Project: ServeMe System

CSE 5325 – Fall 2020

Project Management

Module: COCOMO

Deliverable: COCOMO Estimate Report

Version: [1.0] **Date: [04/13/2021]**

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1. Introduction

The objective of this document is to estimate the cost, effort and schedule for the ServeMe System (SMS).

We have used SystemStar to calculate and generate reports that we will be using as a guidance throughout our project. We have provided print screens of the COCOMO for reference.

We have deriving COCOMO results using the following 3 important factors:

- Source Line of Code(SLOC)
- Scale Drivers
- Cost Drivers

Important Estimations Generated:

- Total size of SLOC
- Total Effort(in Person-Months)
- Total Duration(in Months)
- Total Cost(in thousand $)
- Total Productivity in Developed SLOC per Person-Month

Model used:

- Waterfall

Method Used:

- SLOC

Number of Developers: 5

Recommendations:

- The estimations are done on the basis of the Source Line of Code. The issue with it is that we do not have the SLOC yet. This is simply a tentative quantity which has a high possibility of changing afterwards.
- There could be hardware issues, personnel loss that are not taken into account.
- The exact technology/software were not accounted for.

The above factors will eventually change all the estimations. Hence, we cannot be completely reliable on the COCOMO estimations.

2. Estimating Factors

2.1 Source of Lines of Code

The following is the number of lines of code delivered as part of this project, A justification for the total amount of LOC is provided.

SLOC | Source Lines Of Code	Value Chosen:5000
Justification: We have decided to go for the maximum SLOC i.e. 5000 so that we would be able to know the maximum cost and try to not go beyond that amount.	

2.2 Scale Drivers

The following is the list of scale drivers, the values applicable to this project and a justification for each value chosen:

PREC | Precedentedness	Value Chosen: Generally Familiar
Justification: The team is familiar with the system design of the project since they have done somewhat similar one last year.	

FLEX | Development Flexibility	Value Chosen: Occasional relaxation
Justification: We are aiming to meet all our requirements. Relaxation will be given at times when something unprecedented happens such as personal loss, medical emergency etc.	

RESL | Architecture/Risk Resolution	Value Chosen: 100%
Justification: We are following the Waterfall Model. Hence, our requirements will be completely defined for the entire project.	

TEAM | Team Cohesion	Value Chosen: Highly Cooperative
Justification: We have a great relationship with our business stakeholders. Also, our project team, which in itself is a stakeholder too, consists of members that are not only highly qualified but also champions of effective communication.	

PMAT | Process Maturity	Value Chosen: SEI CMM Level 4
Justification: We focus on a well-defined approach, intense triage events, calculated risks and use of metrics to quantify our work.	

2.3 Cost Drivers

The following is the list of cost drivers, the values applicable to this project and a justification for each value chosen:

Personnel:

ACAP | Analyst Capability	Value Chosen: Very High
Justification: Our team consists of a Junior programmer, 2 Senior 4 out 5 members of the development team have worked together in different projects of various difficulty levels.	

APEX | Applications Experience Cost Driver	Value Chosen:Very High
Justification: The average experience of the development team is 6-7 years. Hence, the domain knowledge required to handle the project is very high.	

PCAP | COCOMO Programmer Capability Cost Driver	Value Chosen: Very High
Justification: All the members of the team are highly qualified and recognized. Even the Junior programmer who is a new college grad recruit has gone through a rigorous interview process to have been finally placed in this project.	

PLEX | Platform Experience Cost Driver	Value Chosen: Very High
Justification: The team consists of personnel experienced in UX/UI, embedded systems, backend and gaming designs.	

LTEX | Language and Tool Experience Cost Driver	Value Chosen: Very High
Justification: Our developers are well-versed in JavaScript, Java, React, Springboot, MySQL, HTML, CSS etc. Moreover, everyone will be provided paid training before the project starts.	

PCON | Personnel Continuity Cost Driver	Value Chosen: Nominal
Justification: We are not expecting to retire the existing members and add a lot of talents in near future. We are only thinking of adding two testers since our two Staff Software Developers will also be doing the job of a tester for the first release. Hence, our personnel turnover is neither high nor low.	

Platform:

TIME | Execution Time Constraint Cost Driver	Value Chosen: Nominal
Justification: We aim at developing software projects that do not take too much time of the available execution time. Hence, we have set TIME to nominal. It also means that execution won't be too low else we won't be able to meet the customer satisfaction.	

STOR | Main Storage Constraint Cost Driver	Value Chosen: Nominal
Justification: Considering this is our first release, we do not want our software to use a lot of space that is available to it. We want it to run on 50% of the main storage space.	

PVOL | Platform Volatility Cost Driver	Value Chosen: Low
Justification: We have chosen the Platform volatility to be low because there is not going to be any major change for a year after the project is deployed. we will focus on minor changes such as cosmetic changes, new versions, license renewal, performance scalability etc. every month.	

Product:

RELY | Required Software Reliability Driver	Value Chosen: High
Justification: This is a project which will be released to public use. We will be taking user data. Hence, any software failure is going to put the company in a financially high risk. So, our software needs to be highly reliable.	

DATA | Database Size Cost Driver	Value Chosen: Nominal
Justification: We are not building any separate database. We are going to use an off-the-shelf database available to us freely i.e MySQL. Therefore, the database size is not going to be overwhelming to handle.	

CPLX | Product Complexity Cost Driver	Value Chosen: High
Justification : We have decided to keep our product complexity high because we are using data structures like queues, stacks, hashmaps etc. Also, our software will have multimedia like videos, photos uploaded by the service provider.	

RUSE | Required Reusability Cost Driver	Value Chosen: High
Justification: ServeMe System is fairly generic in terms of its usability. We are using experienced resources and spending money and efforts to build an application that could be re-used in our company for future reference. This reusability factor will help us in training the resources too.	

DOCU | COCOMO Documentation Match to Life-Cycle Needs Cost Driver	Value Chosen: Nominal
Justification: First of all the RUSE is High, hence DOCU needs to be Nominal. Secondly, we have already mentioned in our Project Scope and Feasibility that we are not focusing on a high level guide related to the system. We want to invest a moderate amount of time in this phase.	

Project:

TOOL | COCOMO Use of Software Tools Cost Driver	Value Chosen: Nominal
Justification: As mentioned in our Project Scope and Feasibility, we will be using free tools available in the market. This project is our pilot version. We expect a high code quality from our developers to gain customers. Therefore, we will stick to a nominal level of Software tool.	

SITE | COCOMO Multisite Development Cost Driver	Value Chosen: Extra High
Justification: We have mentioned in our Microsoft Project plan that we will be using an office space. So, all of our developers will be located in one place. This ensures us greater communication and easier handling of issues.	

SCED | Required Development Schedule Cost Driver	Value Chosen: Very Low
Justification: First of all, we are using the waterfall model. Every aspect of every phase will be well-defined. Our developers and testers will be working parallel to each other. Secondly, we are focused on developing an easy-to-use application with moderate amounts of documentation. Hence, there is not much room for flexibility.	

3 Project Final Timeline and Cost Structure

- Previous Cost, Work and Duration (from assignment #2);

Duration	3 months
Human Resource Cost	$1,10,944
Non-Human Resources Cost	$2,36,000
Profit (0.5*(human+non-human cost))	$2,46.944*0.5 = $1,73,472
Total cost	$3,46.944 + $1,73,472 = $5,20,416

- New Time and Cost Structure

New Schedule (Duration)	5 months
COCOMO estimated costs (Human Resources) (requirement+product design+Detailed design + code/unit test+integration testing)	$1,65,000
Non-Human Resources	$1,20,000
Maintenance Cost	$5500
Profit (0.5*(human+non-human cost))	$2,90,500*0.5 = $1,45,250
Total cost	$2,90,500+ $1,45,250 = $4,35,750

4. Conclusion and Recommendations

Conclusions:
Reason why previous estimations are different from the current one:

In our Project Scope and Feasibility, we defined our budget to be $5,00,000. But while manually estimating, we went over budget.

Earlier, we did not calculate the project cost and schedule estimation on the following characteristics:

- personnel,
- project,
- platform and
- product.

We did not use any equation.

We overallocated human resources for a 3 month project.

We did not include maintenance cost.

We miscalculated the non-human resources such as license, hardware and utility cost.

We did not know the productivity of the resources involved.

Following are the COCOMO results:

- Total size of SLOC:5000
- Total Effort(in Person-Months):6.7
- Total Duration(in Months):5
- Total Cost(in thousand $):165
- Total Productivity in Developed SLOC per Person-Month:740.9

Recommendation:

Following things are the reasons why we would use COCOMO:

- Better management
- Suitable for our tight deadline pilot project
- Easy to follow
- Reports and Graphs Generation
- Different aspects of the team as well as the hardware/software are taken into considerations

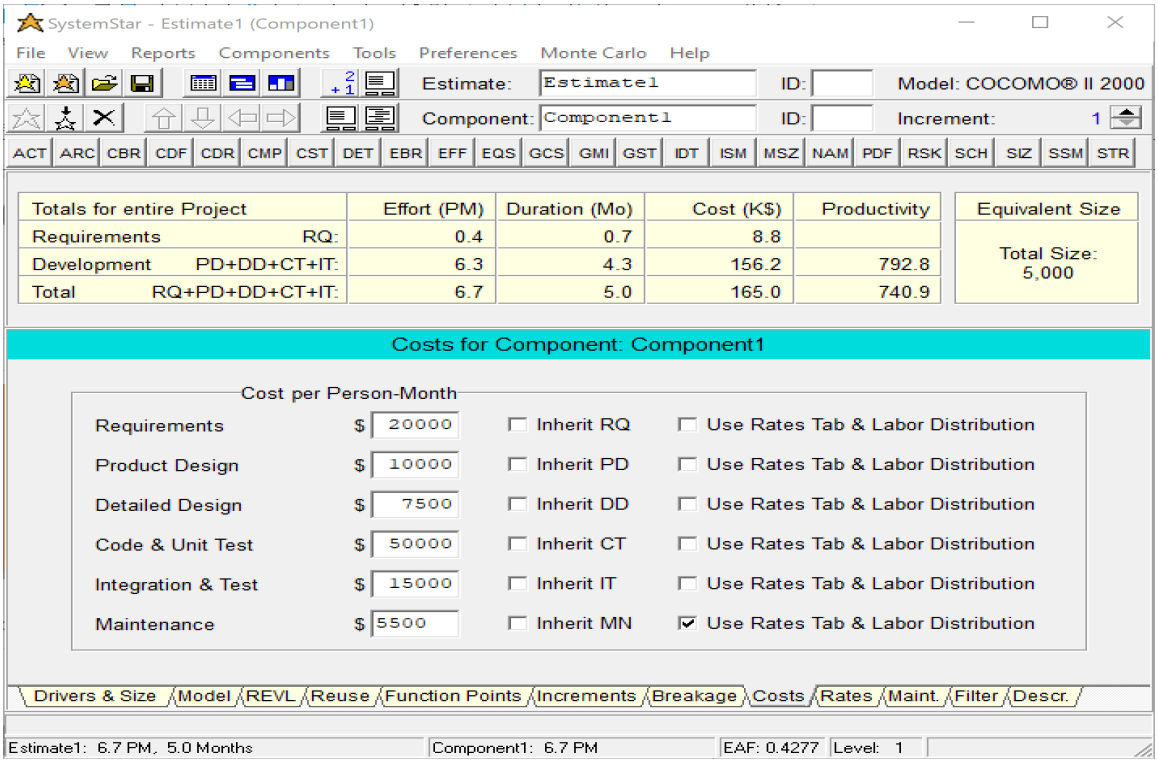
In spite of the advantages of COCOMO, we will **SPLIT** the project between the earlier estimation and add the COCOMO estimations.

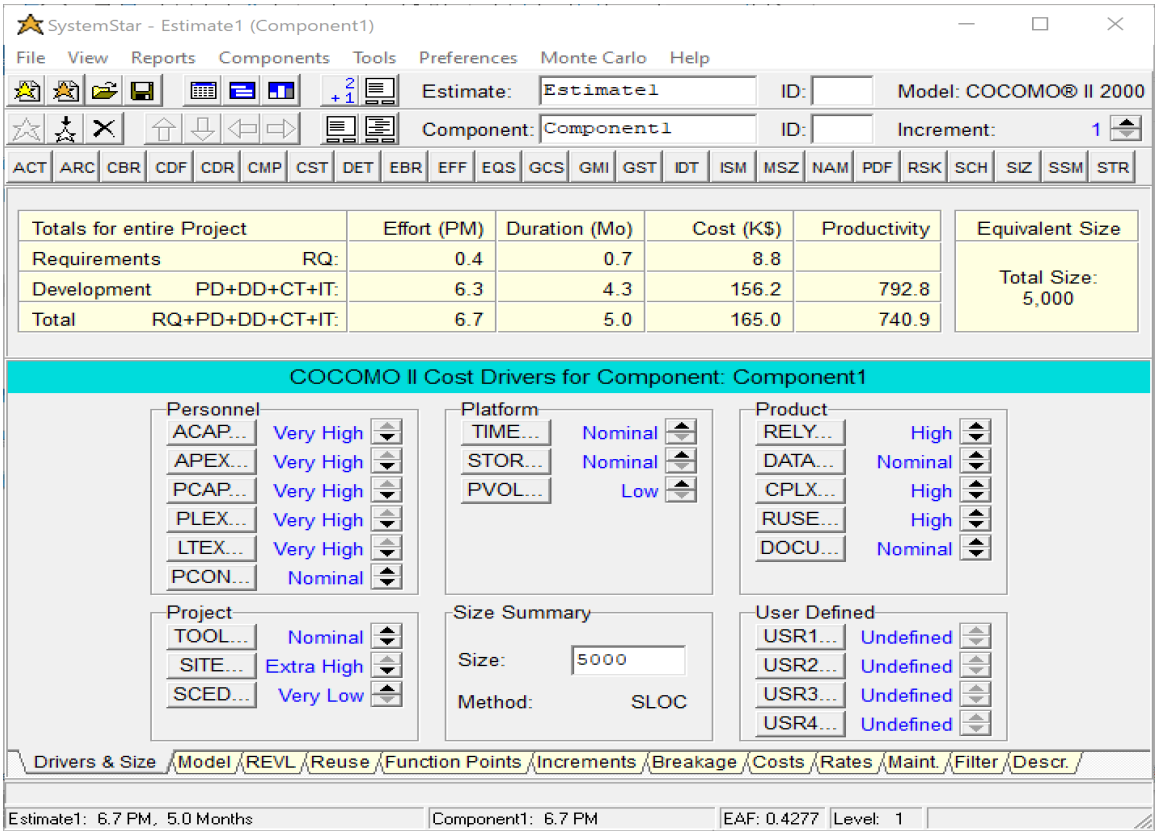
Reason: COCOMO did not use the cost of software licenses, building rent etc. But, we need to be economical as these services will incur us a lot of money. E.g. We cannot stretch a small and simple project to 10 months based on COCOMO.

Our approach is to be mindful of our goals and use the best of the two worlds.

Appendices

print screens of COCOMO reports


SystemStar - Estimate1 (Component1)
File View Reports Components Tools Preferences Monte Carlo Help
Estimate: Estimate1 ID: Model: COCOMO® II 2000
Component: Component1 ID: Increment: 1
ACT ARC CBR CDF CDR CMP CST DET EBR EFF EQS GCS GMI GST IDT ISM MSZ NAM PDF RSK SCH SIZ SSM STR
Totals for entire Project | Effort (PM) | Duration (Mo) | Cost (K$) | Productivity | Equivalent Size
Requirements RQ: | 0.4 | 0.7 | 8.8 |
Development PD+DD+CT+IT: | 6.3 | 4.3 | 156.2 | 792.8 | Total Size: 5,000
Total RQ+PD+DD+CT+IT: | 6.7 | 5.0 | 165.0 | 740.9
Costs for Component: Component1
Cost per Person-Month
Requirements $ 20000 Inherit RQ Use Rates Tab & Labor Distribution
Product Design $ 10000 Inherit PD Use Rates Tab & Labor Distribution
Detailed Design $ 7500 Inherit DD Use Rates Tab & Labor Distribution
Code & Unit Test $ 50000 Inherit CT Use Rates Tab & Labor Distribution
Integration & Test $ 15000 Inherit IT Use Rates Tab & Labor Distribution
Maintenance $ 5500 Inherit MN Use Rates Tab & Labor Distribution
Drivers & Size Model REVL Reuse Function Points Increments Breakage Costs Rates Maint. Filter Descr.
Estimate1: 6.7 PM, 5.0 Months
Component1: 6.7 PM
EAF: 0.4277
Level: 1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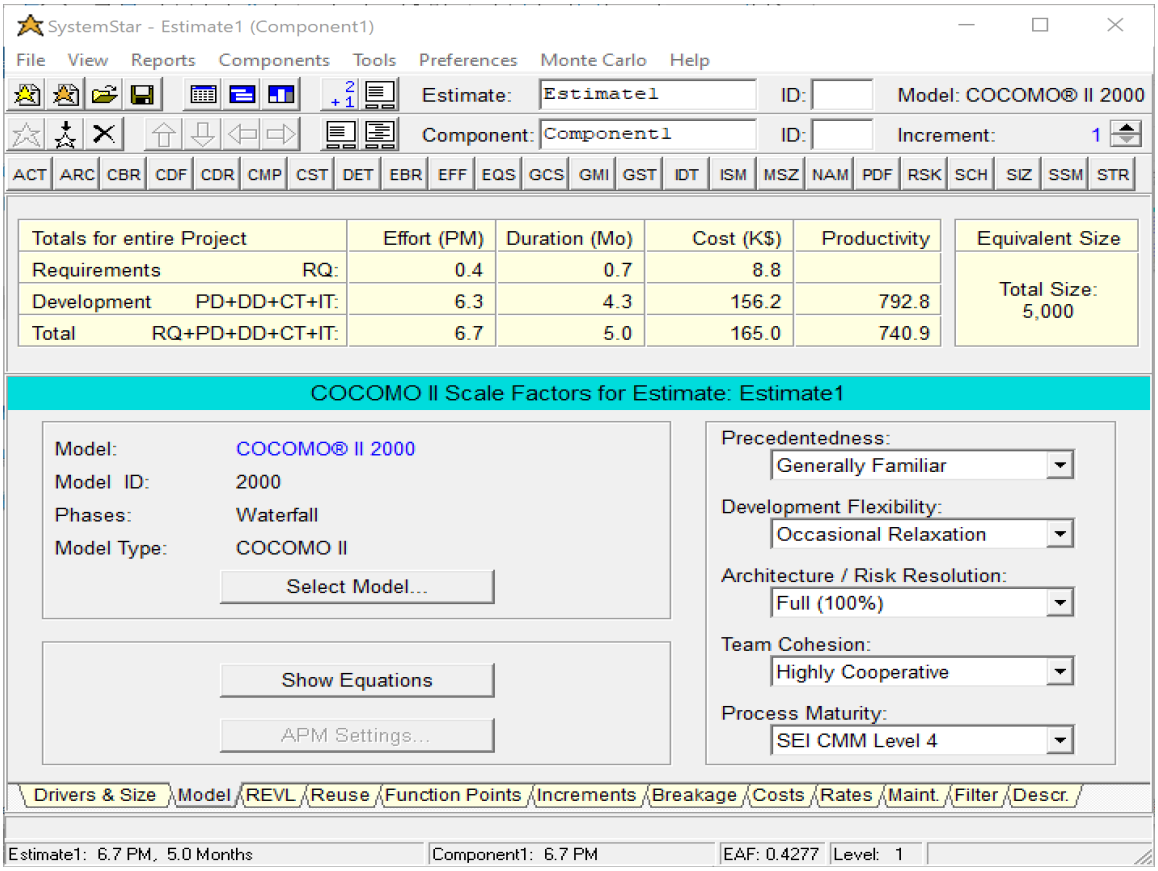
COCOMO II Cost Drivers for Component: Component1
Personnel
ACAP... Very High
APEX... Very High
PCAP... Very High
PLEX... Very High
LTEX... Very High
PCON... Nominal
Platform
TIME... Nominal
STOR... Nominal
PVOL... Low
Product
RELY... High
DATA... Nominal
CPLX... High
RUSE... High
DOCU... Nominal
Project
TOOL... Nominal
SITE... Extra High
SCED... Very Low
Size Summary
Size: 5000
Method: SLOC
User Defined
USR1... Undefined
USR2... Undefined
USR3... Undefined
USR4... Undefined
Drivers & Size Model REVL Reuse Function Points Increments Breakage Costs Rates Maint. Filter Descr.
Estimate1: 6.7 PM, 5.0 Months
Component1: 6.7 PM
EAF: 0.4277
Level: 1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Total RQ+PD+DD+CT+IT: | 6.7 | 5.0 | 165.0 | 740.9
COCOMO II Scale Factors for Estimate: Estimate1
Model: COCOMO® II 2000
Model ID: 2000
Phases: Waterfall
Model Type: COCOMO II
Select Model...
Show Equations
APM Settings...
Precedentedness: Generally Familiar
Development Flexibility: Occasional Relaxation
Architecture / Risk Resolution: Full (100%)
Team Cohesion: Highly Cooperative
Process Maturity: SEI CMM Level 4
Drivers & Size Model REVL Reuse Function Points Increments Breakage Costs Rates Maint. Filter Descr.
Estimate1: 6.7 PM, 5.0 Months
Component1: 6.7 PM
EAF: 0.4277
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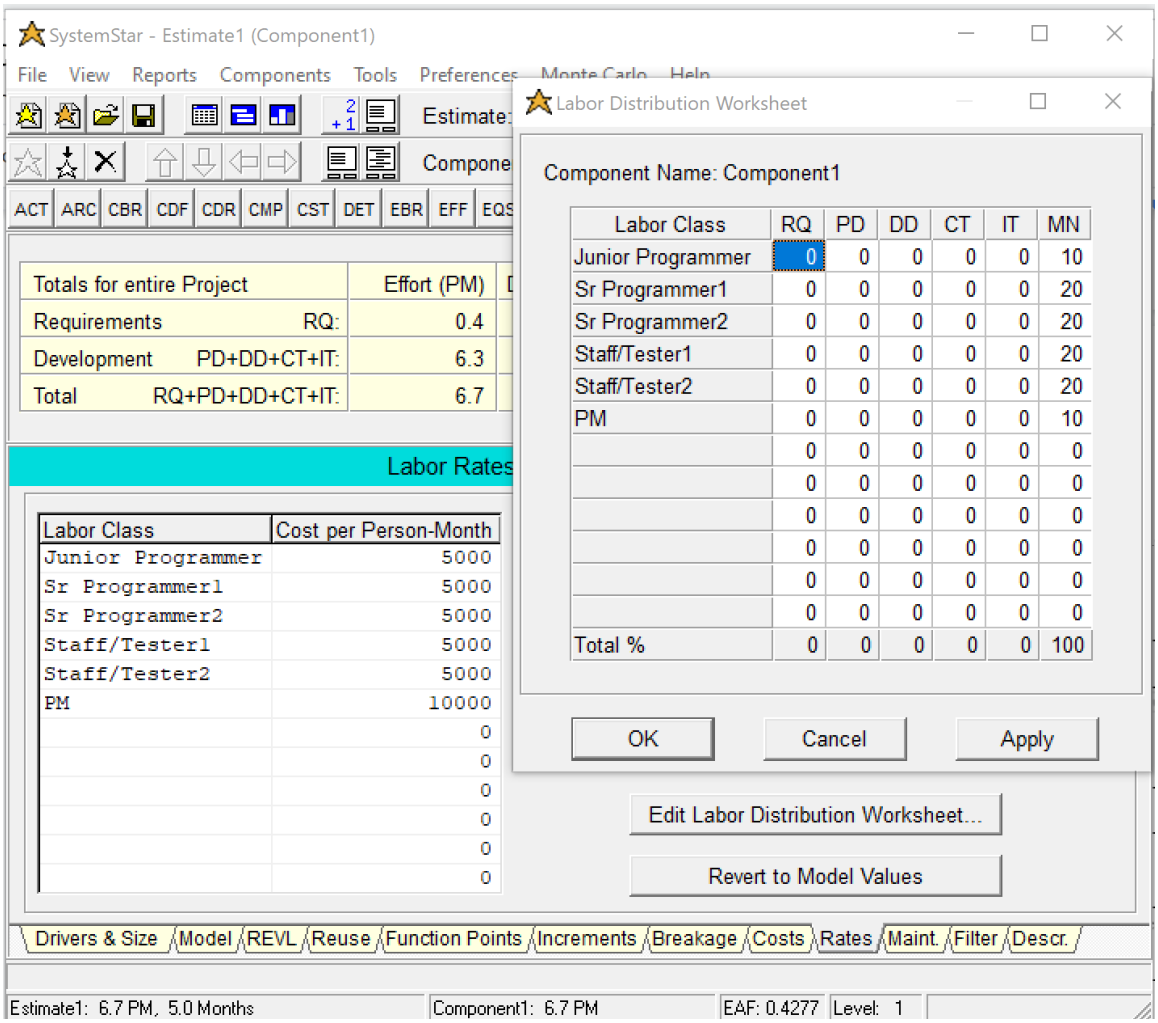
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Effort (PM)
Requirements RQ: 0.4
Development PD+DD+CT+IT: 6.3
Total RQ+PD+DD+CT+IT: 6.7
Labor Rates
Labor Class
Cost per Person-Month
Junior Programmer 5000
Sr Programmer1 5000
Sr Programmer2 5000
Staff/Tester1 5000
Staff/Tester2 5000
PM 10000
Labor Distribution Worksheet
Component Name: Component1
Labor Class RQ PD DD CT IT MN
Junior Programmer 0 0 0 0 0 10
Sr Programmer1 0 0 0 0 0 20
Sr Programmer2 0 0 0 0 0 20
Staff/Tester1 0 0 0 0 0 20
Staff/Tester2 0 0 0 0 0 20
PM 0 0 0 0 0 10
Total % 0 0 0 0 0 100
OK
Cancel
Apply
Edit Labor Distribution Worksheet...
Revert to Model Values
Drivers & Size Model REVL Reuse Function Points Increments Breakage Costs Rates Maint. Filter Descr.
Estimate1: 6.7 PM, 5.0 Months
Component1: 6.7 PM
EAF: 0.4277
Level: 1