Project: Service Request System (SRS)

CSE 5325 – Fall 2024

Project Management

Module: COCOMO

Deliverable: COCOMO Estimate Report

**Version: [1.0]** **Date: [04/10/2024]**

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# 1. Introduction

Developing a service request system entails meticulous estimation of effort, time, and cost to ensure systematic and thorough development. The project's primary objective is to create a comprehensive web-based platform and Android application that facilitates users in soliciting various services from service providers. The system will encompass multiple service categories, providing functionalities such as placing service requests, managing cancellations and changes, handling payments, reviews and ratings, order history, search, and sorting capabilities.

The project team must consider numerous variables that could influence both the development process and the outcome of the project. A framework for estimating the effort, time, and cost required to build a software project is provided by the Constructive Cost Model (COCOMO). This model considers factors such as project size, complexity, and other relevant criteria. Utilizing this software cost estimation model, this study aims to estimate the effort, time frame, and cost required for developing the service request system. By considering project size, complexity, and other relevant criteria, the COCOMO framework provides a structured approach to estimate the development process and final product.

The project size is determined based on the breadth of service categories and functionalities, expressed in thousands of lines of code (KLOC). Cost drivers are identified, considering factors such as system complexity, team expertise, dependability standards, and environmental elements like development tools.

The COCOMO study for the service request system project offers a structured approach to estimate effort, time, and cost, considering various project variables and objectives. By utilizing this estimation model, project stakeholders can make well-informed decisions, ultimately leading to the successful completion of the project within defined constraints and expectations.

# 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.

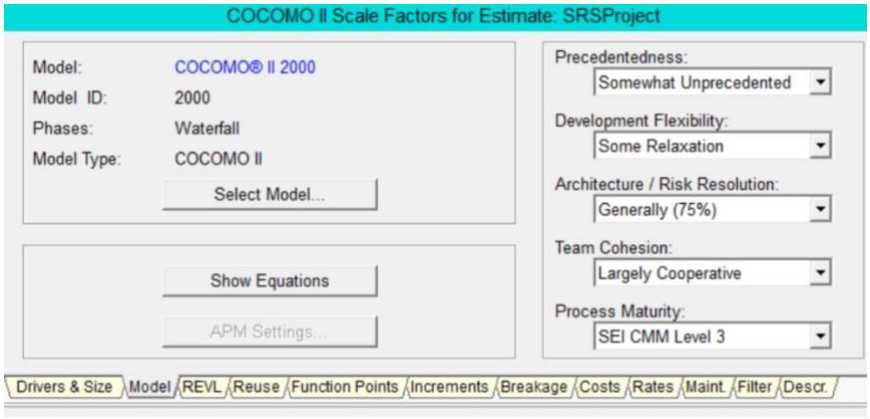
| **SLOC \| Source Lines Of Code** | Value Chosen: 5000 |
|---|---|
| Justification: Choosing 5000 Source Lines of Code (SLOC) for a comprehensive service request system (SRS) project aligns with the project's scope, complexity, and maintainability needs, facilitating accurate effort estimation and resource allocation within the Constructive Cost Model (COCOMO). | |

## 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 \| Precendentedness** | Value Chosen: Somewhat Unprecedented/ Nominal |
|---|---|
| Justification: A web and an android application are both being constructed. The development team is experienced in developing online applications; however, they are not as skilled in developing Android applications. The Precedentedness Scale Driver is therefore Somewhat Unprecedented. | |
| **FLEX \| Development Flexibility** | Value Chosen:Some Relaxation/Low |
| Justification: The client's needs might change, and this was factored in during the project's progress. The main factor driving Development Flexibility remains set at Some Relaxation. | |
| **RESL \| Architecture / Risk Resolution** | Value Chosen:Generally/High |
| Justification: Extensive risk analysis has been conducted for this project to guarantee that stability, code performance, and security are not compromised, including the complete encryption of user data to ensure its security. | |
| **TEAM \| Team Cohesion** | Value Chosen:Largely co-operative/High |
| Justification: The team handling this project demonstrates strong camaraderie and excellent teamwork, showcasing high cohesion among its members. | |
| **PMAT \| Process Maturity** | Value Chosen:SEI CMM Level 3/High |
| Justification: The application adheres to a standardized set of instructions for services provided and received, appointments, payments, etc., ensuring precision for each user without compromise. | |

Scale drivers




## 2.3 Cost Drivers

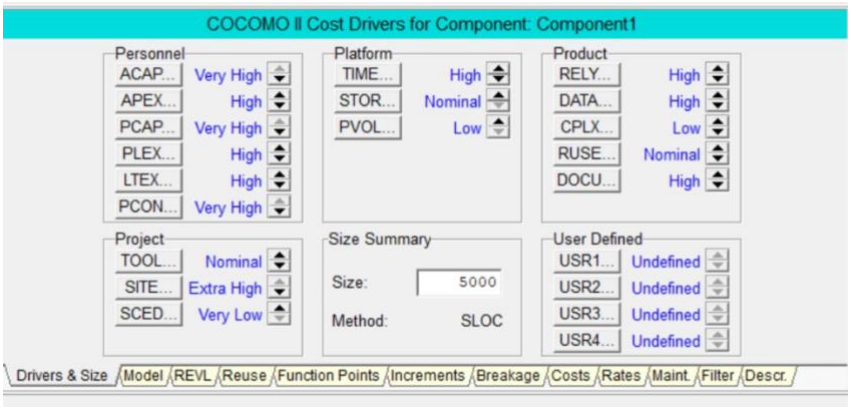
The following is the list of cost drivers, the values applicable to this project and a justification for each value chosen:

| | |
|---|---|
| **ACAP \| Analyst Capability** | Value Chosen: Very High |
| Justification: ACAP is crucial as analysts drive the initial phases of requirement gathering and system design. A Very High rating ensures skilled analysts are available to accurately capture project needs and translate them into feasible solutions. | |
| **AEXP \| Applications Experience** | Value Chosen: High |
| Justification: AEXP is essential for understanding the complexities and nuances of specific application domains. A High rating reflects the significant impact that domain knowledge has on the efficiency and effectiveness of the development process. | |
| **PCAP \| Programmer Capability** | Value Chosen: Very High |
| Justification: PCAP directly influences the quality and speed of code development. A Very High rating ensures that highly skilled programmers are available to write efficient and maintainable code, reducing the likelihood of errors and rework. | |
| **PLEX \| Platform Experience** | Value Chosen: High |
| Justification: PLEX is vital for leveraging the full capabilities of the chosen development platform. A High rating indicates the importance of platform familiarity in optimizing development efforts and minimizing platform-related issues. | |
| **LTEX \| Language and Tool Experience** | Value Chosen: High |
| Justification: LTEX impacts development productivity and code quality by ensuring proficiency in the programming languages and tools used in the project. A High rating acknowledges the significant benefits of expertise in these areas for efficient development. | |

| | |
|---|---|
| **PCON \| Personnel Continuity** | Value Chosen: Very High |
| Justification: PCON is critical for maintaining stable team dynamics and minimizing disruptions throughout the project lifecycle. A Very High rating emphasizes the importance of continuity in personnel to avoid knowledge gaps and productivity losses. | |
| **TOOL \| Use of Software Tools** | Value Chosen: Nominal |
| Justification: TOOL influences development efficiency, but its impact may not be as significant as other factors. Hence, a Nominal rating suggests that while the use of tools is important, it may not heavily influence overall project costs and schedules. | |
| **SITE \| Multisite Development** | Value Chosen: Extra High |
| Justification: SITE introduces coordination challenges and communication overheads, particularly in distributed team settings. An Extra High rating reflects the increased complexity and effort required to manage multisite development effectively. | |
| **SCED \| Required Development Schedule** | Value Chosen: Very Low |
| Justification: SCED represents the flexibility or rigidity of project timelines. A Very Low rating indicates that schedule constraints are minimal or negotiable, allowing for more flexibility in resource allocation and project planning. | |
| **TIME \| Execution Time Constraint** | Value Chosen: High |
| Justification: TIME (Execution Time Constraint) reflects the importance of meeting specific timing requirements for project deliverables. A High rating signifies that strict timing constraints may necessitate additional effort or resources to ensure on-time delivery. | |
| **STOR \| Main Storage Constraint** | Value Chosen: Nominal |
| Justification: STOR (Main Storage Constraint) may impact system performance and scalability but is often manageable through optimization strategies or hardware upgrades. Hence, a Nominal rating suggests that storage constraints are not a primary driver of project costs or schedules. | |
| **PVOL \| Platform Volatility** | Value Chosen: Low |
| Justification: PVOL (Platform Volatility) measures the stability of the development platform over the project's duration. A Low rating indicates that stable platforms require fewer adjustments and rework, reducing development effort and mitigating risks associated with platform changes. | |
| **RELY \| Required Software Reliability** | Value Chosen: High |
| Justification: RELY (Required Software Reliability) influences testing efforts and the level of quality assurance required to meet reliability targets. A High rating acknowledges the significant impact of reliability requirements on project costs and schedules. | |
| **DATA \| Data Base Size** | Value Chosen: Nominal |
| Justification: DATA (Data Base Size) affects storage requirements, performance, and data management efforts. However, a Nominal rating suggests that database | |

| | |
|---|---|
| size may not be a primary driver of project costs or schedules, as scaling strategies can often address size-related challenges. | |
| **CPLX \| Product Complexity** | Value Chosen: High |
| Justification: CPLX (Product Complexity) directly impacts development effort and resource allocation due to the increased challenges associated with complex products. Hence, a High rating emphasizes the importance of considering the complexity of the product when estimating project costs and schedules. | |
| **RUSE \| Required Reusability** | Value Chosen: Nominal |
| Justification: RUSE (Required Reusability) being rated as Nominal suggests that while reusability is considered, it's not a primary driver affecting project costs and schedules. This indicates that the project doesn't heavily rely on reusable components or modules to mitigate development effort. | |
| **DOCU \| Documentation match to life-cycle needs** | Value Chosen: High |
| Justification: DOCU (Documentation) being rated as High emphasizes the importance of comprehensive documentation aligned with the project's life-cycle needs. This ensures clarity, facilitates maintenance, and reduces risks associated with knowledge gaps or turnover, thus impacting project efficiency positively. | |

Cost Drivers



# 3 Project Final Timeline and Cost Structure

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

Schedule: 02/01/2024-04/30/2024 (64 days or 3 months)

| People | Working hours | Standard Rate | Overtime rate |
|---|---|---|---|
| Project Manager | 8 | $100.00 | $150.00 |
| Developer 1 | 8 | $50.00 | $75.00 |
| Developer 2 | 8 | $50.00 | $75.00 |
| Developer 3 | 8 | $50.00 | $75.00 |
| Developer 4 | 8 | $50.00 | $75.00 |
| Developer 5 | 8 | $50.00 | $75.00 |
| Developer 6 | 8 | $50.00 | $75.00 |
| **Non-human resources: $20000**<br>**(**includes Development machines, servers,Networking and security, VPN, TestTools, Software licenses. **)** | | | |

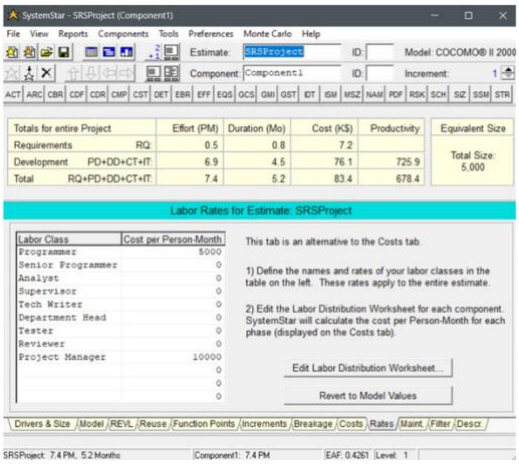
The estimated total cost of the project, encompassing both software and hardware components, is $121,576.00 This cost has been calculated to ensure that all resources are accounted for to execute the project successfully within the designated timeframe of three months. The budget allows the project team to procure necessary hardware and software resources and cover associated charges and unforeseen expenses. It's important to note that this cost assessment has been meticulously calculated and reviewed to ensure all prices are acceptable and justifiable.

**New Schedule (Duration);**

The current estimated duration using COCOMO is : 5.2 months - The COCOMO estimate's new duration is 2.2 months.

The current estimate for human resources costs using COCOMO is $83.400

| | |
|---|---|
| COCOMO estimated cost | $83,400 |
| Non-human resources | $20,000 |
| Total cost | $103,400 |




**Profit and Overhead**:

50% of overhead cost must be included i.e $51,700

new cost=$155,100 (cost + overhead cost)

Project profit margin:

50% of Total Costs = $51,700 (total cost ) + $25,850 (Overhead) So, total profit = **$77,550**

# 4. Conclusion and Recommendations

The COCOMO estimate for the project presents a different cost compared to the earlier estimate. The projected duration of the project could vary from the initial estimate because COCOMO considers factors such as project complexity, team size, and scheduling constraints. Consequently, the overall cost of the project may rise as additional time or resources may be needed to complete project tasks. It's important to note that by incorporating new factors that may have been overlooked in the previous estimate, the COCOMO estimate provides a more accurate calculation of the project cost.

The project estimates, with and without COCOMO, differ significantly. The COCOMO model suggests a cost of $83,400 over 5.2 months, while the non-COCOMO estimate indicates $121,576 over 3 months. This variance likely arises from COCOMO's consideration of project size, complexity, and team capabilities, factors not fully accounted for in the initial estimation.

In light of these differences, it's important to weigh the project's priorities and constraints. If time constraints allow and resources are flexible, proceeding with the COCOMO estimate might ensure a more realistic budget and timeline, albeit at a longer duration and potentially higher cost. However, if budget limitations are strict and confidence remains in the accuracy of the non-COCOMO estimate, re-evaluating the project scope and resources might help align with the original plan.

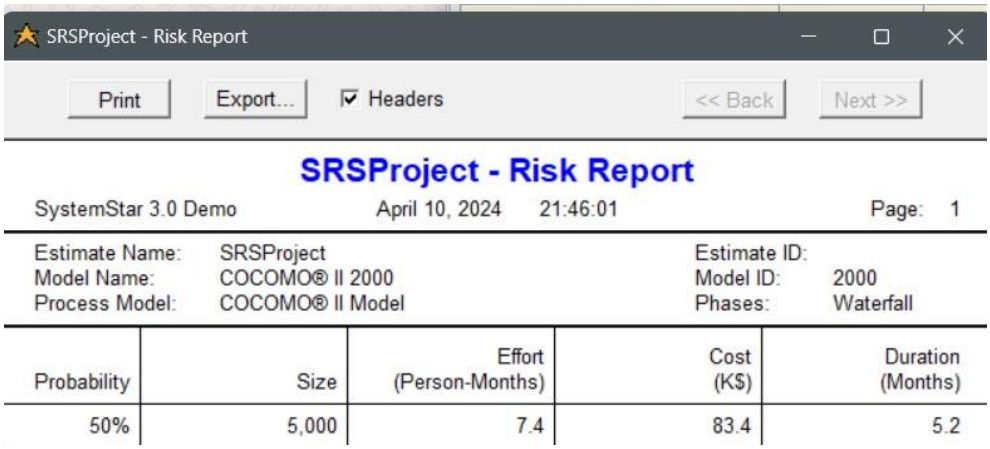
Alternatively, splitting the project into phases and reassessing costs could offer a compromise, leveraging COCOMO's insights while managing resources more effectively. Ultimately, the decision should consider the project's goals, constraints, and available resources.

# Appendices

https://medium.com/@warakornjetlohasiri/cocomo-a-regression-model-in-procedural-cost-estimate-model-for-software-projects-65ab5222a1f5
https://www.geeksforgeeks.org/software-engineering-cocomo-model/

https://en.wikipedia.org/wiki/COCOMO

Reports generated using COCOMO:


SRSProject - Risk Report

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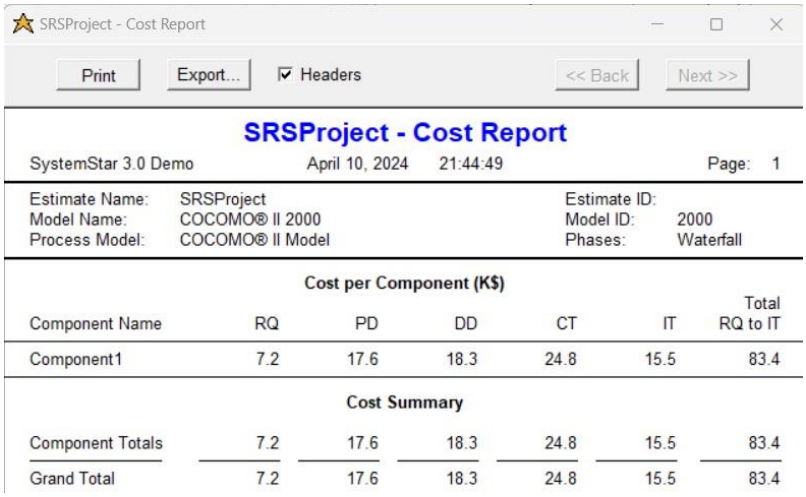
**SRSProject - Risk Report**

SystemStar 3.0 Demo April 10, 2024 21:46:01 Page: 1

Estimate Name: SRSProject
Model Name: COCOMO® II 2000
Process Model: COCOMO® II Model
Estimate ID:
Model ID: 2000
Phases: Waterfall

| Probability | Size | Effort (Person-Months) | Cost (K$) | Duration (Months) |
|---|---|---|---|---|
| 50% | 5,000 | 7.4 | 83.4 | 5.2 |


SRSProject - Cost Report

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**SRSProject - Cost Report**

SystemStar 3.0 Demo April 10, 2024 21:44:49 Page: 1

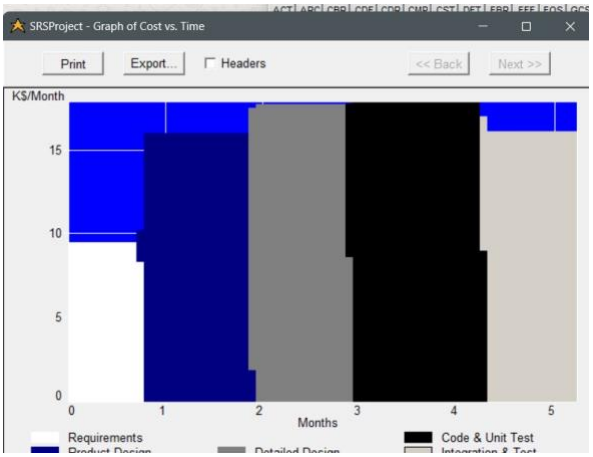
Estimate Name: SRSProject
Model Name: COCOMO® II 2000
Process Model: COCOMO® II Model
Estimate ID:
Model ID: 2000
Phases: Waterfall

**Cost per Component (K$)**

| Component Name | RQ | PD | DD | CT | IT | Total RQ to IT |
|---|---|---|---|---|---|---|
| Component1 | 7.2 | 17.6 | 18.3 | 24.8 | 15.5 | 83.4 |

**Cost Summary**

| | | | | | | |
|---|---|---|---|---|---|---|
| Component Totals | 7.2 | 17.6 | 18.3 | 24.8 | 15.5 | 83.4 |
| Grand Total | 7.2 | 17.6 | 18.3 | 24.8 | 15.5 | 83.4 |



## SRSProject - Estimate Comparison Report

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| | | | |
|---|---|---|---|
| Estimate Name: | SRSProject | Estimate ID: | |
| Model Name: | COCOMO® II 2000 | Model ID: | 2000 |
| Process Model: | COCOMO® II Model | Phases: | Waterfal |

| | |
|---|---|
| Estimate Name | SRSProject |
| Development Mode | n/a |
| Filename | |
| Model Name | COCOMO® II 2000 |
| Process Model | COCOMO II |
| Phases | Waterfall |
| Increments | 1 |
| **Estimate Summary (RQ to IT)** | |
| Developed Size | 5,000 |
| Total Cost (K$) | 83.4 |
| Total Effort (Person-Months) | 7.4 |
| Total Duration (Months) | 5.2 |
| Productivity (Lines/PM) | 678.4 |
| Unit Cost ($/Line) | 16.68 |
| **Requirements** | |
| Cost (K$) | 7.2 |
| Effort (Person-Months) | 0.5 |
| Duration (Months) | 0.8 |
| Average Staffing | 0.6 |
| **Product Design** | |
| Cost (K$) | 17.6 |
| Effort (Person-Months) | 1.2 |
| Duration (Months) | 1.1 |
| Average Staffing | 1.1 |
| **Detailed Design** | |
| Cost (K$) | 18.3 |
| Effort (Person-Months) | 1.8 |
| Duration (Months) | 1.0 |
| Average Staffing | 1.8 |
| **Code & Unit Test** | |
| Cost (K$) | 24.8 |
| Effort (Person-Months) | 2.5 |
| Duration (Months) | 1.4 |
| Average Staffing | 1.8 |
| **Integration & Test** | |
| Cost (K$) | 15.5 |
| Effort (Person-Months) | 1.4 |
| Duration (Months) | 1.0 |
| Average Staffing | 1.5 |
| **Maintenance** | |
| Annual Cost (K$) | 0.0 |
| Person-Months per Year | 0.0 |
| Average Staffing | 0.0 |

SRSProject - Detail Report

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## SRSProject - Detail Report

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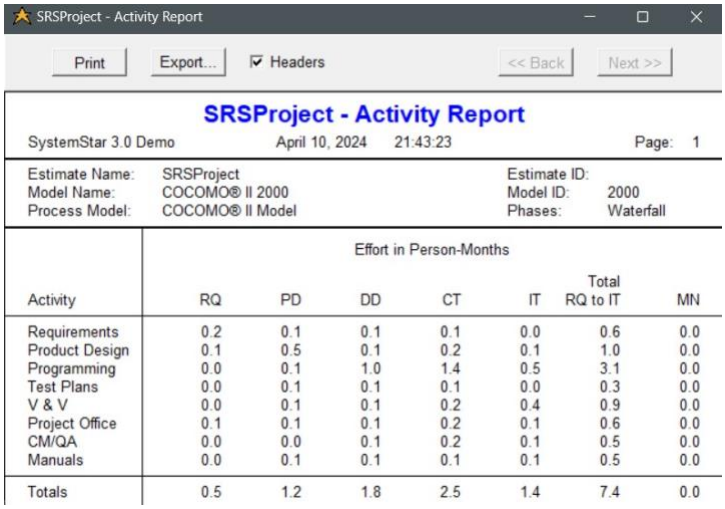
| | | | |
|---|---|---|---|
| Estimate Name: | SRSProject | Estimate ID: | |
| Model Name: | COCOMO® II 2000 | Model ID: | 2000 |
| Process Model: | COCOMO® II Model | Phases: | Waterfall |

| | | | |
|---|---|---|---|
| Component Name: | Component1 | Component ID: | |
| Increment: | 1 | Level: | 1 |
| Developed Size: | 5,000 | EAF: | 0.4261 |

| Phase | Effort (Person-Months) | Cost (K$) | Duration (Months) | Staffing |
|---|---|---|---|---|
| RQ -- Requirements | 0.5 | 7.2 | 0.8 | 0.6 |
| PD -- Product Design | 1.2 | 17.6 | 1.1 | 1.1 |
| DD -- Detailed Design | 1.8 | 18.3 | 1.0 | 1.8 |
| CT -- Code & Unit Test | 2.5 | 24.8 | 1.4 | 1.8 |
| IT -- Integration & Test | 1.4 | 15.5 | 1.0 | 1.5 |
| Development (PD+DD+CT+IT) | 6.9 | 76.1 | 4.5 | |
| Totals (RQ+PD+DD+CT+IT) | 7.4 | 83.4 | 5.2 | |
| MN -- Maintenance (per year) | 0.0 | 0.0 | | 0.0 |


SRSProject - Activity Report
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SRSProject - Activity Report
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Page: 1
Estimate Name: SRSProject
Model Name: COCOMO® II 2000
Process Model: COCOMO® II Model
Estimate ID:
Model ID: 2000
Phases: Waterfall
Effort in Person-Months
Activity RQ PD DD CT IT Total RQ to IT MN
Requirements 0.2 0.1 0.1 0.1 0.0 0.6 0.0
Product Design 0.1 0.5 0.1 0.2 0.1 1.0 0.0
Programming 0.0 0.1 1.0 1.4 0.5 3.1 0.0
Test Plans 0.0 0.1 0.1 0.1 0.0 0.3 0.0
V & V 0.0 0.1 0.1 0.2 0.4 0.9 0.0
Project Office 0.1 0.1 0.1 0.2 0.1 0.6 0.0
CM/QA 0.0 0.0 0.1 0.2 0.1 0.5 0.0
Manuals 0.0 0.1 0.1 0.1 0.1 0.5 0.0
Totals 0.5 1.2 1.8 2.5 1.4 7.4 0.0