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| Project: | | ServeMe System (SMS)  CSE 5325 – Spring 2021  Project Management | | | |
| Module: | | COCOMO | | | |
| Deliverable: | | COCOMO Estimate Report | | | |
| Version: | | | [1.0] | Date: | [04/13/2021] |
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# 1. Introduction

COCOMO (Constructive Cost Model) is a regression model based on numbers of Lines of Code (LOC). Barry Boehm proposed this model in 1970 based on the deep study of 63 projects, making it one of the most well-documented models. The cost and duration estimated by this model is highly dependent of Scale Drivers. The Cost Drivers highly influence the efforts estimated by this model.

We are using SystemStar to integrate the COCOMO model for our project. There are 5 scale drivers and 17 cost drivers in the SystemStar model in addition to the Microsoft Project.

This document postulates all drivers and the new estimated cost provided by COCOMO model. It also concludes which model should taken in consideration for the current project and future projects.

# 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.

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| **SLOC | Source Lines Of Code** | Value Chosen: 5000 |
| Justification: For our current project, the expected source lines of code is around 9000. Which considers 4000 for websites and almost same for all the modules. But as we are using the trial version of System Star, it bounds us to be in maximum limit of 5000 lines of code. | |

## 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:

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| **PREC | Precendentedness** | Value Chosen: Nominal |
| Justification: Precedentedness means how the current project is related to work done in the previous projects. I chose nominal because, this project is somewhat related to the previous ones. Some new features in this one is the online payment methods, cancellation policies and reviews. On the other side, major part of work done in android application and website will remain untouched. | |

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| **FLEX | Development Flexibility** | Value Chosen: High |
| Justification: This driver reflects the degree of flexibility in the development process. I chose the value high, because the project must satisfy the minimum functional requirements given by clients. Now, the team also able to give some recommendations to client regarding final product to be built. So, in that manner the team has high flexibility in development phase. | |

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| **RESL | Risk Resolution** | Value Chosen: High |
| Justification: This driver reflects the extent of risk in project development. As we have already discussed in phase one of the project documentation, the project consists of one major risk among 4 risks. Although, risk resolution plan describes several mitigations for the risks. | |

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| **TEAM | Team Cohesion** | Value Chosen: High |
| Justification: Team Cohesion describes how well the development team knows each other and their cohesion in working together. The developers working in my team are with each other since more than 2 years. To improve cohesion, we are increasing communication and encourage team building. On the other side, relations between client and some team members are very good. | |

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| **PMAT | Process Maturity** | Value Chosen: Nominal |
| Justification: This driver reflects the process maturity of the organization. The value is chosen nominal, because our company is still expanding (currently on CMM level 2), and there is room for process improvement. In the company, there are several procedures that can be repeated with predictable results. | |

## 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:

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| **ACAP | Analyst Capability** | Value Chosen: Very High |
| Justification: In this cost driver, we consider how the analysts are capable for this project. To meet a set of client requirements, an analyst must be highly skilled and have had handled multiple similar projects. We have analysts who meet all these requirements and have shown his analyst abilities, efficiency, and communication ability in past experiences. | |

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| **APEX | Application Experience** | Value Chosen: Very High |
| Justification: Developers in the team are highly experienced in respective application development. In past, they all have worked on major projects under commercial enterprises and wide range of applications. Additionally, developers are certified in the respective technologies they are currently working upon. | |

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| **PCAP | Programmer Capability** | Value Chosen: Very High |
| Justification: Programmers in our team are highly capable. They consist of the most important skills such as, mathematical skills, communication skills, problem-solving and proficiency at least three (required) programming languages. | |

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| **PLEX | Platform Experience** | Value Chosen: Very High |
| Justification: As described above, team has developed multiple projects in past, in which they had lots of platform dependencies and they handled it very well. They are experienced with technology platforms, computing platforms, utility platforms, etc. | |

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| **LTEX | Language and Tool Experience** | Value Chosen: High |
| Justification: The team has around 2 years of experience working on developing APIs such as REST API using Python, JAVA and MySQL also on developing user interface using React, HTML, CSS, JavaScript which will be used for website development in this project as well. But the team has relatively less experience in developing android applications. | |

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| **PCON | Personnel Continuity** | Value Chosen: Nominal |
| Justification: Personnel continuity is nominal as because of COVID since almost last two years, the average turn-over of organization has decreased compared to what it used to be. | |

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| **TOOL | Use of Software Tools** | Value Chosen: Very high |
| Justification: We use Jira software tool for development. This tool is one of the most effective software tools for Agile development cycle. | |

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| **SITE | Multisite Development** | Value Chosen: Very High |
| Justification: All developers in our team are in 30 miles around Dallas area. So, we can communicate effectively face-to-face. For working, we all work together in the office located in Dallas downtown. | |

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| **SCED | Development Schedule** | Value Chosen: Nominal |
| Justification: Development schedule value is set to Nominal. We are following the same schedule till now and unless and until major changes in requirements or unfavorable feedbacks we will be continued to follow the same. | |

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| **TIME | Execution Time** | Value Chosen: High |
| Justification: The project does not include any extensive CPU features so execution time will be high. | |

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| **STOR | Main Storage Constraint** | Value Chosen: High |
| Justification: The project is expected to use more than half of available main memory. System will use newer available options in market to store data. | |

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| **PVOL | Platform Volatility** | Value Chosen: Low |
| Justification: Platform that we use will be updated every year, so platform volatility is low. | |

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| **RELY | Required Reliability** | Value Chosen: Very High |
| Justification: The system must be highly reliable. Sensitive information provided by customers should not get leaked. Moreover, money transactions must be secure from end to end. | |

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| **DATA | Database Size** | Value Chosen: High |
| Justification: The database size will be quite higher than we expected. All data provided by customers and service providers will be stored, as more data will be helpful to our analysts to perform better market basket. | |

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| **CPLX | Product Complexity** | Value Chosen: Nominal |
| Justification: The product complexity will be nominal. As the product should be easy enough for any customer to understand and use it effectively. | |

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| **RUSE | Required Reusability** | Value Chosen: Low |
| Justification: The project deadline is very tight for this project. So, we will not have enough time to make project reusable. Therefore, the reusability of this project is low. But we are planning to make it reusable if we get a space. | |

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| **DOCU | Documentation match to life cycle needs** | Value Chosen: Nominal |
| Justification: A well presence of documentation helps keep track of all aspects of application and it improves on the quality of software product. It helps to transfer development, maintenance, and knowledge to other developers. Which helps to maintain the system in future. Server environments, database access, code deployment, application installation etc. are the significant components of documentation. | |

# 3 Project Final Timeline and Cost Structure

* Previous Cost, Work and Duration (from assignment #2):

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| --- | --- |
| **Duration** | 65 Days |
| **Work** | 2,824 hours |
| **Cost** | $158,400.00 |

Non- Human Resources:

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| --- | --- |
| **Server** | $2,000.00 |
| **Google Play Store Account** | $100.00 |
| **Laptops** | $12,000.00 |
| **Projector** | $200.00 |
| **Software Licenses** | $300.00 |
| **Office Setup** | $4,000.00 |

**Estimated Cost**: $177,000.00

**Profit**: $88,500.00

**Total Cost**: Estimated Cost + Profit = $177,000 + $88,500 = **$265,500.00**

* Values obtained from System Star COCOMO:

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| --- | --- | --- |
| **Efforts** | | 5.5 Person-Months |
| **Duration** | | 7.1 Months |
| **Average staffing: Efforts/ Duration** | 0.77 | |
| **COCOMO Estimated Cost** | $163,800 | |

* Non-Human Resources:

|  |  |
| --- | --- |
| **Server** | $2,000.00 |
| **Google Play Store Account** | $100.00 |
| **Laptops** | $12,000.00 |
| **Projector** | $200.00 |
| **Software Licenses** | $300.00 |
| **Office Setup** | $4,000.00 |

**Estimated Cost**: $171,600.00

**Profit**: $85,800

**Total cost** = Estimated Cost + Profit = $171,600 + $85,800 = **$257,400.00**

# 4. Conclusion and Recommendations

The COCOMO model is used to calculate efforts, duration and cost of the project using Source Lines of Code (SLOC). As mentioned above, the estimated duration of this project is 7.1 months. While using Microsoft Project it was estimated only 65 days. The human resource cost was estimated $177,000 previously, which System star COCOMO estimates $171,600. The same percentage of change can be seen in total cost of both the estimations.

In Microsoft Project we did not consider Scale drivers and Cost drivers. They are the main reason behind the difference in cost between MS Project and System star COCOMO Estimator. Another reason can be taken into account is the limitation of Source Lines of Code in System star. Now, only 5000 lines are considered which used to be around 9000. COCOMO estimates the cost based on SLOC only, so that factor has a major role while calculating cost.

In Cost drivers, we did not consider Application, experience, Platform Experience and Programmer Capability individually. Experience of individual developer and of a whole team are counted in previous estimation and COCOMO estimation, respectively. By considering the team’s performance, the capability of programmer is signified. Multisite Development factor also affects COCOMO cost. When all the team members share same physical working location their efficiency increases. And they get more opportunity to interact with each other.

Apart from cost drivers, Scale drivers have a major impact on cost. In previous estimation, we did not consider Team Cohesion. A strong team with better communication and teamwork capability give an advantage to the project development rather than a team without communication and no teamwork experience.

If we consider all the reports and cost estimations, we can see that COCOMO has estimated 7.1 months to complete the project with less cost, though. But as we are in the middle of our decided schedule and already given a commitment to client, we should stick to the current schedule. Even with extra cost, if we stick to the schedule, we will be able to complete the project before deadline. But in future COCOMO cost estimation can be helpful, if we take total cost of project into the account.

# Appendices

1. <https://www.geeksforgeeks.org/software-engineering-cocomo-model/>
2. <https://www.researchgate.net/figure/COCOMO-II-Scale-factors_tbl1_220413934>
3. <http://www.dmi.usherb.ca/~frappier/IFT721/COCOMOII.PDF>







