Software Test Estimation: An Expert View

As mentioned in Test Mangement Phases Tutorial, Test estimation is a management activity which approximates**how long** a Task would take to complete. Estimating effort for the test is one of the**major** and **important** tasks in Test Management.

Why test estimation?

Two questions you can expect from your clients when discussing potential test engagements are
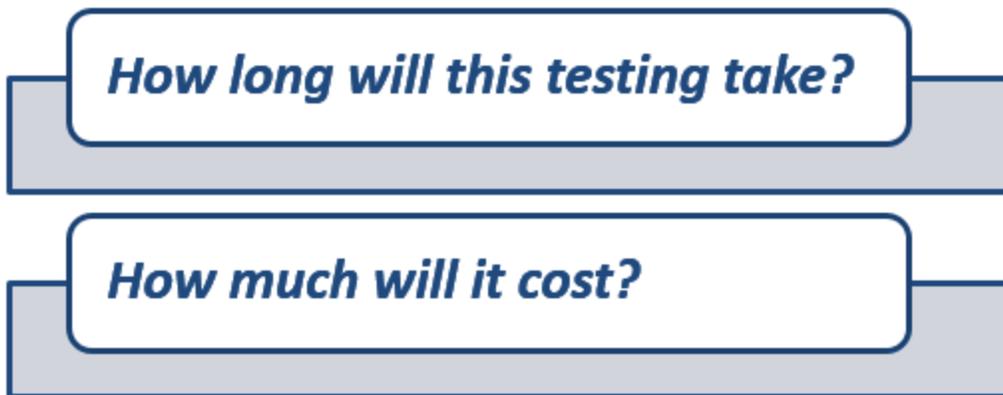
For small projects, these questions are relatively easy to answer. But for the big project like testing Guru99 Bank website, you must think hard to answer those questions.

What to Estimate?

Estimate of what?

- **Resources:** Resources are required to **carry out** any project tasks. They can be people, equipment, facilities, funding, or anything else capable of definition required for the completion of a project activity.
- **Times :** Time is the most valuable resource in a project. Every project has a deadline to delivery.
- **Human Skills :** Human skills mean the **knowledge** and the **experience** of the Team members. They affect to your estimation. For example, a team, whose members have low testing skills, will take more time to finish the project than the one which has high testing skills.
- **Cost:** Cost is the project **budget**. Generally speaking, it means **how much money** it takes to finish the project.

How to estimate ?

Following are the popular test estimation technique-

Work Breakdown Structure (WBS)

• Breaking down the test project into small pieces

Three Point Estimation

• Estimation method is based on statistical data

Functional Point Method

• Measure the size and give weightage to each function point

Following is the 4 Step process to arrive at an estimate

You will learn how to combine these techniques to find the estimate for Guru99 Bankcase study.

Step 1) Divide the whole project into the smallest tasks

Step 2) Allocate each task to team members

Step 3) Estimate the effort required to complete each task

Step 4) Validate the estimation
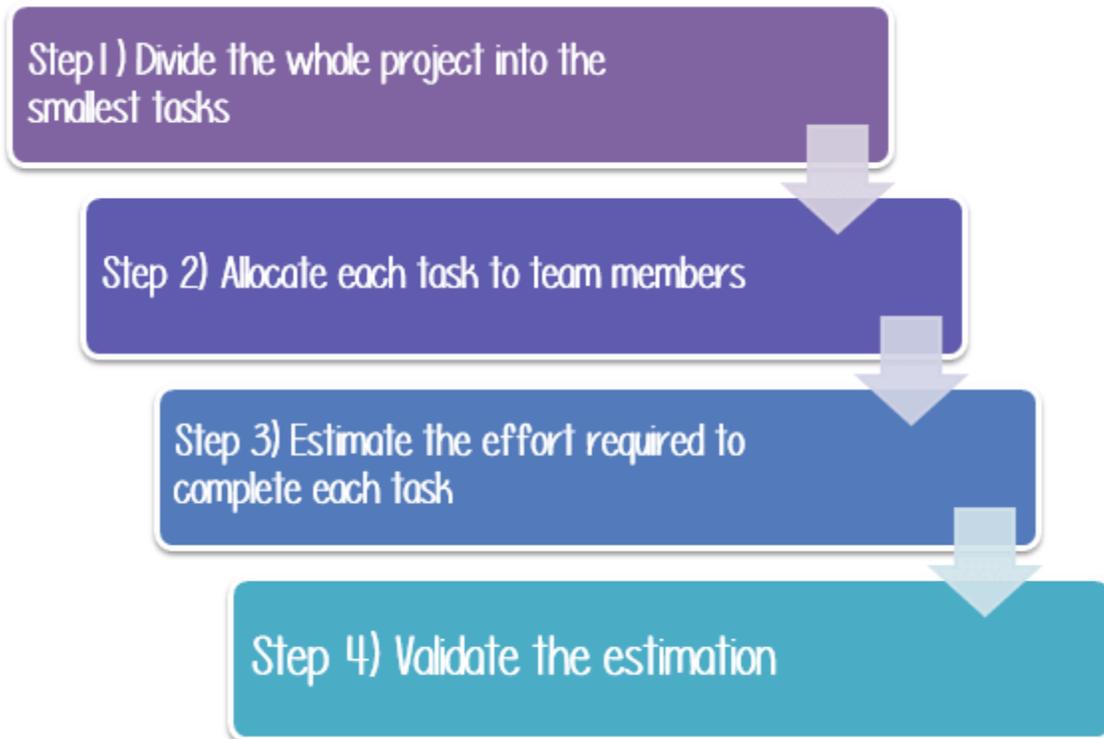
Step1) Divide the whole project task into subtasks

Task is a piece of work that has been given to someone. To do this, you can use the **Work Breakdown Structure** technique.

In this technique, a complex project is divided into modules. The modules are divided into sub-modules. Each sub-module is further divided into functionality. It means divide the whole project task into the **smallest** tasks.
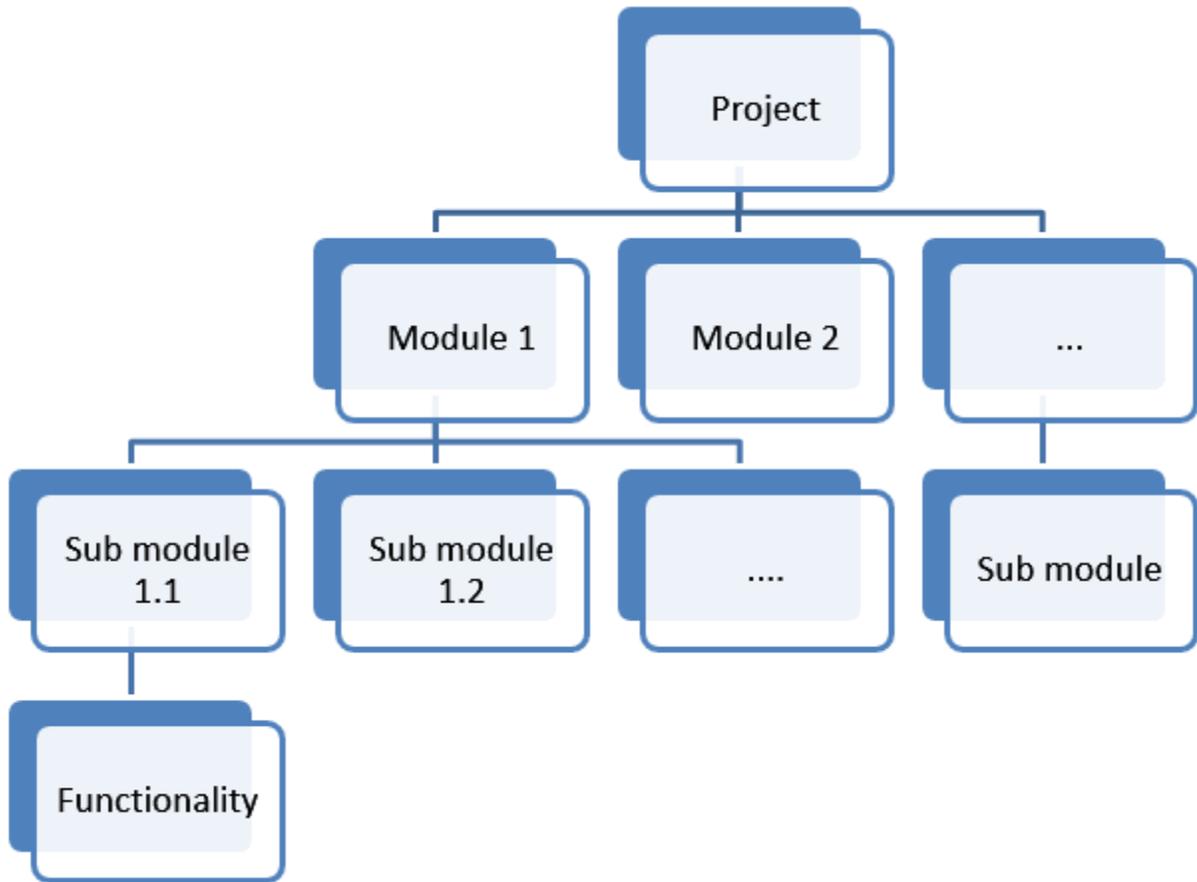
Use the Work Break Down structure to break out the Guru99 Bank project into 5 smaller tasks-
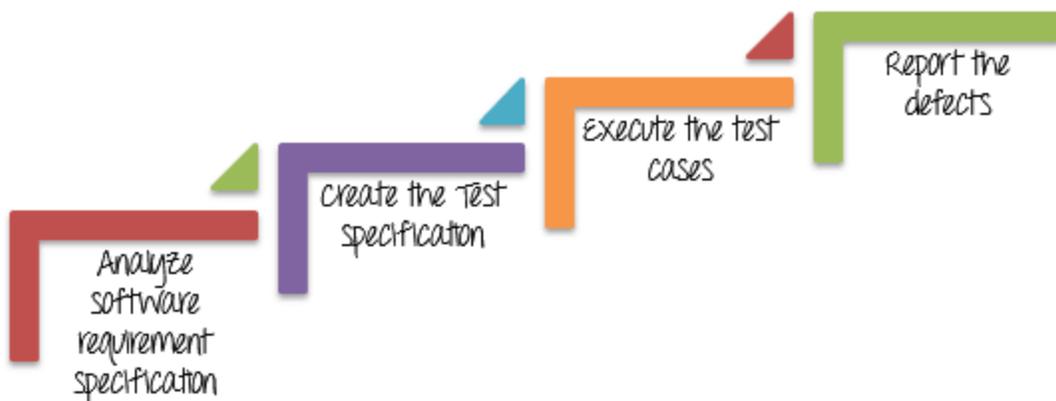
After that, you can break out each task to the **sub-task.** The purpose of this activity is create task as **detailed**as **possible**.

Task	Sub task
Analyze software requirement specification	Investigate the soft requirement specs
	Interview with the developer & other stakeholders to know more abou
Create the Test Specification	Design test scenarios
	Create test cases
	Review and revise test cases
Execute the test cases	Build up the test environment
	Execute the test cases
	Review test execution results
Report the defects	
	Create the defect reports
	Report the defects

Step 2) Allocate each task to team member

In this step, each task is assigned to the **appropriate** member in the project team. You
can assigned task as follows

Task	Members
Analyze software requirement specification	All the members

Create the test specification	Tester/Test Analyst
Build up the test environment	Test Administrator
Execute the test cases	Tester, Test Administrator
Report defects	Tester

Step 3) Estimate the effort for tasks

There are 2 techniques which you can apply to estimate the effort for tasks

1. **Functional Point Method**
2. **Three Point Estimation**

Method 1) Function Point Method

In this method, the Test Manager estimates Size, Duration and Cost for the tasks


Step A) Estimate size for the task

In Step 1, you already have broken the whole project task into small task by using WBS method. Now you estimate the size of those tasks. Let's practice with a particular task "**Create the test specification**"

The size of this task depends on the functional size of the system under test. The functional size reflects the**amount** of functionality that is relevant to the user. The more **number** of functionality, the more **complex**system is.

Prior to start actual estimating tasks effort, functional points are divided into three groups like **Complex**,**Medium Simple** as following:
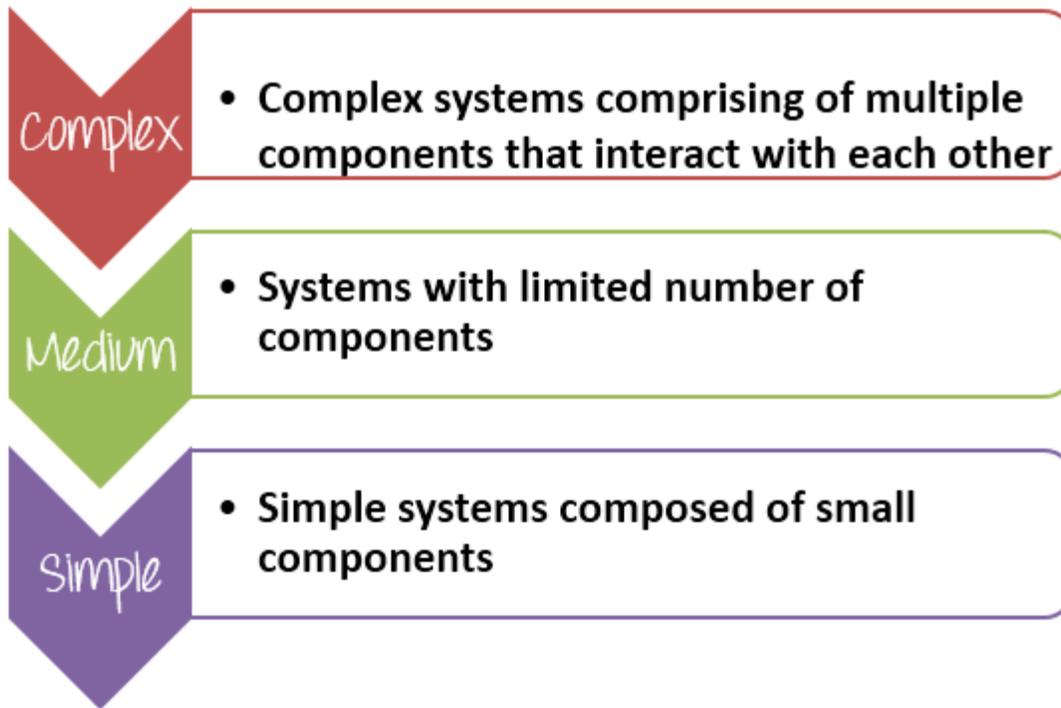
Based on the complex of software functions, the Test Manger has to give **weightage** to each functional point. For example

Group	Weightage
Complex	5
Medium	3
Simple	1

Let's take a simple example exercise to get clearer:

Take a look the software specification of website Guru99 Bank at here, the software engineer have already described the software modules in detail, can you determine the **complexity** of website's features by giving the weightage for each modules?

More complex the function point, more is the effort to test it is. The website is divided into **12 function** points, you can determine the **complexity** of each function points as follows-

No.	Module Name	Applicable Roles	Description
1.	Balance Enquiry	Manager Customer	**Customer:**A customer can have multiple bank accounts. He can view balance of his accounts only **Manager:** A manager can view balance of all the customers who come under his supervision
2.	Fund Transfer	Manager Customer	**Customer:**A customer can have transfer funds from his "own" account to any destination account. **Manager:** A manager can transfer funds from any source bank account to destination account
3.	Mini Statement	Manager Customer	A Mini statement will show last 5 transactions of an account **Customer:**A customer can see mini-statement of only his "own" accounts **Manager:** A manager can see mini-statement of any account
4.	Customized Statement	Manager Customer	A customized statement allows you to filter and display transactions in an account based on date, transaction value **Customer:**A customer can see Customized- statement of only his "own" accounts

			Manager: A manager can see Customized -statement of any account
5.	Change Password	Manager Customer	**Customer:**A customer can change password of only his account. **Manager:** A manager can change password of only his account. He cannot change passwords of his customers
6.	New Customer	Manager	**Manager:** A manager can add a new customer. **Manager:** A manager can edit details like address, email, telephone of a customer.
7.	New Account	Manager	Currently system provides 2 types of accounts • Saving • Current A customer can have multiple saving accounts (one in his name, other in a joint name etc). He can have multiple current accounts for different companies he owns. Or he can have a multiple current and saving accounts. **Manager:** A manager can add a new account for an existing customer.
8.	Edit Account	Manager	**Manager:** A manager can add an edit account details for a existing account
9.	Delete Account	Manager	**Manager:** A manager can add a delete an account for a customer.
10.	Delete Customer	Manager	A customer can be deleted only if he/she has no active current or saving accounts **Manager:** A manager can delete a customer.

11.	Deposit	Manager	**Manager:** A manager can deposit money into any account. Usually done when cash is deposited at a bank branch.
12.	Withdrawal	Manager	**Manager:** A manager can withdraw money from any account. Usually done when cash is withdrawn at a bank branch.

STEP B) Estimate duration for the task

After classifying the **complexity** of the function points, you have to estimate the **duration** to test them. Duration means **how much** time needs to finish the task.
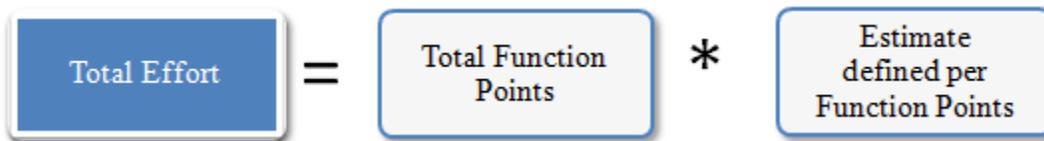
- **Total Effort**: The effort to completely test all the functions of the website
- **Total Function Points**: Total modules of the website
- **Estimate defined per Function Points**: The average effort to complete one function points. This value depends on the **productivity** of the member who will take in charge this task.

Suppose your project team has estimated defined per Function Points of **5 hours/points**. You can estimate the total effort to test all the features of website Guru99 Bank as follows:

	Weightage	# of Function Points	To
Complex	5	3	15
Medium	3	5	15
Simple	1	4	4
Function Total Points			**34**

Estimate define per point	5
Total Estimated Effort (Person Hours)	17

So the total effort to complete the task "Create the test specification" of Guru99 Bank is around 170 man-hours

Once you understand the effort that is required, you can assign resources to determine how long the task will take (duration), and then you can estimate labor and non-labor costs.

Above example also shows the importance of the member in your team. If you have **talented** and**experienced** members, you can finish the assigned task in the **small** time, and your project will finish at the deadline or sooner.

STEP C) Estimate the cost for the tasks

This step helps you to answer the last question of customer "*How much does it cost?*"

Suppose, on average your team salary is $5 per hour. The time required for "Create Test Specs" task is 170 hours. Accordingly the cost for the task is 5*170= $850. Now you can calculate budget for other activities in WBS and arrive at overall budget for the project.

As a project manager, you have to decide how to get the **most return** for your company's investment. The more **accurate** your estimate of project cost is, the **better** able you will be to manage your project's budget.

METHOD 2) Three Point Estimation

Three-Point estimation is one of the techniques that could be used to estimate a task. The simplicity of the Three-point estimation makes it a very useful tool for a Project Manager that who wants to estimate.

In three-point estimation, **three** values are produced initially for every task based on **prior experience** or**best-guesses** as follows

- **a** • The best-case estimate
- **m** • The most likely estimate
- **b** • The worst case estimate

When estimating a task, the Test Manager needs to provide three values, as specified above. The three values identified, estimate what happens in an **optimal state**, what is the **most likely**, or what we think it would be the **worst case** scenario.

Let's see how to use the above three values in the following example

For the task "**Create the test specification**", can you estimate the test effort? Remember that you have to **cover all** the modules of the Guru99 Bank website as done in Function Point Method

You can estimate as following

- The **best case** to complete this task is **120** man-hours (around 15 days). In this case, you have a talented team, they can finish the task in smallest time.
- The **most likely** case to complete this task is **170** man-hours (around 21 days). This is a normal case, you have enough resource and ability to complete the task

- The **worst case** to complete this task is **200**man-hours (around 25 days). You need to perform much more work because your team members are not experienced.

Now, assign the value to each parameter as below

$$a = 120 \quad m = 170 \quad b = 200$$

The effort to complete the task can be calculated using **double-triangular distribution** formula as follows-

$$E = (a + 4m + b)/6$$

$$E = (120 + 4 * 170 + 200)/6$$

$$E = 166.6 \ (man - hours)$$

In the above formula, parameter E is known as **Weighted Average. It is the estimation of the task "Create the test specification".**

But your boss may ask you
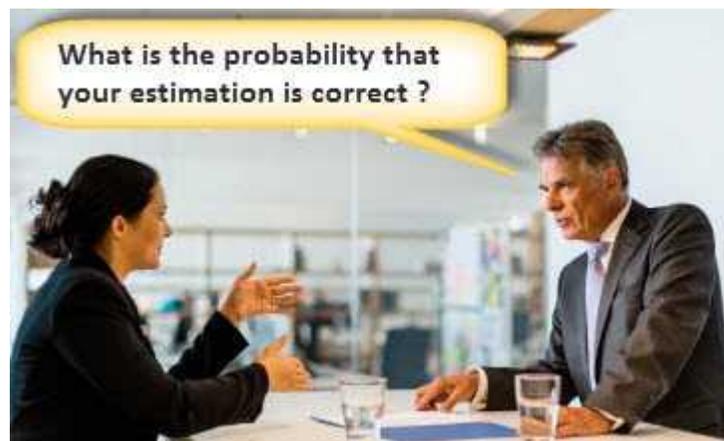
In the above estimation, you just determine a **possible** and not a **certain** value, we must know about the**probability** that the estimation is correct. You can use the other formula:

$$SD = (b - a)/6$$

$$SD = (200 - 120)/6$$

$$SD = 13.33 \ (man - hours)$$

In above formula, the SD mean Standard Deviation, this value could give you the information about the**probability** that the estimation is correct.

Now you can conclude the estimation for the task "Create the test specification"

To complete the task "Create the test specification" of Guru99 Bank website, you need **166.6 ± 13.33** Man-hour (153.33 to 179.99 man-hour)

Step 4) Validate the estimation

Once you create an aggregate estimate for all the tasks mentioned in the WBS, you need to forward it to the**management board**, who will **review** and **approve** it.

The member of management board could comprise of the CEO, Project Manager & other stakeholders.

The management board will review and discuss your estimation plan with you. You may explain them your estimation **logically** and **reasonably** so that they can approve your estimation plan.

Test estimation best practices

This topic introduces general tips on how to estimate Testing accuracy.

- **Add some buffer time:** Many unpredictable things may happen to your project, such as a talented team member quits his job suddenly, the testing takes more time than estimated to complete… etc. That why you need include some buffer in your estimation. Having a buffer in the estimation enables to cope for any delays that may occur.
- **Account Resource planning in estimation:** What should you do if some members in your team take long leaves? It may delay the project.Resource planning in estimation plays a key role. The availability of resources will help to make sure that the estimations are realistic. Here you have to consider the leaves for your team member, generally long leaves.
- **Use the past experienceas reference:** Experiences from past projects play a vital role while preparing the time estimates. Because some project may be some similarity, you can reuse the past estimation. For example, if you use to do a project like testing a website, you can learn from that experience, try to avoid all the difficulties or issues that were faced in past projects.
- **Stick to your estimation:** Estimation is just estimate because it may go **wrong**.In early stages of the project, you should frequently **re-check the test estimations and make modification** if needed. We should not extend the estimation after we fix it, unless there are major changes in requirement, or you have to negotiate with customer about the re-estimation