

**Project: ServeMe System (SMS)**

**CSE 5325 – Spring 2021**

**Project Management**

**Module: COCOMO**

**Deliverable: COCOMO Estimate Report**

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## 1. Introduction

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The purpose of this document is to define the estimations using COCOMO Model and compare it with the estimation we found using our previous approach. The ServeMe System (SMS) being developed enables the users to generate smooth service request for their homes and small businesses. It is being developed for all platforms and can be accessed through website and Apps – Both for Android and Apple. Service request can be created for Plumbing, Computer repair, pest control, tutoring etc. The profit projection is 50% of our development cost.

I have used COCOMO Model tool provided by Softstar to estimate both the cost and duration of the project. Cost estimation by COCOMO Model is slightly smaller than the cost estimated without the COCOMO Model. This is because COCOMO Model does not consider number of hours worked by the developers on the project in order to finish it on schedule and also due to different salary rates such as \$5000 for each developer per month and \$10,000 for project manager per month.

The COCOMO Model estimated the duration of the project to be around 4.7 Months (~143 days) which is a greater number of months compared to the estimation done without the COCOMO Model. The duration I estimated without COCOMO Model lies within the deadline of the project which is 3 months as mentioned by the client. This is because COCOMO Model does not consider the number of hours, they worked on it as a factor but purely considers SLOC (Single Line of Code) as a factor. The size of this SLOC, in the early phase of system life cycle (Waterfall Model) is estimated with great uncertainty. So, the accurate cost estimate cannot be arrived at.

A brief description on the selections I have made for both scale drivers and cost drivers for the COCOMO Model is given below along with its value where I have explained why choosing that specific value would give us accurate estimation for cost, duration and effort for the project.

## 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.

<b>SLOC   Source Lines of Code</b>	Value Chosen: 4500
Justification: In order to estimate the SLOC value, we can follow two methods:  Method 1: Checking for similar projects  We can check for similar project like projects we have developed previously and examine how similar or how different there are and adapt the estimate accordingly.  Method 2: Taking from panel of experts  We can seek the estimate from a panel of experts such as senior developers or project managers who have experience on the project. Here, the experts do not directly interact in order not to influence each other but their individual estimates are aggregated.  We have followed method 2 and have got an aggregated estimate of 4500 SLOC.	

### 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:

<b>PREC   Precendentedness</b>	Value Chosen: High – Generally Familiar
Justification: The value chosen is “High” for this scale driver because our team has previously worked on similar projects with a familiar application framework, features that could be further extended synchronously to fit for this project requirements.	

<b>FLEX   Development Flexibility</b>	Value Chosen: Very Low - Rigorous
Justification: The value chosen is “Very Low” for this scale driver because the mere success of this project depends on the whole implementation of the requirements as there already existing projects that perform the same. So, in order for the project to have a popular usage we need to satisfy all the requirements strictly which makes the project stand out from its predators. If any of the requirements are not met stake holders will not accept the deal ultimately causing us a loss. So, its highly important that all the requirements are met.	

<b>RESL   Architecture / Risk Resolution</b>	Value Chosen: Very High – Mostly (90%)
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Justification: The value chosen is “Very High – Mostly (90%) for this scale driver because even if the architecture is well established prior to the initialization of the project and the project is equipped with top software architects. There may be an uncertainty with respect to risks that do not have immediate counter action.

<b>TEAM   Team Cohesion</b>	Value Chosen: Very High – Highly Cooperative
Justification: The value chosen is “Very High – Highly Cooperative” for this scale driver, team members are highly interactive with the stake holders with respect to the requirements, objectives and specifications. They maintain a highly professional atmosphere with favorable outcomes as evidently seen with the previous projects that the team has handled successfully.	

<b>PMAT   Process Maturity</b>	Value Chosen: High – SEI CMM Level 3 – “Defined” – SW process is standardized.
Justification: The value chosen is “High” for this scale driver because each of our organization development process and its tools are standardized as there’s a set of defined and documented standard processes which are established specific for this project and these are improved as the time progresses. That in our case, we have specified strategy that we will apply towards the 3 different modules such as Web application, Android app and Apple app.	

## 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:

<b>ACAP   Analyst Capability</b>	Value Chosen: Very High
Justification: Analysts selected for the team to do this project are exceptionally best in the business. Few of the them have prior experience of developing similar projects and are well acquainted with each other as they have worked together.	

<b>APEX   Applications Experience</b>	Value Chosen: High
Justification: My team members are provided with 3 to 5 years of domain experience, most of it being merely application experience along with them actively being involved in several other tasks along the line, thereby choosing the value as high.	

<b>PCAP   Programmer Capability</b>	Value Chosen: Very High-90 <sup>th</sup> percentile
Justification: All the members who have been assigned this project are capable, competent and experienced. These members have been through rigorous process of hiring which shows that they are the most suitable for the position given in this project.	

<b>PLEX   Platform Experience</b>	Value Chosen: Very High-6 years
Justification: Our team has a lot of prior experience on these platforms as we have successfully developed various web applications that uses HTML, MYSQL, JavaScript, CSS and also developed various apps using XCode for Apple and Android studios for Android.so I believe that our team members are quite accustomed to the platforms that are to be currently used in this project too.	

<b>LTEX   Language and Tool Experience</b>	Value Chosen: Very High-6years
Justification: Our team has an experience of 8 years working with Android Studios which uses Java, SQL database to develop android apps and working with XCode to develop App store apps. Similarly, we have 6 years of experience in developing websites using Adobe Dreamweaver.	

<b>PCON   Personnel Continuity</b>	Value Chosen: Nominal – 12% turnover per year
Justification: Our team members from previous projects have been involved in various subsequent ones. Barely anyone is completely new, and most of them turns out to be associates from previous projects. So, the turnover projected is nominal. But with the success of this project, the annual turnover will increase and we will able to choose 6% turnover per year.	

<b>TOOL   Use of Software Tools</b>	Value Chosen: Very High
Justification: Multiple Tools utilized in this project are automated and integrable into our workflow to achieve the accuracy and efficiency. Most of the tools are mature and compatible with the platforms that available in the market.	

<b>SITE   Multisite Development</b>	Value Chosen: Extra High
Justification: As we have rented an office space which we will using for this project. It becomes easy for us to stay in constant communication and interact as needed. This solves the communication issues and keep the team motivated.	

<b>SCED   Development Schedule</b>	Value Chosen: Very Low
Justification: The deadline given by the client is 3 months which is a tight development schedule. With proper plan and execution, we can successfully complete the project within 3 months. As we have taken waterfall model which is a liner sequential life cycle model where each stage is well defined. In this implementation stage, we had the developers be divided into 3 group consisting of 2 people each. All 3 group are simultaneously working to implement webpage, android app and apple app at the same time. Currently the team is focusing on developing the project which is not complex and has nominal documentation. Which is why we have chosen 75% of nominal schedule.	

<b>TIME   Execution Time Constraint</b>	Value Chosen: Nominal
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Justification: This project system is highly dependent on the user interaction. The system is never scheduled to be shut down that is, it will be up and running at all times but it can periodically be idle with some exceptions.

<b>STOR   Main Storage Constraint</b>	Value Chosen: Nominal (50%)
Justification: The value we have chosen for this cost driver is "Nominal" because data storage constraints are not a major concern for this project as we will be using cloud hosting where if 50% of available storage is used, we can easily scale up and maintain our performance.	

<b>PVOL   Platform Volatility</b>	Value Chosen: Low
Justification: We have chosen the value to be Low because the platforms that we are using are already well established and hence there won't be major changes other than small bug fixes and minor updates.	

<b>RELY   Required Reliability</b>	Value Chosen: High
Justification: As this is a transaction sensitive project which involves transaction being processed every second by the services provided by the user and services consumed by customer, if software failure takes place it affects these transactions causing them to abort which may lead to financial losses to both users using the app and stakeholders.	

<b>DATA   Database Size</b>	Value Chosen: Nominal
Justification: The amount of data required to be tested is chosen to be nominal because not all features of the project are to be strictly tested, only certain parts are to be strictly tested such as payment section where transactions are involved.	

<b>CPLX   Product Complexity</b>	Value Chosen: Nominal
Justification: For this cost driver we have chosen the value nominal as the project involves posting of services, accepting of requests, which are pretty straight forward implementation. The little bit of difficult part of the project is implementing the bidding which involves nested code. Other than that, most of the project is not that complex.	

<b>RUSE   Required Reusability</b>	Value Chosen: Low
Justification: For this cost driver we have chosen the value low because developing software components to be reused is much more expensive. so to reduce the cost as much as possible we decided to not include reusability in our components.	

<b>DOCU   Documentation match to life-cycle needs</b>	Value Chosen: Very High
Justification: As we are using waterfall model more emphasis is given to the documentation. as in this model there is no scope of changing the requirements once the project the development starts.	

### 3 Project Final Timeline and Cost Structure

#### Earlier Estimation – Assignment 2

Stages	Duration	Start	Finish	Cost	Work
Requirements	11 days	01-02-2021	15-02-2021	\$16,800	288 hrs
Design	14 days	16-02-2021	05-03-2021	\$12,000	240 hrs
Implementation	25 days	08-03-2021	09-04-2021	\$70,000	1200 hrs
Testing	11 days	12-04-2021	26-04-2021	\$25,000	254 hrs
Deployment	4 days	27-04-2021	30-04-2021	\$20,000	120 hrs
<b>Total</b>				<b>\$193,800</b> (includes miscellaneous costs)	

**Selling price to client = \$193,800+ (\$193,800\* 0.5) = \$290,700.**

**Profit = \$96,900.**



## COCOMO ESTIMATION

Totals for entire Project	Effort (PM)	Duration (Mo)	Cost (K\$)	Productivity	Equivalent Size
Requirements RQ:	0.3	0.7	5.6		Total Size: 4,500
Development PD+DD+CT+IT:	4.8	4.0	133.1	944.1	
Total RQ+PD+DD+CT+IT:	5.1	4.7	138.8	882.4	

Stage	COCOMO ESTIMATED VALUES	Duration
Requirements - RQ	5.6k = \$5600	0.7 Months (~21 days)
Development – PD+DD+CT+IT	\$133.1k = \$133,100	4.0 Months (~122 days)
Miscellaneous Cost	\$40,000 [ \$8,000 - Health Insurance, \$7,000 – Hardware's, \$ 10,000 - Software Licensing, \$ 6000 - Utilities, \$7000 - Rent, \$2000 - Others]	-
<b>Total</b>	<b>\$178,800</b>	<b>4.7 Months (~143 days)</b>

**Selling price to client = \$178,800 + (\$178,800\*0.5) = \$268,200**

**Profit = \$89,400**

#### 4. Conclusion and Recommendations

The previous cost estimate done by me without the COCOMO model is larger than the cost estimate done with COCOMO model. In COCOMO model, it follows a scientific approach and doesn't have extra modules such as development phase that we have in the previous method.

The duration estimate done by the COCOMO model is 4.7 Months, which is more than the duration estimate I did without the COCOMO model, which was in accordance to the 3 months deadline given to me by the stakeholder. The estimates are different because COCOMO model doesn't take the number of developers working on the project as a factor and strongly considers the SLOC (Single Line of Code) which is used in the estimation of the Effort, Duration, Cost and Productivity. In order to work out the required effort for the project, we need to know the size of the project. Unfortunately knowing the size of a project, is the half the battle. If we knew how much code will be required by an implementation, we could probably provide a reasonable estimate for how long the implementation would take.

I believe that we can continue on this project and complete it on time mentioned by the stake holders. As the selected members of the team are quite experienced with similar projects in the past.

We will be profited by selling the project 50% over the total cost to the client.

# Appendices

## 1. COCOMO – Scale Drivers

★ SystemStar - ServeMe System (Component1)

File View Reports Components Tools Preferences Monte Carlo Help

Estimate:  ID:  Model: COCOMO® II 2000

Component:  ID:  Increment:

ACT ARC CBR CDF CDR CMP CST DET EBR EFF EQS GCS GMI GST IDT ISM MSZ NAM PDF RSK SCH SZ SSM STR

Totals for entire Project		Effort (PM)	Duration (Mo)	Cost (K\$)	Productivity	Equivalent Size
Requirements	RQ:	0.3	0.7	5.6		Total Size: 4,500
Development	PD+DD+CT+IT:	4.8	4.0	133.1	944.1	
Total	RQ+PD+DD+CT+IT:	5.1	4.7	138.8	882.4	

**COCOMO II Scale Factors for Estimate: ServeMe System**

Model:

Model ID:

Phases:

Model Type:

Precedentedness:

Development Flexibility:

Architecture / Risk Resolution:

Team Cohesion:

Process Maturity:

Drivers & Size Model REVL Reuse Function Points Increments Breakage Costs Rates Maint Filter Descr.

ServeMe System: 5.1 PM, 4.7 Months Component1: 5.1 PM EAF: 0.3383 Level: 1

## 2. COCOMO – Cost Drivers

SystemStar - ServeMe System (Component1)

File View Reports Components Tools Preferences Monte Carlo Help

Estimate: ServeMe System 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:	0.3	0.7	5.6		Total Size: 4,500
Development	PD+DD+CT+IT:	4.8	4.0	133.1	944.1	
Total	RQ+PD+DD+CT+IT:	5.1	4.7	138.8	882.4	

**COCOMO II Cost Drivers for Component: Component1**

**Personnel**  
ACAP... Very High  
APEX... 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... Nominal  
RUSE... Low  
DOCU... Very High

**Project**  
TOOL... Very High  
SITE... Extra High  
SCED... Very Low

**Size Summary**  
Size:   
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.

ServeMe System: 5.1 PM, 4.7 Months    Component1: 5.1 PM    EAF: 0.3383    Level: 1

## 3. COCOMO – Costs for Component

SystemStar - ServeMe System (Component1)

File View Reports Components Tools Preferences Monte Carlo Help

Estimate: ServeMe System 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:	0.3	0.7	5.6		Total Size: 4,500
Development	PD+DD+CT+IT:	4.8	4.0	133.1	944.1	
Total	RQ+PD+DD+CT+IT:	5.1	4.7	138.8	882.4	

**Costs for Component: Component1**

Cost per Person-Month

Requirements	\$ <input type="text" value="16800"/>	<input type="checkbox"/> Inherit RQ	<input type="checkbox"/> Use Rates Tab & Labor Distribution
Product Design	\$ <input type="text" value="4000"/>	<input type="checkbox"/> Inherit PD	<input type="checkbox"/> Use Rates Tab & Labor Distribution
Detailed Design	\$ <input type="text" value="8000"/>	<input type="checkbox"/> Inherit DD	<input type="checkbox"/> Use Rates Tab & Labor Distribution
Code & Unit Test	\$ <input type="text" value="65000"/>	<input type="checkbox"/> Inherit CT	<input type="checkbox"/> Use Rates Tab & Labor Distribution
Integration & Test	\$ <input type="text" value="8000"/>	<input type="checkbox"/> Inherit IT	<input type="checkbox"/> Use Rates Tab & Labor Distribution
Maintenance	\$ <input type="text" value="5000"/>	<input type="checkbox"/> Inherit MN	<input type="checkbox"/> Use Rates Tab & Labor Distribution

Drivers & Size / Model / REVL / Reuse / Function Points / Increments / Breakage / Costs / Rates / Maint. / Filter / Descr.

ServeMe System: 5.1 PM, 4.7 Months    Component1: 5.1 PM    EAF: 0.3383    Level: 1

4. Dr Bahram Khalili Lecture Videos.

5. <http://softstarsystems.com/overview.htm>