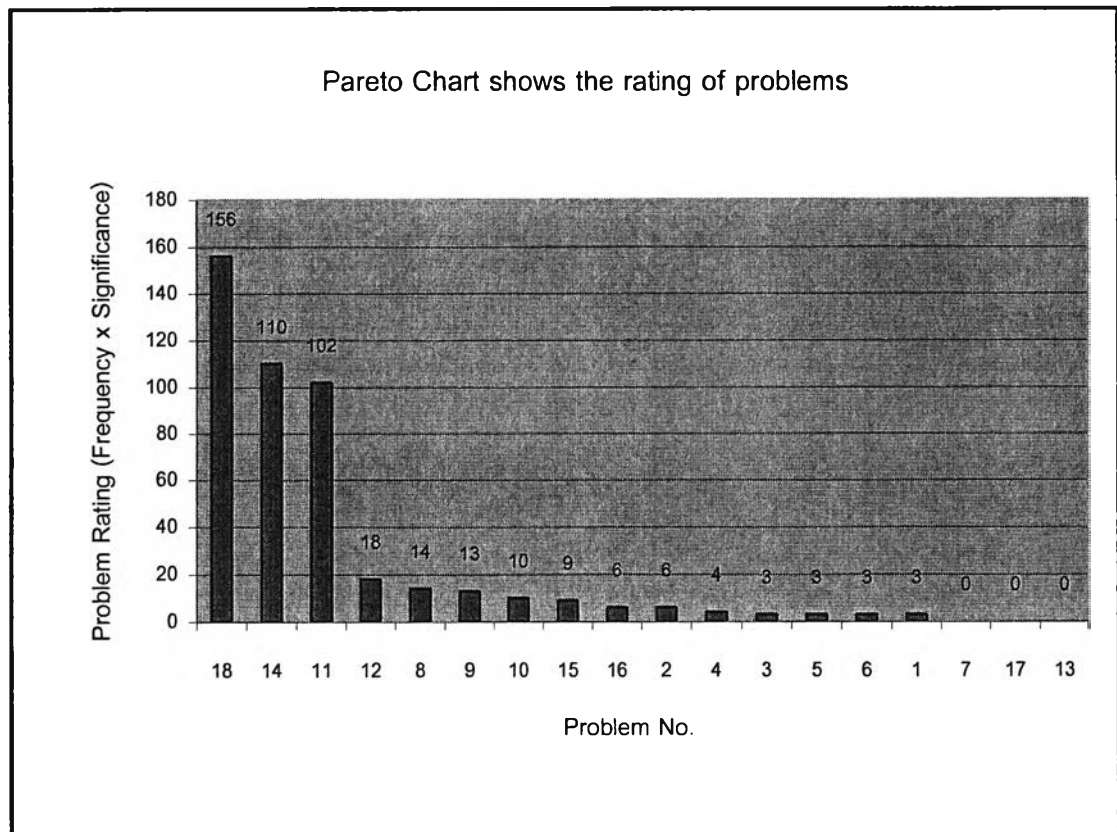
6. Swimming pool structure sag/collapse	3	1	3
7. Swimming pool built to the wrong dimension or shape	3	0	0
<b><u>Problem with the Water pipeline:</u></b>			
8. Water leakage	2	7	14
9. Water blockage	1	13	13
<b><u>Problem with the Equipment:</u></b>			
10. Filter machine breakdown or faulty	2	5	10
11. Water pump machine breakdown or faulty	2	51	102
<b><u>Problem with the Finishing of the swimming pool:</u></b>			
12. Floor tile fall off	2	9	18
13. Floor tile crack and break	2	0	0
14. Floor tile is not laid down properly/perfectly	2	55	110
15. Uneven floor	3	3	9
16. Imperfect equipments fitting e.g. lighting, gating etc	3	2	6
17. Sharp edges found	3	0	0
18. Water in the swimming pool not clean and clear	2	78	156

From the calculation above, author rearranges problems in its descending order by rating, starting at the top with the problem that scored the highest problem rating down to the least rating at the bottom.

**Table 4.5 – New ranking of problems by Problem Rating**

<b>Problem No.</b>	<b>Description of Problems</b>	<b>Problem Rating</b>
<b>18</b>	<b>Water in the swimming pool not clean and clear</b>	<b>156</b>
<b>14</b>	<b>Floor tile is not laid down properly/perfectly</b>	<b>110</b>
<b>11</b>	<b>Water pump machine breakdown or faulty</b>	<b>102</b>
<b>12</b>	<b>Floor tile fall off</b>	<b>18</b>
<b>8</b>	<b>Water leakage</b>	<b>14</b>
<b>9</b>	<b>Water blockage</b>	<b>13</b>
<b>10</b>	<b>Filter machine breakdown or faulty</b>	<b>10</b>
<b>15</b>	<b>Uneven floor</b>	<b>9</b>
<b>16</b>	<b>Imperfect equipments fitting e.g. lighting, gating etc</b>	<b>6</b>
<b>2</b>	<b>Crack in the structure and water leakage</b>	<b>6</b>
<b>4</b>	<b>Cracking of the terrace</b>	<b>4</b>
<b>5</b>	<b>Sagging of the terrace</b>	<b>3</b>
<b>6</b>	<b>Swimming pool structure sag/collapse</b>	<b>3</b>
<b>1</b>	<b>Swimming pool structure tear apart</b>	<b>3</b>
<b>3</b>	<b>Crack found on the concrete surface but no leakage</b>	<b>3</b>
<b>7</b>	<b>Swimming pool built to the wrong dimension or shape</b>	<b>0</b>
<b>17</b>	<b>Sharp edges found</b>	<b>0</b>
<b>13</b>	<b>Floor tile crack and break</b>	<b>0</b>

Once all the problems have been rearranged in the order of the rating, these rating are then used to plot a Pareto chart in a form of vertical bar graph, as shown by the figure 4.2 below. Such an illustration as Pareto chart below, allows author to get a clear visual of the whole problem situation and the rating on each problem that customers encountered.



**Figure 4.2 - Pareto chart**

### 4.1.3 Data Analysis

The remarks column of Table 4.2 above intends to give the readers fundamental understanding on the characteristic of the problems. Of all the 18 problems identified, there may only be a few numbers of the problems that the company is made responsible for. Author and the team together identified each problem carefully and all agreed on the decision that there are altogether 16 problems (not 18) in total that company would be responsible. Since company need not be responsible for the other 2 problems (problems that company need not be responsible are Problem 1, and 6) because they were caused by customer's own construction team. So in stage 1, author will only resolve a 20% portion (Pareto Analysis refers to Pareto chart above for Figure4.2) of the total 16 problems, which are problems 18, 14 and 11.

**Problem 1** is concerned at the Swimming pool structure tear apart has to be eliminated from the total number of problems since the problem occurred under 4<sup>th</sup> scenario, where customers provide their own blue print to the design and construction team but come to ABC for the necessary equipments and accessories, and so in this case the company can not offer one-year warranty to anything but the equipments. **Problem 6** is the Swimming pool structure sag/collapse again the only time that this disaster occurred was to the vinyl type of swimming pool, which is beyond the scope of this thesis as it is the data of concrete swimming pool that author wants and not the vinyl type, which is why this particular problem is eliminated.

20% of the 16 problems come down to 3 problems, in which author intends to resolve all 3 problems employing Cause and Effect technique in search for the cause of the effect for the three problems chosen. In choosing the three problems author refers to the Pareto chart above to see which of the problems weighted the highest. Whichever the problems were rated the highly, author shall pay most attention to solving them. According to the Pareto chart above Figure 4.2, author is to choose three problems in which the following problems are chosen 18, 14, and 11 since they required most attention. The figures presented in the Table 4.6 below indicate the amount of times each specific problem occurred (frequency) in the particular month collectedly over the period of three years.

Table 4.6 –Past record on the frequency of the occurrence on selected problems

<b>Monthly occurrence of the selected problems over the period of three years (2000-2003)</b>									
<i>Problems</i>	<i>Problem 18</i>			<i>Problem 14</i>			<i>Problem 11</i>		
<b>When</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>
<b>January</b>	1	2	2	1	2	2	1	0	2
<b>February</b>	2	2	3	1	2	2	0	0	3
<b>March</b>	1	3	4	1	2	1	1	2	2
<b>April</b>	2	2	2	1	0	3	2	1	2
<b>May</b>	1	1	2	2	1	1	0	1	1
<b>June</b>	2	2	3	2	1	2	0	1	2
<b>July</b>	1	0	3	1	2	2	0	1	1
<b>August</b>	2	2	1	1	2	2	0	1	2
<b>September</b>	2	3	2	2	1	2	0	2	4
<b>October</b>	3	4	3	0	2	3	2	3	3
<b>November</b>	3	3	2	1	1	3	2	2	3
<b>December</b>	2	2	3	0	2	2	1	2	2
<b>Total Occurrence (Frequency)</b>	<u>78</u>			<u>55</u>			<u>51</u>		

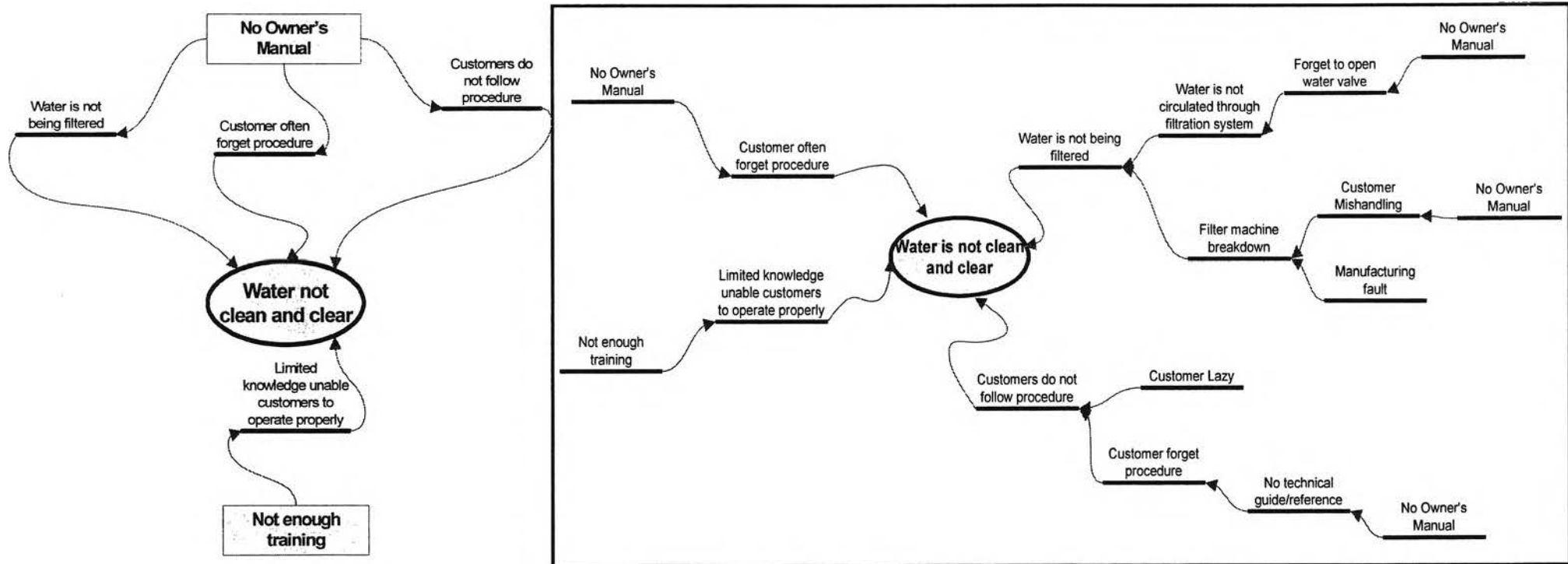
The last row 'Total' in the table above represents the total occurrence of the problem over the period of three years, which is exactly the same figure as shown previously in a different table called 'Frequency'.

Throughout section 4.1.3, author will look closely at the chosen three problems (effect) using Cause and Effect diagram (refer back to section 2.12 Cause and Effect Analysis in Chapter 2). When using C&E diagram to identify causes to an effect (or problem) author must take in to consideration these following five categories; Method, Man, Material, Machine and Environment, all of which may contain both direct and indirect causes to the problem. Cause and effect diagram allows author and the problem solving team (consists of 4 parties: Head of Technician, Sales, Designer, Subcontractor and one staff representative from the 4 parties) to brainstorm all the possible causes to an effect relating to five categories listed above. In formulating a complete cause and effect diagram, author and the problem solving team arrange a group meeting and together brainstorm personal, team or co-partner experienced in which came across in the past and still at present.

First, author will look at each problem in a broader view by performing a primary relationship diagram to verify the causal chain associated to each problem. Once the C&E diagram has been completed author shall circle around cause(s) that possibly the root cause of the effect. Then author would perform a second analysis called Why-Why (refer back to 2.13 Why-Why Analysis in Chapter 2) by continuously asking the problem (effect) *Why? Why? Why?* it happened or in other words asking *how come it happened?* in order to back tracking the causes previously found by the Cause and Effect to identify the real root cause. Why-Why in the way enables author to see the relationship of causes that lead towards the effect.

**Relationship diagram showing the causal chain associated to Problem number 18 - Water in the swimming pool not clean and clear**

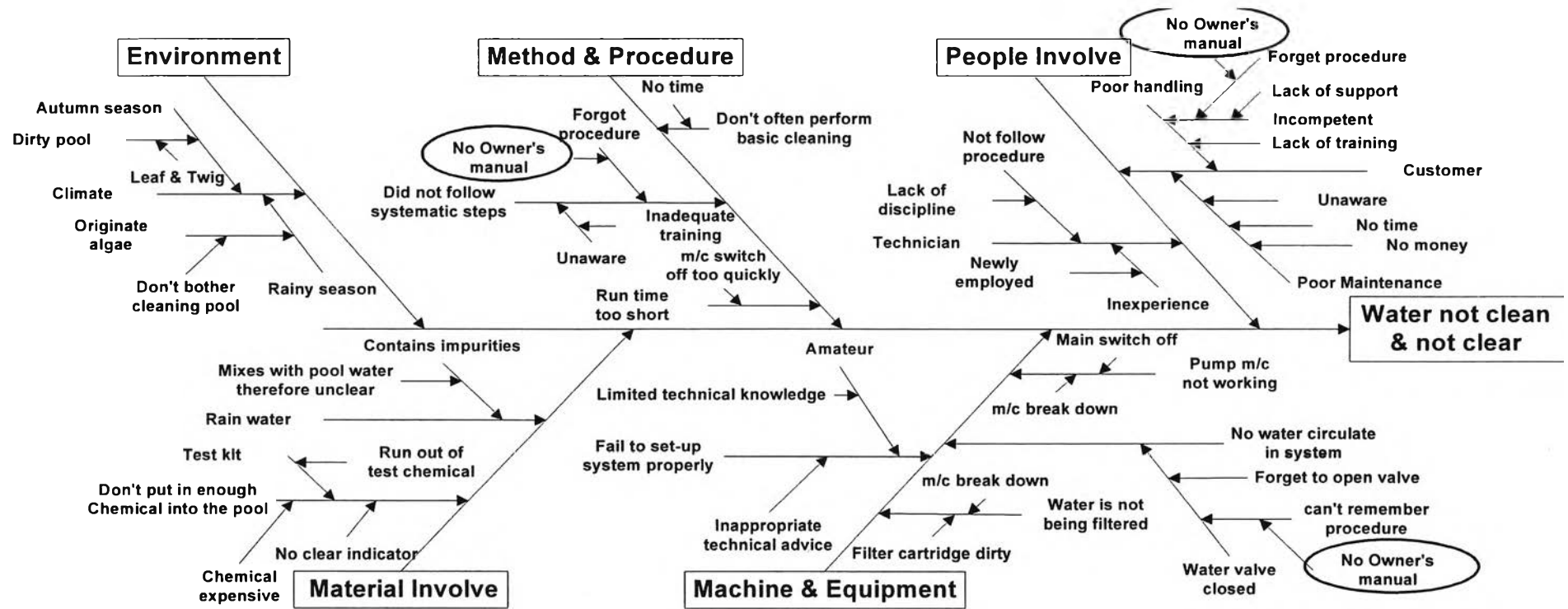
Both the figures show relationship diagram of problems, where the one on the left illustrate less detailed relationship of the root cause to the problem and diagram on the right shows relationship and the link between consequences of the actual root cause to the problem. As can be seen that “No Owner’s Manual” appears quite often, which is therefore anticipated to be the root cause, because of it customer forget the procedure, water is not filtered, and customer cannot follow procedure (refer to the figure on the right). “Not enough training” is secondary cause author feels that it is not exactly the root because given there was no training, customers would still be able to perform tasks provided that they were written in the manual and that customers can refer to from time to time when in need.



**Figure 4.3 – Diagram showing the relationship between causes to Problem number 18**



**Cause & Effect diagram to identify root cause(s) for Problem number 18 - Water in the swimming pool not clean and clear**



**Figure 4.4 - Cause & Effect diagram on Problem 18**

### **Cause & Effect Analysis:**

**People Involve** - There are two categories of people Technician and Customer that take on responsibility in making the water clean and clear. Water clean and clear is one of company's selling points, which soon became core competence. Therefore company must make sure that the water in the swimming pool has both the properties company is held in repute by customer. It is most unlikely that the swimming pool water is handed to the customer when the water is neither clean nor clear because the project could not be completed hence customer will not sign close the contract. For this reason technician is not the concern for this problem.

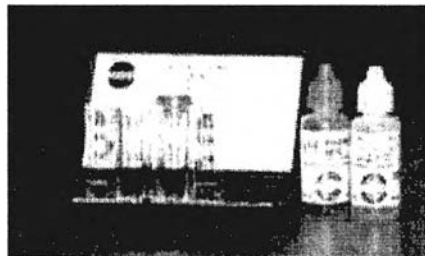
Once the project is completed, contract is closed the attention is now on customer, the fact that customer, the user, must take on heavy load of responsibilities in looking after the swimming pool. Customers are often the cause for the water to lose its cleanliness and clarity usually because they handle water treatment incorrectly and that customers no longer bothered, perhaps not enough time and occasionally unaware of when to clean the pool. Customer handles cleaning incorrectly, why does this occur? Does not the company provide customers training? Well, yes, company provides the first time and only just one time training to every customer, which customers often find all the technical knowledge much too much to take in. Customers are often under pressure for handling too much technical procedure especially when company does not supply owner's manual to every customer.

**Method & Procedure** - Another possible cause to the same problem lies in the hand of the owner/users on how they perform the cleaning. Often customers do not follow the direction as recommended by company. Why do not they follow the procedure directed by the company? There are manifolds to why customers do not often follow the set procedure: it is most likely that customers forget the exact procedure since there is no description in writing (owner's manual) to remind customers' and for their future reference; owner may not see the necessity to keep water system on the flow for the amount of time recommended by the company to filter water thus water not entirely cleaned. Meaning that pump and filter machines are required to be left on for at least six hours (the running time length depends on the size of the swimming pool), 3 times a week in order to filter and purify entire water in the pool.

**Material Involve** - Chemical products, as shown below, have an influence over the cleanliness and clarify of swimming pool water. Customer must make sure that chemical products such as chlorine, algaecide, and etc are mixed at the right quantity to water ratio. Customers do not have the confident to handle chemical products and so often customers tend to skip procedure and like most likely that they do not put in enough chlorine content to disinfect micro-organism the swimming pool impurities and not enough algaecide to prevent algae from forming green layer in the swimming pool. This could be the direct result of not having in possession the water test kit in which it enable customers to keep track of the PH level and alkali level of the swimming pool water.



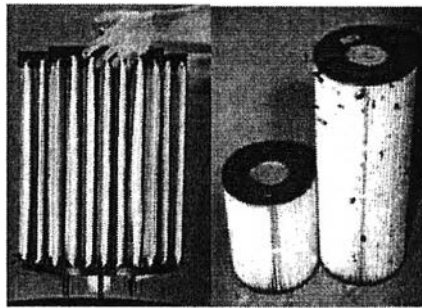
**Figure 4.5 – Chemical products**



**Figure 4.6 - Water test kit**

**Machine & Equipment** - Another possible cause to the problem is the inappropriate size of filter machine for example small to medium size filter machine is used to filter large-scale swimming pool. This fault cannot be anyone else part from company's own sales representative for not being able to direct customers the appropriate size of water pump nor filter machine. However, the chance of this happening is 0% because company has been around for over 20 years and therefore must at the least be able to justify the correct machine size for the right pool size.

The most likely cause is however these possibility; firstly, water is not being filtered because the cartridge (as shown below) in the water filter machine needed replacement and thus unable to clean away impurities that are pumped passed the filter cartridge.



**Figure 4.7 - filter cartridge or filter membrane**

Secondly, water is not being circulated through the filter machine possible because customer forget to open the water valve, again if there was a clear systematic procedure attached somewhere where customers can clearly see what to do would be ideal, but instead customer are trained once by the company's technician and it is most unlikely that customers would recall heavy load of technical knowledge.

**Environment** - Whether or not swimming pool get dirty easily depends on the location of the swimming pool. Swimming pool could be right below large trees, which is the direct cause since tree leafs, twigs, dusts and etc are impurities caused as the result of them decomposing in water without constant care, by mean of sweeping off dirty from the pool by the owner.

### Why-Why Analysis to identify root cause(s) for Problem number 18 - Water in the swimming pool not clean and clear

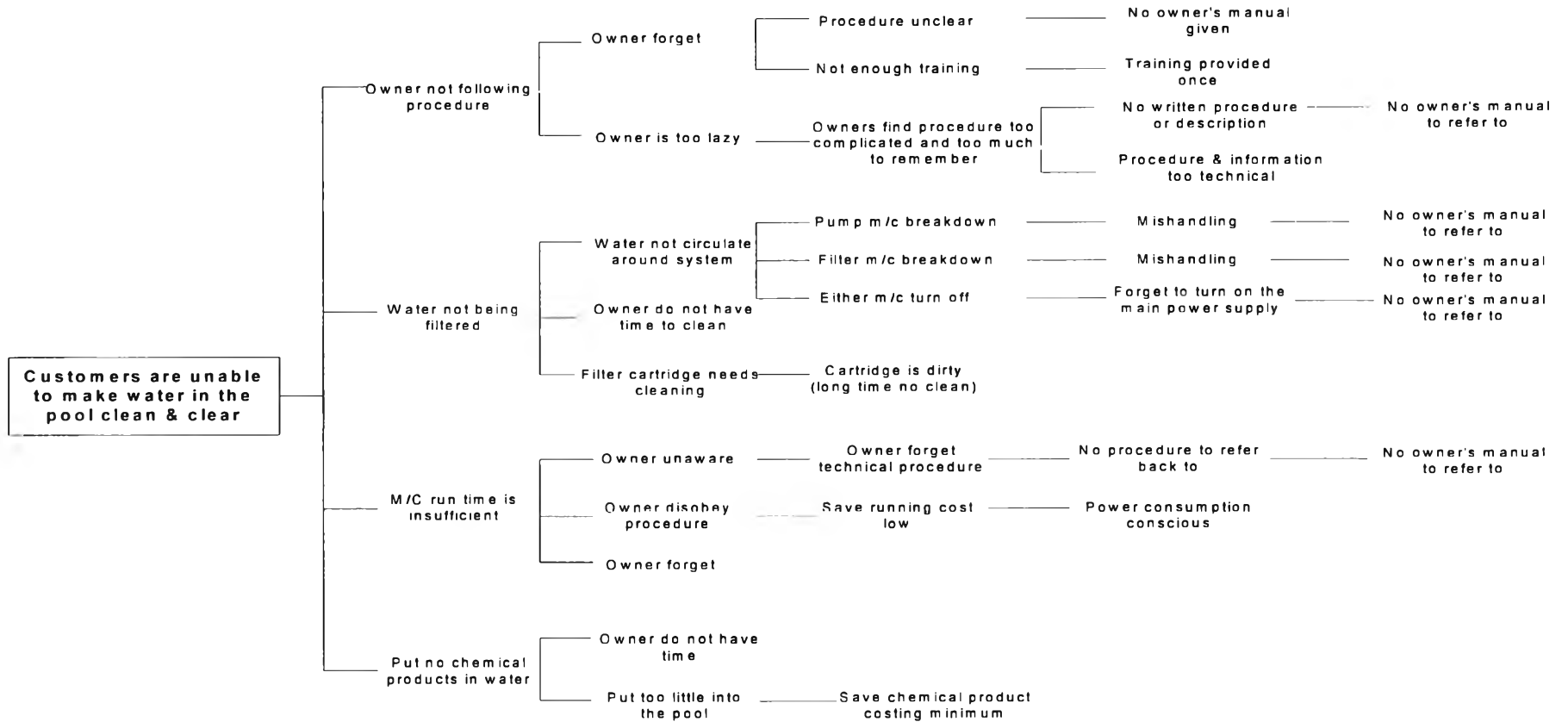


Figure 4.8 - Why-Why diagram on Problem 18

**Why-Why Analysis:** According to why-why analysis above, author is able to trace the root cause by asking back the problem statement question *why it occurred?* in order to identify the cause(s) to that problem. Analysis carries on by repeatedly asking the same question *why?* which should eventually end up with series of consecutive causes that reveals the relationship between each cause. This enables author to visualise the chain of causes that lead to the root cause of the problem.

In order to analyse a perfect why-why, author interviewed two relevant people, who will definitely be useful in the finding of this analysis customers (owners) and technician. By involving two groups of people, the problem can be explored from different perspective to the problem, which helps identify the root cause more quickly and effectively.

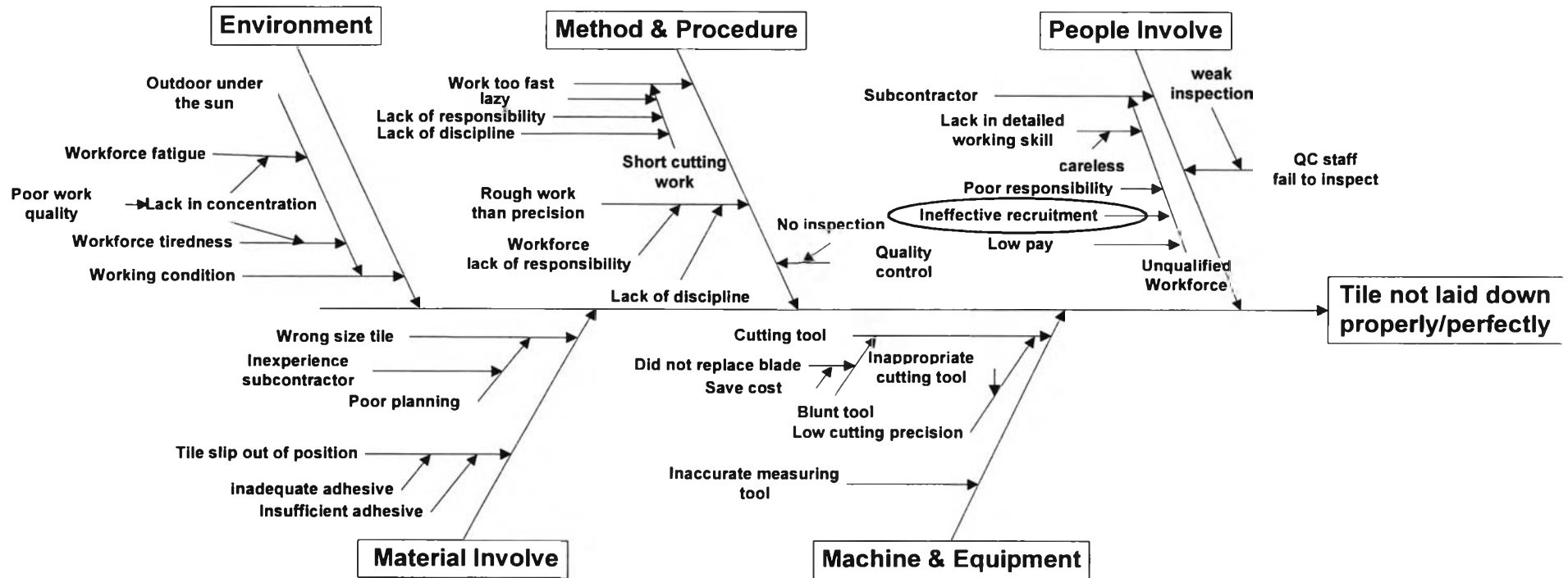
Looking from customers' viewpoint and asking them this following question: why is it that water in the swimming pool not clean or clear? Customer replied that they are unable to operate by themselves since they were not given a clear instruction, in which they can follow. Although company provide a one time training to all the customers but most likely that they forget the exact procedure, water pump and filter machines runtime, chemical product level, and other important procedures that must be followed.

On the other hand, when technicians are asked the same question, it seems to technician that customers tend not to follows the exactly procedure and often do not leave both water pump and filter machines to run the hours requested. Furthermore, customers (owners) are too light handed on the chemical products that are needed to put into the swimming at the right amount while the circulation of water, which is when both water pump and filter machines are running. However, technicians admitted to the fact that company only provide customers one-time training on the use & handling of all the switches and machines and that they provide no owner's manual for customers to refer to, which are the main causes to the problem.

To sum up, the root cause(s) to this problem 18 – water in the swimming pool not clean and clear, is down to:

1. Company only provide one-time training is not enough
2. Company provides no owner's manual for customers/owners to refer to.

**Cause & Effect diagram to identify root cause(s) for Problem number 14 - Floor tile is not laid down properly/perfectly**



**Figure 4.9 - Cause and Effect diagram on Problem 14**

### **Cause & Effect Analysis:**

**People Involve** - Both the subcontractor and company take equal share of responsibility in making sure that swimming pool is handed over to customer at its highest quality as possible. The past record, in the Table 4.2, shows in some cases tiles were not laid down properly and/or perfectly in term of the neatness. The work people who laid down swimming pool floor tiles take full responsible for this problem since it was their task to complete thus their responsibility. It is most likely that work people are inexperienced at laying tiles, and that they do not have enough responsibility and discipline to control quality at their own pace. Company equally take the blame because company's engineer fail to detect these little details that customers take in to consideration as they define for being quality swimming pool.

**Method & Procedure** - Company is made responsible for making sure that the subcontractor hired is qualified in term of price, time, and quality. Subcontractor, on the other hand, must make sure that the outcome of every product stays within the budget; well built (swimming pool construction); and meet quality standard. Company hire most of the subcontractor base on work quality of all round aspects but most importantly the relationship between company and subcontractor. It seem that quality base on relationship is slipping The fact that problem such as this particular one exists is however down to company inabilities to pass on quality policy and control those shop floor staffs/work force at the bottom of the hierarchy.

Despite having company's own engineers to check up on the work undertaken by subcontractor problem yet still exists. There is somehow a fault in the system for not having to detect the work and work people who lay tiles do not perform quality work. First, the actual people who perform the task; it is possible that they find a quick route to finishing the work quicker with less effort, unfortunately, much worse work quality but not noticeable to the engineer who take quick scan inspection. People who perform the task "shop-floor staff" clearly do not have a standard to their work, lack of responsibility and certain discipline for making work right. People of this kind tend to get the work roughly right rather than exactly right. Obviously the shop floor staffs are not aware of the consequences when bad works get out to customers' hands.

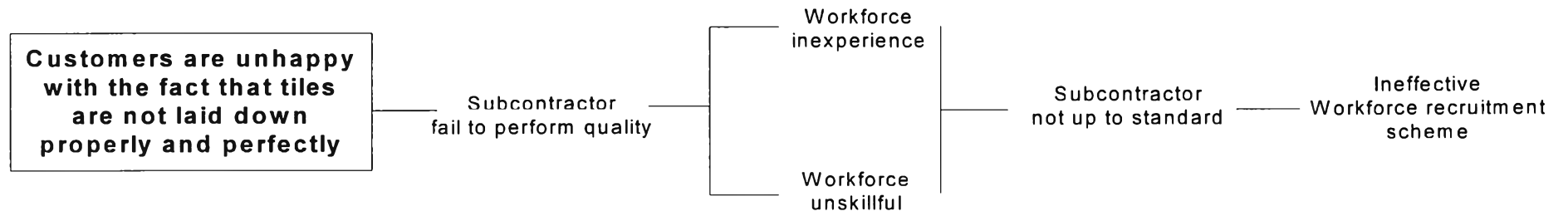


**Material Involve** - Why do not tiles lie down properly and perfectly? Well looking on the bright side of this problem, disregarding what has already been said above, how likely is it that problem persist because of the use of wrong mixed cement. This enables tiles to slides from side to side without work force knowing. Or the use of natural stone could be impossible to have the floor exactly perfect because of its weight.

**Machine & Equipment** - Again, looking at the problem from a different angle, disregard the possibilities of other conspiracy mentioned above. The reason that tiles are not laid down perfectly could be because of the working tools people have to put up with. The fact that tile cutting tool is too old and lacking of the ability to cut straight, or perhaps the tool is working fine but the cutting blade that needed replacement etc.

**Environment** - Or is the climate to be blame? Working directly under the sun is not exactly the best place to be everyday from morning throughout afternoon, when the temperature is something between 30-40°C. However, that is where work people would be laying down tile for swimming pool, they certainly are fatigue and tired of the job, which became the reason for their lost in concentration and lack of the ability to getting work done perfectly, thus poor work quality.

**Why-Why Analysis to identify root cause(s) for Problem number 14 - Floor tile is not lay down properly/perfectly**



**Figure 4.10 - Why-Why diagram for Problem 14**

**Why-Why Analysis:**

Subcontractor should take full responsibility, when such an imperfection slips out of control to the hand of customers. This is totally their fault for not being able to control their workforce and making sure that the swimming pool is delivered the quality that customers are expected. According to the analysis and through the inspection, evidence has revealed that existing subcontractor's workforces are lacking the necessary skill and responsibility to laid down tile properly and perfectly.

The central of the attention to the problem lies at the fact that the subcontractor is lacking the stringent control and inspection over the works that were done by their workforce. Subcontractor should also be responsible at performing workforce screening, this is to ensure sure that those who are employed by subcontractor are qualified, experienced and skilful workforce that can participate quality in every tasks. While subcontractor questioned their own workforce for not carrying out quality tasks, company should also pay more attention to recruiting/evaluating their subcontractor by mean of carrying out a regular performance appraisal against existing subcontractors, and for the new subcontractors there should be an performance evaluation probation period prior approving as qualified subcontractor in order to make sure that the company employ reasonable if not the best team of subcontractor in helping company to exploit quality to products.

**Relationship diagram showing the causal chain associated to Problem number 11 - Water pump machine breakdown or faulty**

Similar to problem 18 where there may be more than one consequence to the root cause, this is exactly the purpose of this relationship diagram. This diagram is intended to identify the link of consequences as influent by the root cause. For example, due to the fact that there is no owner’s manual given to customers, they often forget the procedure, which like to cause mishandling and then lead to putting too much chemical into the pool and as well as leaving the water valve closed during the process which consequent to machine overheating.

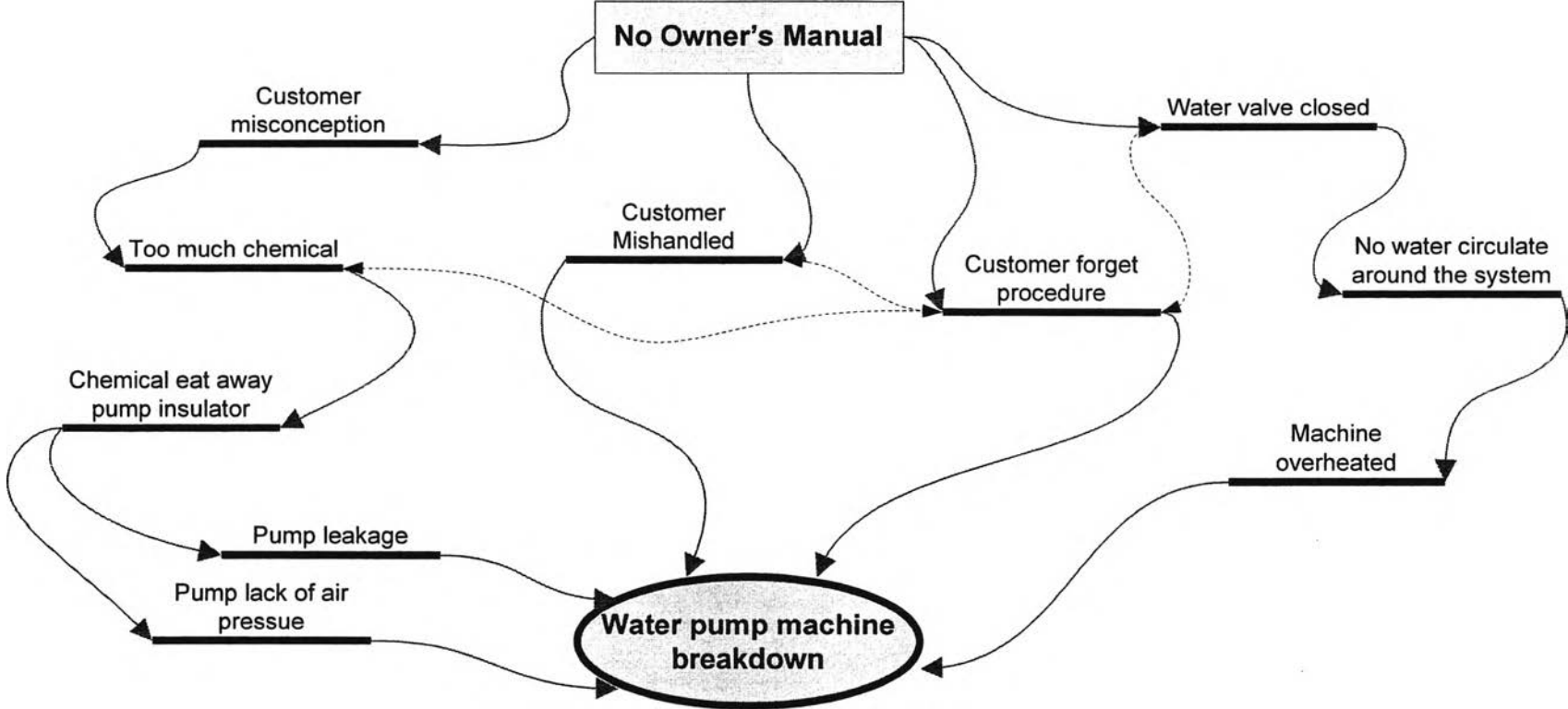
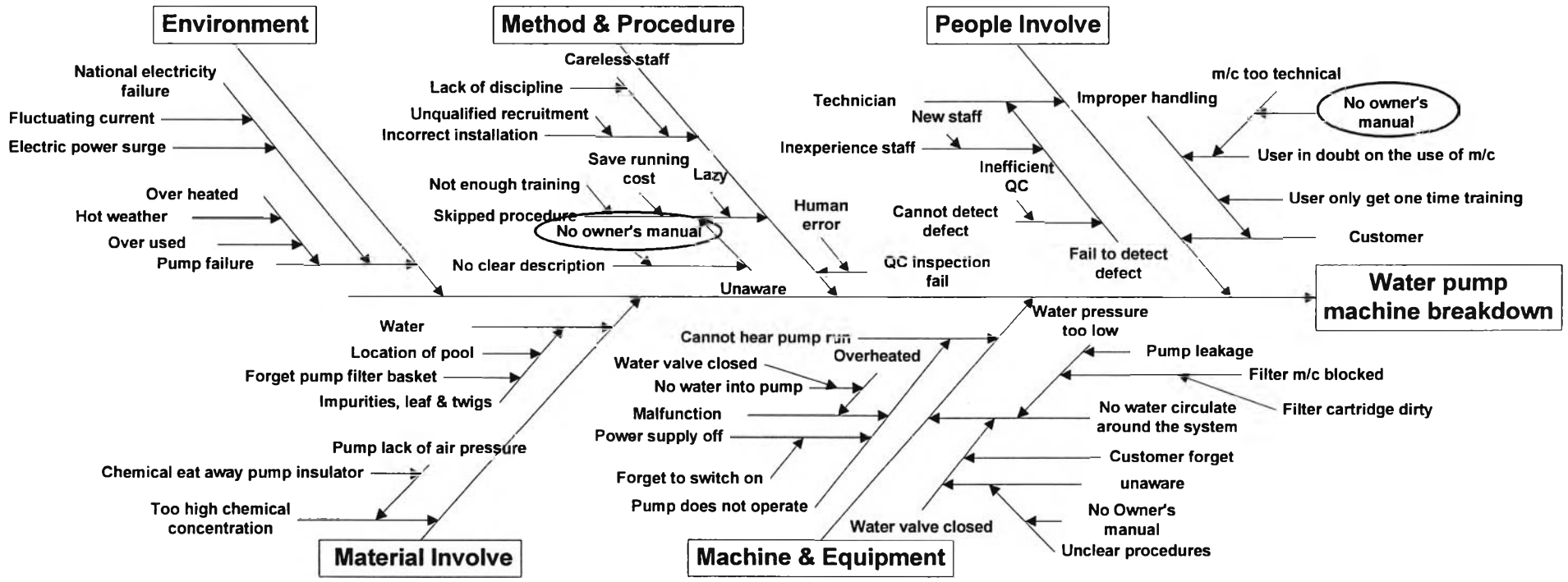


Figure 4.11 – Diagram showing the relationship between causes to Problem number 11

**Cause & Effect diagram to identify root cause(s) for Problem number 11 - Water pump machine breakdown or faulty**



**Figure 4.12 – Cause and Effect diagram on Problem 11**

**Cause & Effect Analysis:**

**People Involve** - There are two ways to look at this problem; first, the water pump machine is actually faulty as it contains manufacturing fault; and second, the water pump machine breakdowns under customers improper handling. Both problems are possible but the percentage of the first problem happening is small since the company undergo inspection on all of the new arrival machines and equipments, this is usually where problems/fault are detected, which made the first concern not the issue to worry. On the other hand, the concern is more to the second case, whereby the machine breakdown under owner's responsibility. Why does this occur? Does not customer/owner get primary training by company's technician? Similar to problem 18, yes all new swimming pool owners are trained once by company's technician on the use & handling, which consists of technical staffs such as switches, procedure and etc. As has already been analysed in problem 18, customers/owners often find that there are too much technical procedure and terms to remember at one time. Worse there is no written manual (owner's manual) given in order for customers' future reference on the use, handling and systematic procedure.

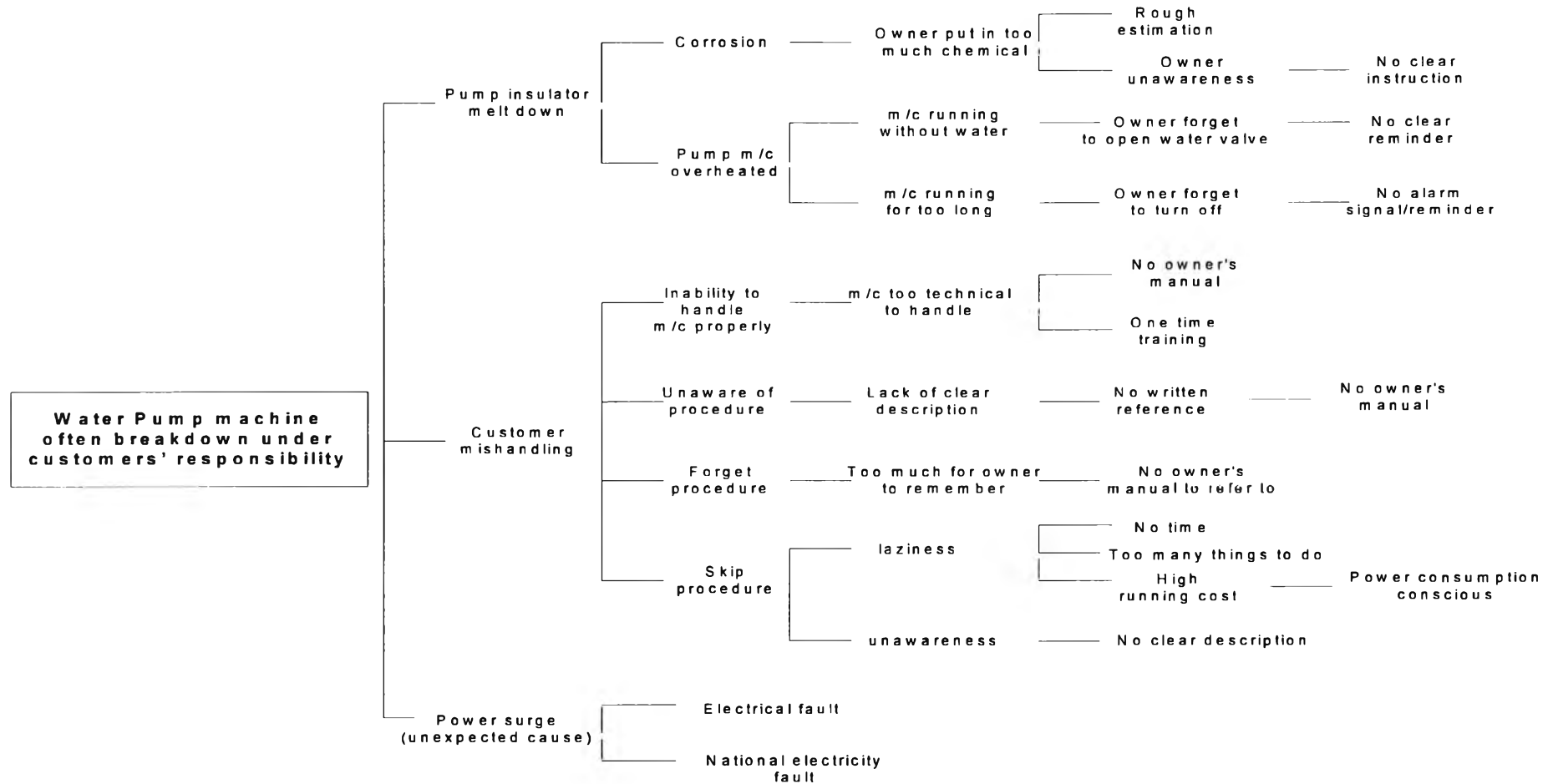
**Method & Procedure** - There are few things to remember in running pump machine; owner must first switch on the main power supply and then switch on the power button of the water pump machine. Owners often tend to forget to switch on the main power supply, and thinking that the water pump machine breakdown. Owners also like to forget and most likely unaware that they need to open the water valve, which consequent in no water running through the pump. Could not they realise this straight away? Yes it is possible to distinguish the sound of when water pump run with or without water through it. However, this ability is technical and not usually obvious to the owners. Only if there was a clear indicator visible to the eyes of the owners when turning water pump on would help tremendously but there is none and nor do they get owner's manual.

**Material Involve** - Chemical products especially chlorine is a factor, which results only with time, to causing machine breakdown. The water pump machine is all the time in contact to water that contains some chlorine level between 1 and no more than 1.5ppm ( $1 < 1.5$ ) and PH level of 7.2 no more than 7.6 ( $PH\ 7.2 < 7.6$ ) although may not be highly concentrated but they corrode away the insulator within water pump machine, which over time after a few years begins to show effect as water pump can not any longer pump as much water into the system, hence low pressure pump. Owners often put in too much chlorine and other chemical products, which only going to speed up corroding process on water pump insulator.

**Machine & Equipment** - There are many reasons to the breakdown of water pump machine and most likely causes are as follows. Owners often forget and not realised that the water valve is closed and so left the water pump machine to run without water passing through the pump (no water circulation), this leads to severe machine overheating, which create enormous friction and cause the insulator to melt down. Again owners would be able to detect this through hearing if only there were sign or indicator showing on the pump machine. Despite of the hearing, owner is able to read the pressure gauge situated on the filter machine nearby to check if water is pumped from the machine or not. However, customers usually disregard the checking on pressure and left machine to run for several hours. The pump machine has a filter basket of its own in order to capture any large object such as leafs, twigs, sands, pebbles and other small to medium size particle, but usually owners tend to forget to replace back the basket after cleaning, which cause them to enter directly to the pump which get in the way of some mechanic lever.

**Environment** - The breakdown can be caused by power surge usually when owner switch on higher current into the system, which caused the water, pump to malfunction. Or possibly high current is passed through the wire and unfortunately to the machine. Dampness from rain, or location of the technical room is another possibility, it causes machine to short circuit and malfunction.

**Why-Why Analysis to identify root cause(s) for Problem number 11 - Water pump machine breakdown or faulty**



**Figure 4.13 - Why-Why diagram for Problem 11**



**Why-Why Analysis:**

Similar to problem 18, problem 11 required to be looked from two viewpoints: from customers as the owner and technician as the maintenance. First, author shall concentrate on customer/owner viewpoint and asking the question why water pumps machine breakdown. Before answering the question it would be best to identify what are the possible causes to the breakdown of water pump machine? Well there are three possible causes pump insulator (rubber pump inside the machine) melt down, customer wrong handling, and finally the unexpected cause as the result of power surge. Author shall elaborate the second cause, customer wrong handling. According to customers they are finding it much too technical to remember all little information let alone to handle. There is some certain preparation that customers must do prior running the water pump machine, which is to open the water valve. Without water valve being opened, there will be no water passing through the machines both pump and filter, which subsequently melt down the insulator inside the water pump hence pump stops. Going back slightly to find out why customers/owners usually forget to open the water valve. Problem persists from time to time because they were unaware of the water valve and sometimes unable to recall the exact procedure once told by the technician. Furthermore, company provides them no owner's manual, which they can regularly refer to when forget. Now refer back to the meltdown of insulator, there are more than just one reason that it melt down, customer often leave the machine running for too long that overheated the insulator and caused it to melt down. Insulator can too corrode as direct result of customer putting in too much chemical content, which over time eats away the insulator.

To sum up, the root cause(s) to this problem 11 – water pump machine breakdown, is down to:

1. Company do not provide brief instruction or clear procedure on the use & handling of machine.
2. Second reason is that customers tend to leave the machine running and forget to turn it off as the result machine overheated. Hence, no timer or signal alarm to alert customer.

## 4.2 STAGE 2

Stage 2 represents “One-dimensional” attribute, and in this stage author is to define what the company does for the customers as a value added to the purchase of swimming pool.

### 4.2.1 Data Collection

#### 1. Customer Survey: Questionnaire

Both of the STAGE 2 and 3 have a few things in common and they are 1) to satisfy customers 2) to satisfy customers even more. In an attempt to satisfy customers, it is important to know what they actually want, thus questionnaire is designed to capture customers' needs/desire. Such the information that author needed to know are in depth details of customer inner needs, which usually takes a bit of time to think and make suggestion and for this reason it is exactly why customers needed to be surveyed, thus author chose customer survey as an approach to collect data.

As has already been stressed previously in STAGE 1 under subsection 2 Customer Survey: Questionnaire, since author needed to collect data/opinion by the use of survey anyway, the company requested that author carryout an additional survey to ask customers of company's current service for their future reference. Some feedback to the questions, which is the last part where customers are asked to point out/recommend any further improvement to the product and/or service, set by the company in the survey has proven to be useful for further suggestion to be made in both STAGE 2 & 3. The feedback retrieved from the *Customer Survey on Service* have been summarised in the Table 4.7.

#### 2. Interviewing

Interview is by far the most direct and effective way to draw out information from the source. Since STAGE 2 covers criteria relating to activities/services after sales as the company is at present undergo. So author chose to interview the Sales Representatives since they are the people who do the talking and selling. Unlike customers, Author chose to interview the staffs directly because it is the quickest way to get response and can become very detailing by investigating the motives, feeling, tone of voice and facial expression, which together can be very informative. Base on a casual interview with a few members of staffs from the sales function, which took place on Monday the 30<sup>th</sup> of June 2003, and the following questions were asked:

***Q: What extra tasks or service does the company do, if at all, in satisfying customers, who chooses ABC as the solution to their swimming pool?***

**A:** Our job as a sales person is to represent our company; in fact we work for the company as the middle person between ABC co., Ltd and customers. Being in the middle is hard work since we must somehow compromise between customers' requirement and yet need to beware of company's limitation. All the customers always enjoy getting a little more of something that benefited them from the purchase, and as with the majority of the sales person we try to satisfy customer by providing extra things as a compromise from the company. The best that we can do is 5% discount and perhaps throw in one or two special gift, if possible. These are pretty much all that we as sales person can do for the customers; however, the fact that we also guarantee our work for one year, once used to be daring but now is a normal standard since other competitors too offer the warranty.

***Q: Following by the next question: have any of the sales people received any recommendations or complaints about company on any issue that would be useful by the company?***

**A:** According to majority of the sales representative, customers often call back on an occasional basis to express; it was actually more like moaning, making a verbal complaint over their disappointment from the deal to the sales. Customers demand onsite care service offer to the owners beside one-year warranty, which is only service only when customers required. This kind of service was not at all what each customer had in mind, certainly not from the market leader, and most definitely was not the feeling that the customer got when sales representative was trying to make a sale.

### **3. Benchmarking**

Essential source of data collection comes from benchmarking against business rivals. It is absolutely vital to know what customers want from the company that company apparently does not have but other companies have. By benchmarking own company against else where no matter what industry companies are in, allow ABC to realise that customer service is unacceptable as evident by the feedback from the survey shown below in Table 4.7 and so the first priority for STAGE 2 change is on Customer Service issue, which can then be followed by some kind of customers' benefit or value added from the purchasing made with the company.

#### 4.2.2 Data Analysis

Base on the feedback from the customers, author seem to get an impression that customers are disappointed with the after sale service the customers received after the sale is completed. As ABC is a family business and ran under a family management, to author allege opinion family owned business (primitive Chinese ways) tends to think in term of company's profit first before satisfying customers not knowing that the true driving force of any business is solely dependant upon customer or author can simply say that family business is profit-oriented. All of these have made it much hard for the sales to persuade customers to choosing ABC, especially when the company do not support the sale by having a better after sale service. If continued this way, no matter how talent the sales representative are, author can say that ABC will suffer from lost of sale as is evident in the recent home fair, which took place a few months back in October, one of the company's rival was able to hit sale figure as high as 20 millions baht, where by ABC just scraped 10 millions baht. Well one firm evidence that author know is that the competitor offers with every swimming pool 10-years manufacturing warranty against leakages and a periodic onsite service. ABC definitely needed some guidance on how to keep and at the same time win more customers and the only way to do this is to offer to every customers more value added.

### 4.3 STAGE 3

Stage 3 represents “Attractive” attribute, and in this stage author has to determine factors necessary for the company to uplift its swimming pool features and/or customer service level in order to delight customers.

#### 4.3.1 Data Collection

##### 1. Customer survey: Questionnaire

Similar to STAGE 2, part of the questions from the customer survey used in STAGE 1, became rather useful for both the STAGE 2 and 3. In composing questionnaire, author and the team consist of the following parties: Operator, Head of technician, Head of sales, Financial, and one staff representative from each function and together come up with a set of questions relating the functions/departments they work in. Customers are asked to answer questions by simply selecting the option of their choice to help identify company’s current service level. This survey enables all customers to express their feeling toward the company and recommend any further action or features that would help the company excel at what the company does. A copy of the questionnaire is filed at the back of this thesis in the *Appendix Data collection: Customer Survey on Service* section, where the results are summarised in the table below.

##### 2. Benchmarking

Another way to collect valuable information is through benchmarking against the leading company of the same business nature. However, since the company is allegedly the market leader author looks beyond companies, who are situated in the same country and instead studies new product and/or service currently being offered else where internationally and not yet introduced to the home country by any companies. If ABC is fortunate enough to introduce whatever the technology, product and/or service to the customer first, customer would certainly be delighted. There are a few “Attractive” features, which are currently available in some countries but not yet introduced to the home customers such as Pool Painting, extra add-on features, which will be mentioned in the later Chapter 5.

Table 4.7- Summary on customer survey

<b>SUMMARY OF CUSTOMER SURVEY ON SERVICE</b>	
<b>Question</b>	<b>Feedback</b>
<b><u>Operator</u></b>	
1. How many telephone rings did you have to wait for the operator to respond?	<ul style="list-style-type: none"> <li>• 2 customers reported 7-8 rings, which they reckon was too slow</li> <li>• 18 customers reported 4-5 rings, which is acceptable but quite slow</li> </ul>
2. Was the welcoming expression impressive?	<ul style="list-style-type: none"> <li>• All 20 customers do not hear any delightful welcome and neither do they hear anything unpleasant therefore rated normal.</li> </ul>
3. Was the operator helpful and able to direct you to the right department?	<ul style="list-style-type: none"> <li>• Majority of the customers voted not bad, although 1 or 2 was annoyed with the fact that they were passed around the company too many times.</li> </ul>
<b><u>Sales Representative</u></b>	
1. What can you say about the knowledge of the Sales staff on the products of the company?	<ul style="list-style-type: none"> <li>• 16 customers (80%) are totally satisfied with the knowledgeable advice received from company's professional sales</li> <li>• 4 customers thought their sales have average knowledge</li> </ul>
2. Did you feel that Sales rep was responsive to your requests?	<ul style="list-style-type: none"> <li>• 12 customers fulfilled with the prompt response</li> <li>• 4 customers thought their sales were acceptable</li> <li>• 4 customer rated too slow</li> </ul>

<p>3. Did the Sales rep provide enough relevant information and guide you through to making decision?</p>	<ul style="list-style-type: none"> <li>• 16 customers are happy with the plentiful of information given, and professional recommendation to making decision</li> <li>• 4 customers rated just about</li> </ul>
<p>4. Did the Sales rep spend the appropriate amount of time assisting you?</p>	<ul style="list-style-type: none"> <li>• 6 customers are happy with plentiful amount of time given to them through the purchasing process</li> <li>• 10 customers felt that it was just about right</li> <li>• 4 customers were not assisted enough</li> </ul>
<p>5. Did you feel that you were treated with courtesy and respect at all time?</p>	<ul style="list-style-type: none"> <li>• 20 customers were treated with courtesy and respect shown by the sales person dealt with</li> </ul>
<p>6. Has the Sale rep ever checked up if the product is working fine and that you are satisfied within the period of one year after the sale over?</p>	<ul style="list-style-type: none"> <li>• 20 customers all agreed on this choice, not once, sales have not contacted customers first after the done deal</li> </ul>
<p>7. What do you think of the routine follow-through by Sales rep after purchased?</p>	<ul style="list-style-type: none"> <li>• Another high score on the negative side, all customers agreed that sales rep were all trying to make a sale rather than to focus the concern on customers</li> </ul>

<b><u>Technician</u></b>	
<p>1. Did our Technician show up on time?</p>	<ul style="list-style-type: none"> <li>• 2 customers were surprised by the early arrival (30mins) or on time</li> <li>• 3 customers reported that technician did not turn up at all</li> <li>• 2 customers reported 30 minutes late arrival</li> <li>• 13 customers waited from 3+ hours until the arrival of company's technician</li> </ul>
<p>2. Does the company's maintenance program service meet your expectation?</p>	<ul style="list-style-type: none"> <li>• 15 customers did not see anything special and thought that it was plain and reasonable service</li> <li>• 5 customers thought it was a total waste of money</li> </ul>
<p>3. Did our Technician show you respect and courtesy while at the site?</p>	<ul style="list-style-type: none"> <li>• 17 customers have not any comment of this</li> <li>• 2 customers were satisfied by the courtesy and respect shown by company's technician</li> <li>• 1 customer was treated with few courtesy and respect</li> </ul>
<p>4. Would you consider our Technician to be well dressed while visiting the site?</p>	<ul style="list-style-type: none"> <li>• 2 customers said that the technician was clean &amp; smart</li> <li>• 4 customers reported, technician was dirty &amp; scruffy and was not well dressed</li> <li>• 14 customers have no comment</li> </ul>



5. Please rate our service from  
1 The worst (lowest) – 10 The best  
(highest):

- **Technician support to you:**
  - 6 customers rated 6
  - 8 customers rated 5
  - 6 customers rated 4
- **Ability to solve problems:**
  - 4 customers rated 7
  - 11 customers rated 6
  - 5 customers rated 5
- **Cleanliness of work:**
  - 1 customer rated 8
  - 6 customers rated 6
  - 9 customers rated 5
  - 4 customers rated 4
- **Preparation of equipments:**
  - 1 customers rated 8
  - 2 customers rated 7
  - 8 customers rated 6
  - 7 customers rated 5
  - 2 customers rated 4
- **Solve problem quickly:**
  - 3 customers rated 8
  - 5 customers rated 6
  - 9 customers rated 5
  - 3 customers rated 3
- **Overall quality of work:**
  - 2 customers rated 7
  - 9 customers rated 6
  - 9 customers rated 5

<p>6. Did the Technician pass on appropriate advice on how to look after equipments in detail?</p>	<ul style="list-style-type: none"> <li>• 4 customers said, yes there were appropriate advise but only if they asked the technician</li> <li>• 16 customers did not get any advice from the technician</li> </ul>
<p><b><u>Finance</u></b></p>	
<p>1. Was the detail on the invoice accurate?</p>	<ul style="list-style-type: none"> <li>• 7 customers reported mistake on the invoice usually wrong name, detail listing, and price</li> <li>• 13 customers had their detail correctly</li> </ul>
<p>2. Did our staff approach you appropriately in order to collect money?</p>	<ul style="list-style-type: none"> <li>• 20 customers thought the collection was normal</li> </ul>

<b><u>Company Overall</u></b>	
<p>1. How many days did you have to wait overall until your request was responded?</p>	<ul style="list-style-type: none"> <li>On average of 16 days and sometimes customers might need to wait longer</li> </ul>
<p>2. How satisfied are you with the overall quality of the product: swimming pool and service? Where 10 is the best and 1 is the worst</p>	<ul style="list-style-type: none"> <li><b>Product:</b> <ul style="list-style-type: none"> <li>1 customers rated 8</li> <li>8 customers rated 6</li> <li>6 customers rated 5</li> <li>5 customers rated 4</li> </ul> </li> <li><b>Service:</b> <ul style="list-style-type: none"> <li>5 customers rated 6</li> <li>4 customers rated 5</li> <li>7 customers rated 4</li> <li>4 customers rated 3</li> </ul> </li> </ul>
<p>3. What do you consider the Strengths or Weaknesses of our product/service to be?</p>	<ul style="list-style-type: none"> <li><b>Strengths:</b> Customers defined company's strength are: Company reputation; Experience; Quality of Equipments; Brand of equipments;</li> <li><b>Weaknesses:</b> The following are the weaknesses defined by customers: Bad installation; Quality of work; After sale service; Staffs attitude; Long waiting time; Too expensive for not too great product and service</li> </ul>

<p>4. Would you consider us for your next purchase?</p>	<ul style="list-style-type: none"> <li>• 7 customers say Maybe if product and service both got better</li> <li>• 13 customers say NO</li> </ul>
<p>5. What is your overall level of satisfaction towards the company? Where 10 is highest satisfaction and 1 is unacceptable</p>	<ul style="list-style-type: none"> <li>• <b>Overall:</b> <ul style="list-style-type: none"> <li>1 customer give company 7</li> <li>4 customers give company 6</li> <li>4 customers give company 5</li> <li>8 customers give company 4</li> <li>3 customer give company 3</li> </ul> </li> </ul>
<p>6. Are there any additional Product and/or Service features that may be of interesting to you?</p>	<p>Such recommendations are:</p> <ul style="list-style-type: none"> <li>• Improve competence all round</li> <li>• Improve quality of product</li> <li>• Improve customer after sale service</li> <li>• Lower price</li> <li>• Increase credit term</li> </ul>
<p>7. Please recommend anything further improvement upon our existing Product and/or Service.</p>	
<p>8. Would you recommend us to someone else?</p>	<ul style="list-style-type: none"> <li>• 7 customers say Maybe if product and service both got better</li> <li>• 13 customers say NO</li> </ul>

### 4.3.2 Data Analysis

While author was transferring data from questionnaires to the table 4.7 above, author was under the impression that almost all of the 20 customers, who took part in the survey, were not at all pleased with the company, which reflected through unfavourable rating in every category shown in the table 4.7 above. For the rest of this part author would try to analyse in more detail customers' feedback, which hopefully the company can benefit one way or another from the data.

#### **Operator:**

Author shall begin the analysis by looking at the role of Operator. To start with, 18 customers reported that the operator is unable to pick up the phone sooner than 4 to 5 times of the waiting tone, which according to the customers was acceptable but quite slow. While 2 customers were stood up on the phone to as long as 7 to 8 rings before their calls were responded. Current operator greeting goes something like "Hello, ABC... Sa Wad Dee Ka", which translates to English as "Hello, This is ABC". Customers did not hear anything wrong nor was it unpleasant but it was certainly not the best that they have heard from elsewhere. The welcoming statement may not be the best but sure could sound delightful if it was said at the right tone of voice. Author once experienced this very same situation; the tone of voice from one lady has an immediate effect upon the atmosphere on the phone. Despite that the majority of customers were pleased with the assistance given by the operator, except from two customers, who were being joggle around through functions.

#### **Sales Representative:**

The majority of the customers responded positively towards the first five questions, when they were asked general questions about sales representative. 16 of the 20 customers admitted the sales person that each talked to were up to their expectation and were very pleased to have discussed their needs to a professional sales person in which they were given plentiful of datasheet, leaflet, and technical information necessary to choose the product, however, the other 4 customers thought that the sales person whom each one talked to was unable to give comprehensive advice and that enough information was give. Twelve customers credited the sales person for being responsive and always willing to be

of further assistance to the customers. Four customers thought sales was acceptable at responsiveness and the other four believed that their sales people were too slow at responding to further request and/or support. Customer liked to be taken care of, assisted and guided, which is evident by 4 customers who are happy with the plentiful amount of time spent walking them through making a decision to buying a swimming pool. Other 10 customers felt that sales people were given just about enough time, while other 4 customers were not too impressed with the lack in assistance. 20 customers were treated with all courtesy and respect.

Author would say that the majority of company's sales representatives have attracted reasonable rating by the customers prior purchasing, however, the last two questions have proven a different story since all customers have said in one voice that after their purchase of the product, they have never again heard from the sales unless customer make the first contact. This has lead customers to be under the impression that the reason that sales representatives were being supportive was because of one objective and that was to make a sale.

**Technician:**

Company's Technicians are another caused for concern. 13 customers had to waited for as long as three hours and possibly more for the technician to arrive at the site. 2 customers waited for half an hour for the technician to turn up. Worse yet company's technicians stood up 3 customers. On the other surprising hand 2 customers reported that the technician arrived half an hour earlier than the appointment time, which customers were very much impressed. When asked about the maintenance program service, this is the time when customers call in for assistance having suspected the breakdown of equipment or problems concerning the structure of the swimming pool and company's responsibility to send in the technician to the site for inspection and/or maintenance. 15 customers thought the service was reasonable and did not see anything fancy, while 5 were not too pleased with the service provided. Further question was asked about technician attitude: 2 customers were satisfied by the courtesy and respect that the technician has shown towards customer but 1 customer experienced bad mannered and fairly little respect. The rest 17 customers have no comment on this particular question.

Each customer was asked to rate on company's technicians base on the categories asked and the rating base on an average opinion of 20 customers: customers felt that they received fairly limited technical support when asked for help, hence customer evenly rated the support ranging from 4 to 6; technicians were able to solve problems effectively but some of the customers claimed that the problem persists again shortly after the maintenance; 5 customers rated 5, 11 customers rated 6, 4 customers rated 7; under cleanliness of work 9 rated 5, 4 rated 4, 6 rated 6, and 1 rated 8, which can be explained by the fact that some technicians were not as neat as the others; the next category is the preparation of equipments a spread of scoring from 2 rated 4, 7 rated 5, 8 rated 6, 2 rated 7 and 1 rated 8, some customers thought that technician did not come equipped with relevant tooling necessary to fix the fault and thus has to come back another day, which extended customer waiting time; technicians' ability to solve problem quickly 9 customers rated 5, 3 rated 3, 5 rated 6, and 3 rated 8, a fair distribution of time, which could be the direct effect of different type of problem, however, usually rated based on the preparation of equipments and the ability to define root cause that are being rated on; lastly customers are asked to rate company's technical support as a whole and was rated 9 customers rated 5, same numbers of customers also rated 6, while 2 rated 7, which can be said as plain service. The customers were asked if the technician has passed on appropriate advice or tips on how to look after equipments 4 customers replied yes to this question but only if customers asked, while the rest 16 customers did not receive any technical advice or guide from the technician. This is a serious issue since the majority of fault or malfunction caused by customer's fault at handling.

**Finance:**

Questions under this function is more concerned on the detailing side of the business for instance 7 customers reported that they found mistake on the invoice such mistakes are usually their name spelled incorrectly, detail of the purchase, over charged and some other issue. However, 13 customers are currently happy with present situation and have not yet spotted anything wrong with the billing method.

**Company Overall:**

These last set of questions very much wrap up customers' opinion on the product, service, and company as a whole.

Each customer is required to wait on average of 16 days in order to have company's technician to come around for an inspection and fixed. Even customer who waited for a shorter period of time 14 days thought it was not at all acceptable to wait this long for a small problem. Some of the customers with serious problem, which required an immediate response, did not hear back from the company until about a week later, customer admitted that this delay is totally unacceptable. Customers were asked to express their feeling through a rating on company's product and service; where product was rated 8 by 1 customer, 8 rated 6, 6 rated 5, and 5 rated 4; where as service 5 rated 6, 4 rated 5, 7 rated 4, and 4 rated 3. Company scores very little on the service side, and totally disqualified rating for the product after all those years of experiences and expertise. Customers were then asked to define company's both strengths and weaknesses (if any) from their opinion base on own experience toward the company. Author was told that the reason that they choose ABC in the first place because of the reputation in the market since the company was one of the original swimming pool subcontractors around, and the fact that company is an authorised dealer of high standard equipments imported from the USA and Japan reassured quality. Nevertheless, the identified company's weaknesses to be: imperfect installation and finishing, poor after sale service and customer support, long waiting time, high cost all round, and arrogant/bad staffs attitude. Author did not see the need to ask the next question when customers expressed their feeling so clearly towards company, but here it goes, customers were asked if they would consider us for their next purchase, 7 customers responded "yes" but conditionally, when the product and service got better, while the other 13 customers lost faith in the company totally, thus answered a firm "NO". The same answer goes to the last question when were asked if customer would recommend the company to anyone else.

To wrap this section up, author shall end this with the very last two questions concerning overall rating of the company as identified by 20 customers: 1 customer rated company 7; 4 rated for 6, 4 rated for 5; 8 rated for 4; and 3 rated for 3. One customer kindly recommended that the company improve all round competence on aspect such as cheaper price, better quality product and innovative features, and improve customer service wise.



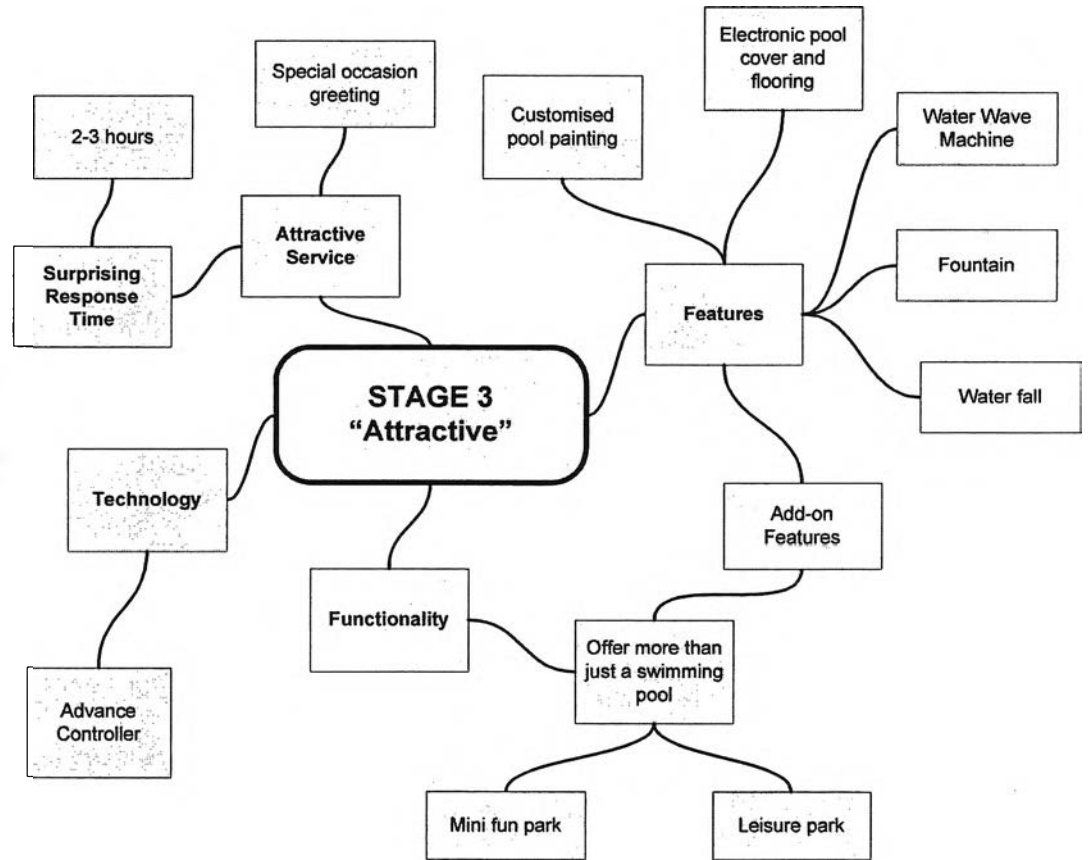
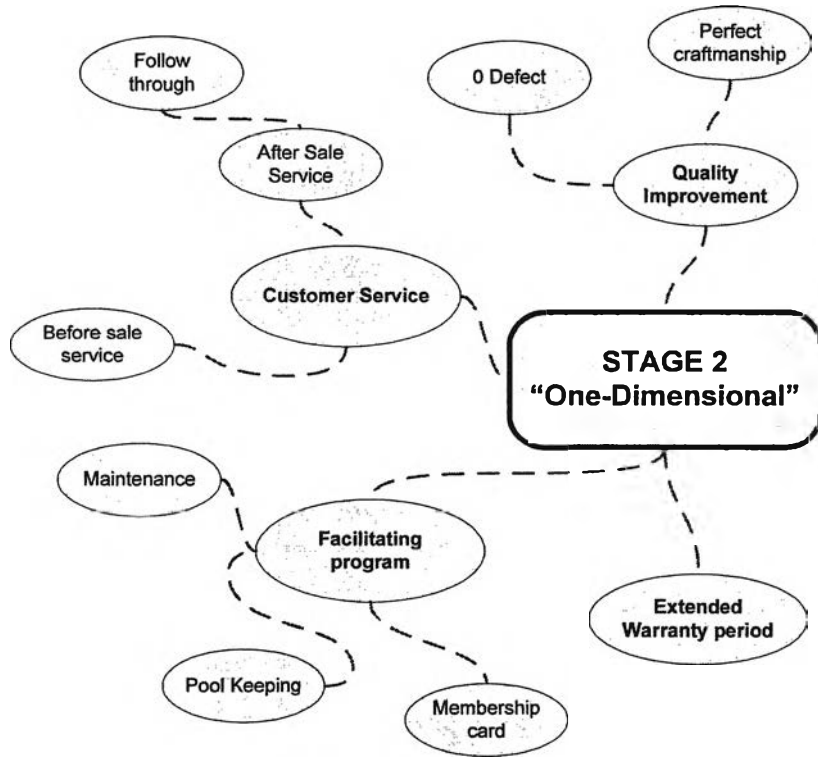
#### 4.4 Analysis of STAGE 2 and STAGE 3

The purpose of this section is to establish criteria for the two attributes and differentiate among the two, which criteria fall into “One-Dimensional”, where customers will be satisfied and which would fall into “Attractive”, where customers are overwhelmed/delighted by the product and/or service company has to offer.

Having studied the meaning of STAGE 2 and STAGE 3 and looked into the present approach currently undertaken by the company, prior to proposing any further solution for individual STAGE/attribute (in the following Chapter 5), it is necessary for author to, first, accumulate criteria and then distinguish the nature of the criteria and only then criteria can be appointed to the specific STAGE.

In separating criteria into STAGE, author and along with the problem solving team (including Head of Sales, Technician, QA, and Designer along with one staff representative of each function) together determine the outcome of each proposed criteria by directing a question to each of the criteria; would this criteria bring about Satisfaction or Delightfulness? Those criteria that trigger Satisfaction falls into STAGE 2 the “One-Dimensional” attribute and those that were thought to be Delightfulness are the STAGE 3 the “Attractive”. Below Figure 4.14 illustrates the sorting of criteria into the two STAGE.

**Grouping of Criteria into two individual STAGE**



**Figure 4.14 – Brainstorming Criteria (Relationship Diagram)**