Project Plan: MSE Portfolio Project

October 23, 2008

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Version 1.0

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Revision History

Version	Date	Changes
1.0	10/23/2008	First draft.

Introduction

This is the project plan for completing the MSE Software Engineering Portfolio project, which is done in partial fulfillment of the Kansas State University (KSU) Master of Software Engineering degree. This documents the plan and cost model for producing the artifacts associated with the software engineering portfolio.

The plan in this document is baselined starting in August, when work on the vision document was taken up in earnest. As the engineering notebook shows, actual work on the vision document was initiated early in 2008, and preceded sporadically for a time, then not at all for a time. Work in earnest on the project started in August 2008; this plan is based on an August 2008 start time.

Project Life-Cycle Model

The project life-cycle model for KSU portfolio projects is a slightly modified version of the Rational Unified Process. There are two main phases – engineering and production, with the engineering phase divided into the inception phase, followed by the elaboration phase. RUP divides the production phase into construction and transition phases. Since there is no installation of the system developed into a production environment, no user training or acceptance testing, there is no transition phase performed as part of portfolio projects.

The following diagram shows the 3 phases of the project, with a "you are here" indicator showing where in the project this version of the plan sits.

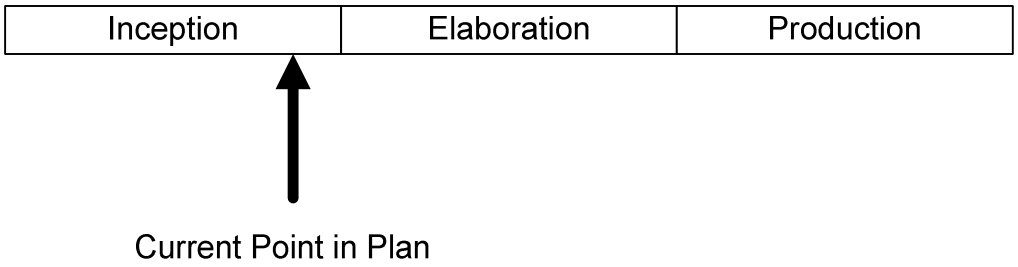


Figure 1 Point in Project Reflected in this Plan

The Plan

The artifacts that are required to be produced as part of the MSE Software Engineering portfolio are detailed on the KSU Computer and Information Sciences web site [1]. Based on the required artifacts, the following work breakdown structure was created.

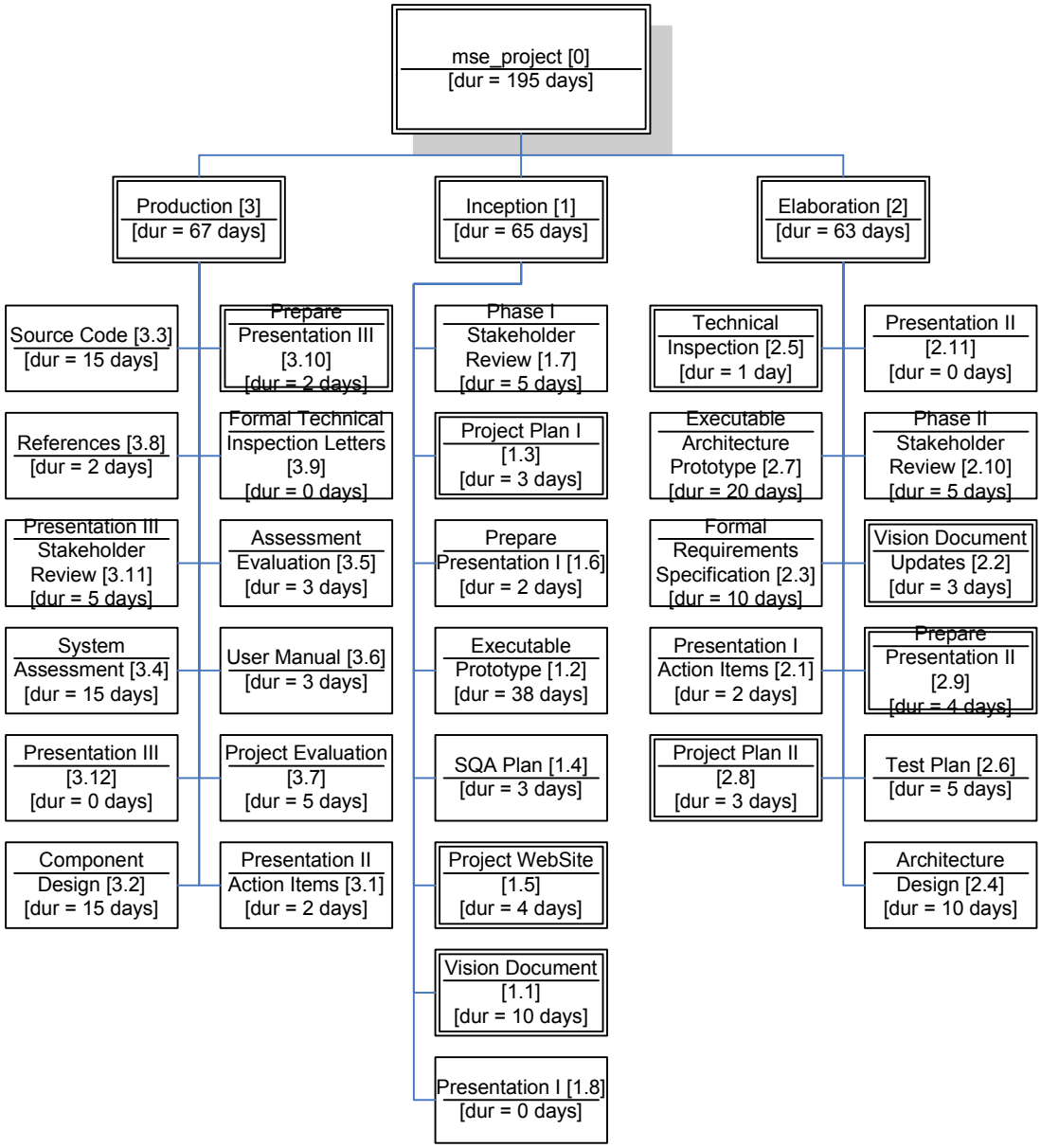
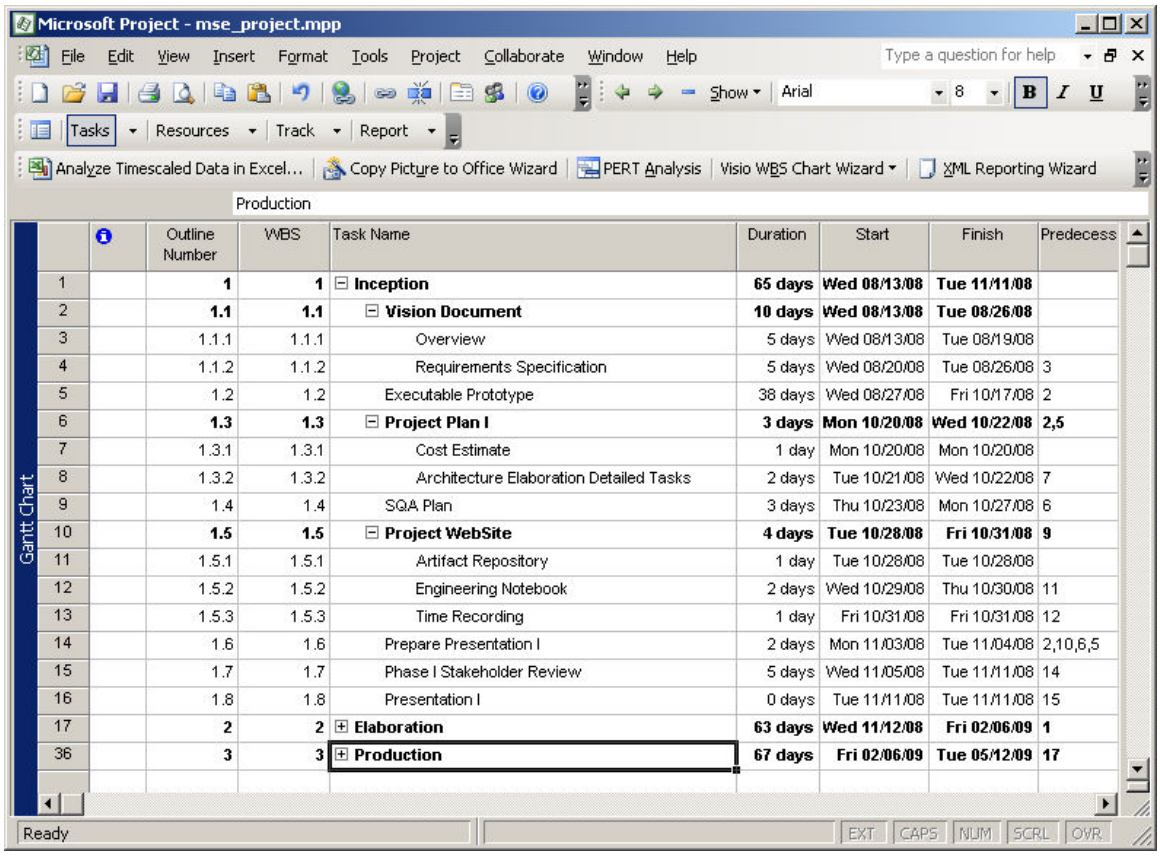


Figure 2 Work Breakdown Structure

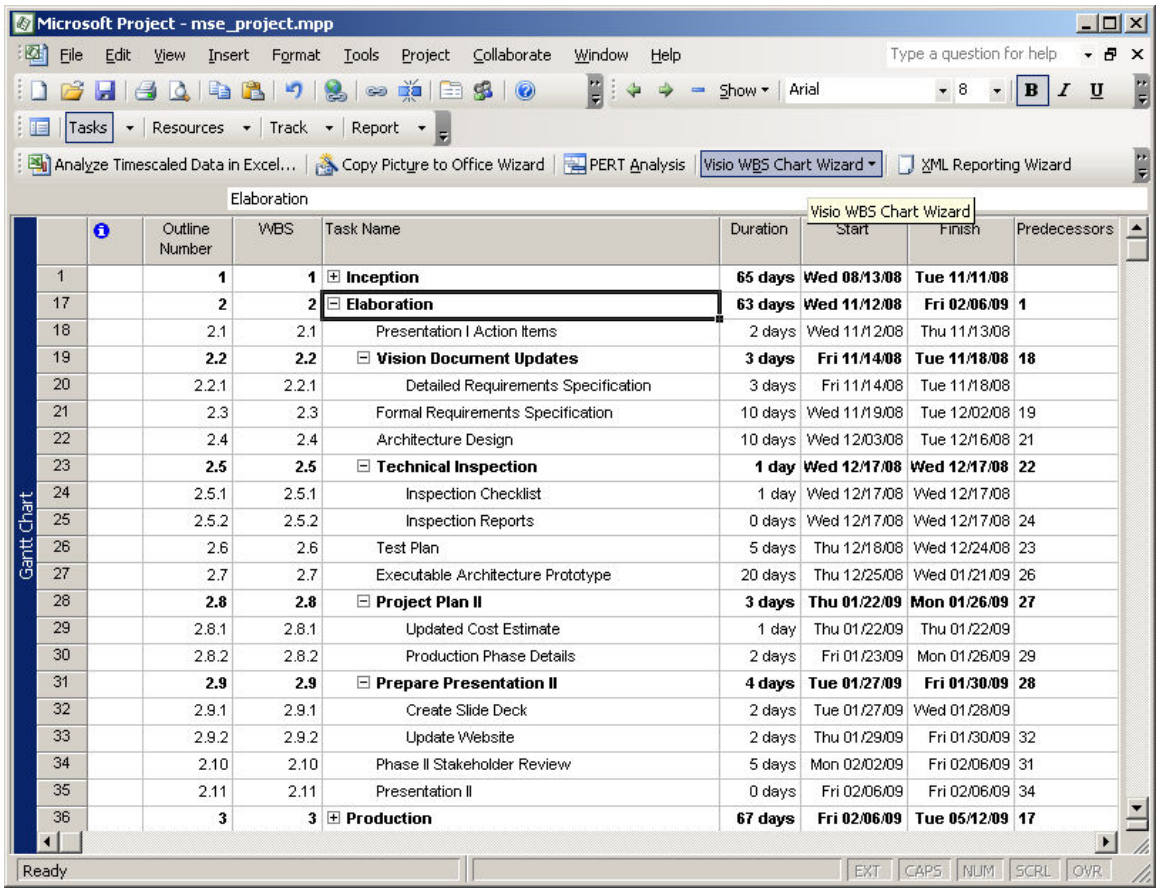
The Gantt chart associated with the plan is available as an artifact on the associated project web site.

Tasks: Inception Phase



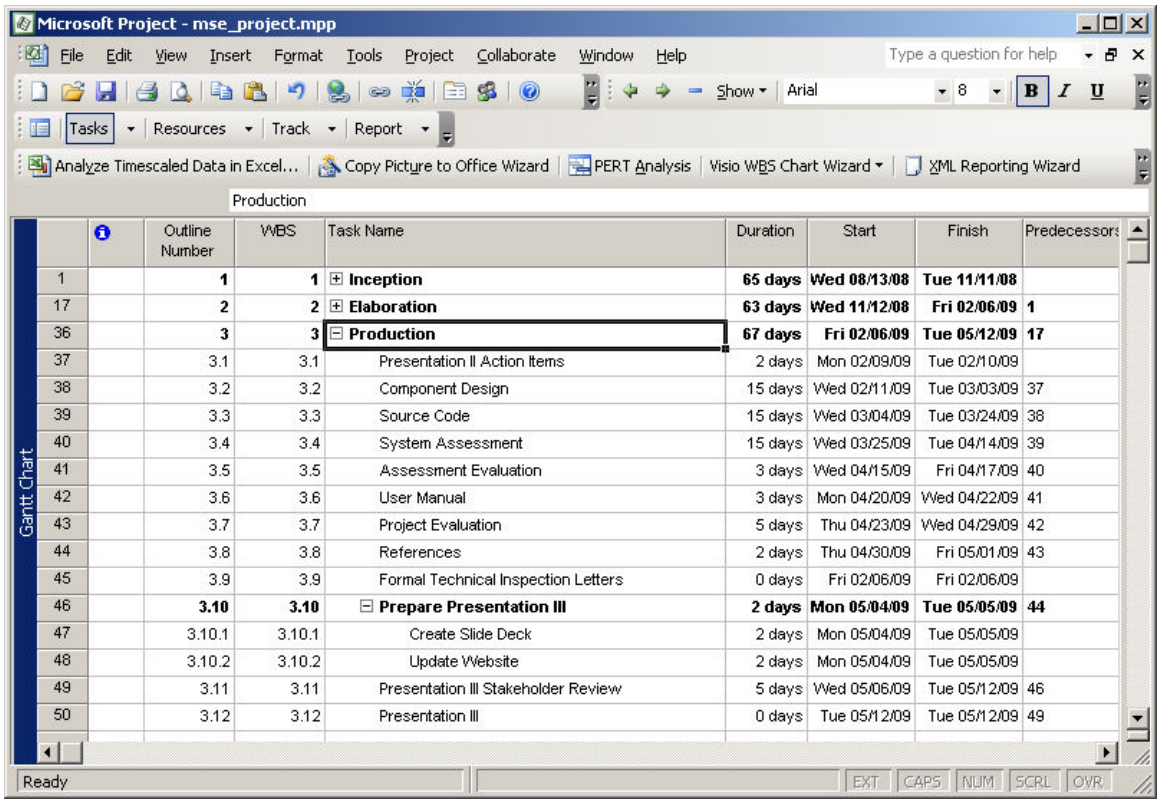
	Outline Number	WBS	Task Name	Duration	Start	Finish	Predecess
1	**1**	**1**	**Inception**	**65 days**	**Wed 08/13/08**	**Tue 11/11/08**	
2	**1.1**	**1.1**	**Vision Document**	**10 days**	**Wed 08/13/08**	**Tue 08/26/08**	
3	1.1.1	1.1.1	Overview	5 days	Wed 08/13/08	Tue 08/19/08	
4	1.1.2	1.1.2	Requirements Specification	5 days	Wed 08/20/08	Tue 08/26/08	3
5	1.2	1.2	Executable Prototype	38 days	Wed 08/27/08	Fri 10/17/08	2
6	**1.3**	**1.3**	**Project Plan I**	**3 days**	**Mon 10/20/08**	**Wed 10/22/08**	**2,5**
7	1.3.1	1.3.1	Cost Estimate	1 day	Mon 10/20/08	Mon 10/20/08	
8	1.3.2	1.3.2	Architecture Elaboration Detailed Tasks	2 days	Tue 10/21/08	Wed 10/22/08	7
9	1.4	1.4	SQA Plan	3 days	Thu 10/23/08	Mon 10/27/08	6
10	**1.5**	**1.5**	**Project WebSite**	**4 days**	**Tue 10/28/08**	**Fri 10/31/08**	**9**
11	1.5.1	1.5.1	Artifact Repository	1 day	Tue 10/28/08	Tue 10/28/08	
12	1.5.2	1.5.2	Engineering Notebook	2 days	Wed 10/29/08	Thu 10/30/08	11
13	1.5.3	1.5.3	Time Recording	1 day	Fri 10/31/08	Fri 10/31/08	12
14	1.6	1.6	Prepare Presentation I	2 days	Mon 11/03/08	Tue 11/04/08	2,10,6,5
15	1.7	1.7	Phase I Stakeholder Review	5 days	Wed 11/05/08	Tue 11/11/08	14
16	1.8	1.8	Presentation I	0 days	Tue 11/11/08	Tue 11/11/08	15
17	**2**	**2**	**Elaboration**	**63 days**	**Wed 11/12/08**	**Fri 02/06/09**	**1**
36	**3**	**3**	**Production**	**67 days**	**Fri 02/06/09**	**Tue 05/12/09**	**17**

Tasks: Elaboration Phase



	Outline Number	WBS	Task Name	Duration	Start	Finish	Predecessors
1	**1**	**1**	**Inception**	**65 days**	**Wed 08/13/08**	**Tue 11/11/08**	
17	**2**	**2**	**Elaboration**	**63 days**	**Wed 11/12/08**	**Fri 02/06/09**	**1**
18	2.1	2.1	Presentation I Action Items	2 days	Wed 11/12/08	Thu 11/13/08	
19	**2.2**	**2.2**	**Vision Document Updates**	**3 days**	**Fri 11/14/08**	**Tue 11/18/08**	**18**
20	2.2.1	2.2.1	Detailed Requirements Specification	3 days	Fri 11/14/08	Tue 11/18/08	
21	2.3	2.3	Formal Requirements Specification	10 days	Wed 11/19/08	Tue 12/02/08	19
22	2.4	2.4	Architecture Design	10 days	Wed 12/03/08	Tue 12/16/08	21
23	**2.5**	**2.5**	**Technical Inspection**	**1 day**	**Wed 12/17/08**	**Wed 12/17/08**	**22**
24	2.5.1	2.5.1	Inspection Checklist	1 day	Wed 12/17/08	Wed 12/17/08	
25	2.5.2	2.5.2	Inspection Reports	0 days	Wed 12/17/08	Wed 12/17/08	24
26	2.6	2.6	Test Plan	5 days	Thu 12/18/08	Wed 12/24/08	23
27	2.7	2.7	Executable Architecture Prototype	20 days	Thu 12/25/08	Wed 01/21/09	26
28	**2.8**	**2.8**	**Project Plan II**	**3 days**	**Thu 01/22/09**	**Mon 01/26/09**	**27**
29	2.8.1	2.8.1	Updated Cost Estimate	1 day	Thu 01/22/09	Thu 01/22/09	
30	2.8.2	2.8.2	Production Phase Details	2 days	Fri 01/23/09	Mon 01/26/09	29
31	**2.9**	**2.9**	**Prepare Presentation II**	**4 days**	**Tue 01/27/09**	**Fri 01/30/09**	**28**
32	2.9.1	2.9.1	Create Slide Deck	2 days	Tue 01/27/09	Wed 01/28/09	
33	2.9.2	2.9.2	Update Website	2 days	Thu 01/29/09	Fri 01/30/09	32
34	2.10	2.10	Phase II Stakeholder Review	5 days	Mon 02/02/09	Fri 02/06/09	31
35	2.11	2.11	Presentation II	0 days	Fri 02/06/09	Fri 02/06/09	34
36	**3**	**3**	**Production**	**67 days**	**Fri 02/06/09**	**Tue 05/12/09**	**17**

Tasks: Production



	Outline Number	WBS	Task Name	Duration	Start	Finish	Predecessors
1	**1**	**1**	**Inception**	**65 days**	**Wed 08/13/08**	**Tue 11/11/08**	
17	**2**	**2**	**Elaboration**	**63 days**	**Wed 11/12/08**	**Fri 02/06/09**	**1**
36	**3**	**3**	**Production**	**67 days**	**Fri 02/06/09**	**Tue 05/12/09**	**17**
37	3.1	3.1	Presentation II Action Items	2 days	Mon 02/09/09	Tue 02/10/09	
38	3.2	3.2	Component Design	15 days	Wed 02/11/09	Tue 03/03/09	37
39	3.3	3.3	Source Code	15 days	Wed 03/04/09	Tue 03/24/09	38
40	3.4	3.4	System Assessment	15 days	Wed 03/25/09	Tue 04/14/09	39
41	3.5	3.5	Assessment Evaluation	3 days	Wed 04/15/09	Fri 04/17/09	40
42	3.6	3.6	User Manual	3 days	Mon 04/20/09	Wed 04/22/09	41
43	3.7	3.7	Project Evaluation	5 days	Thu 04/23/09	Wed 04/29/09	42
44	3.8	3.8	References	2 days	Thu 04/30/09	Fri 05/01/09	43
45	3.9	3.9	Formal Technical Inspection Letters	0 days	Fri 02/06/09	Fri 02/06/09	
46	**3.10**	**3.10**	**Prepare Presentation III**	**2 days**	**Mon 05/04/09**	**Tue 05/05/09**	**44**
47	3.10.1	3.10.1	Create Slide Deck	2 days	Mon 05/04/09	Tue 05/05/09	
48	3.10.2	3.10.2	Update Website	2 days	Mon 05/04/09	Tue 05/05/09	
49	3.11	3.11	Presentation III Stakeholder Review	5 days	Wed 05/06/09	Tue 05/12/09	46
50	3.12	3.12	Presentation III	0 days	Tue 05/12/09	Tue 05/12/09	49

Cost-Estimate

For estimating cost, I have selected the COCOMO II model. This is an update to the COCOMO model that better reflects the realities of modern software development practices. This model features different cost predictors based on the current phase of the project. For this point in the project, I will use the Early Design model. Calculation of effort and schedule is detailed in [2] and [3].

The COCOMO II model calculates effort in person months using the following equation:

$$PM = A \times Size^{E} \times \prod_{i=1}^{n} EM_i$$

Where A = 2.94 for COCOMO II.2000

COCOMO II also provides a schedule estimation equation that gives the time to develop in calendar months:

$$TDEV = \left[C \times \left(PM_{NS}\right)^{(D+0.2\times(E-B))}\right] \times \frac{SCED\%}{100}$$

Where C=3.67, D=0.28, and B=0.91

E represents a scale factor to take into account potential economies of scale, where the size of the project can influence productivity gains or losses as the project is in flight. It is based on if

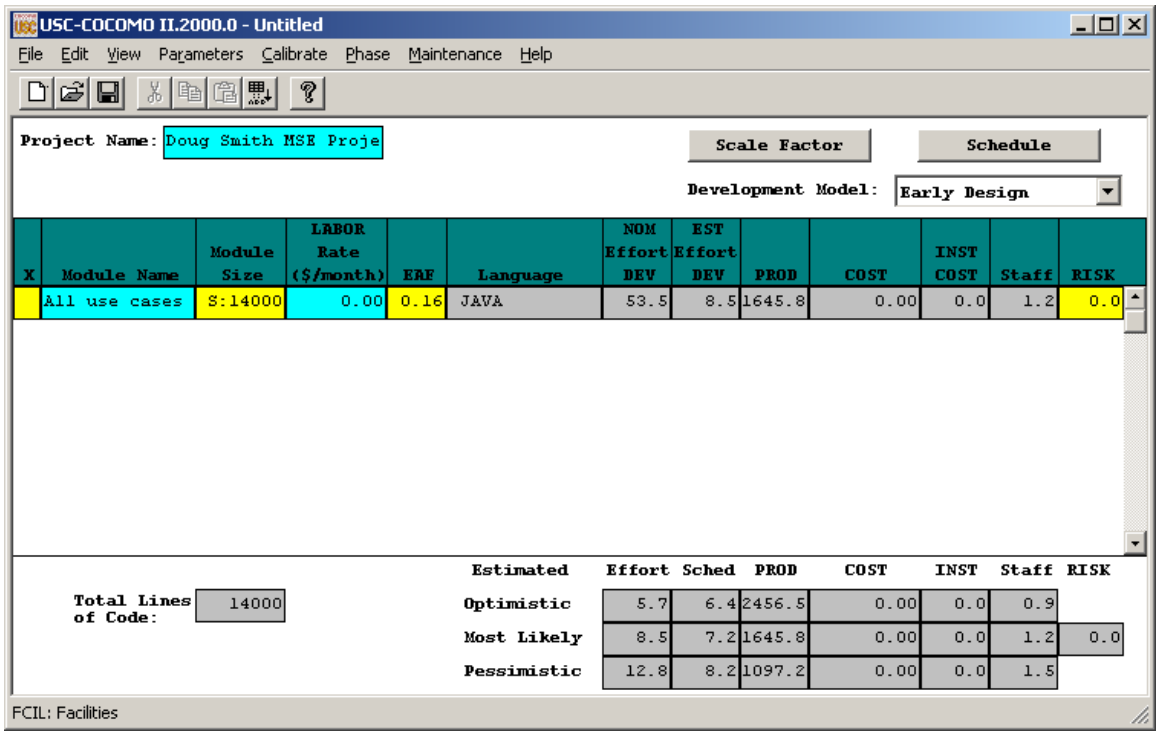
the project undertaken by the development organization has precedence, and on other factors including development flexibility, risk resolution, team cohesion, and process maturity. I have selected nominal values for all these factors, as I believe there will be no scale effects in this project.

At this point in the project, size is difficult to estimate as there are not enough details to justify attempting function point analysis. A very rough guess is 14 KSLOC, arrived at by assuming each of the 14 use cases will required 1 KSLOC to implement.

In producing the estimate, I had to select values for the components used to determine the effort adjustment factor, which the equation calculates as the product of the following effort multipliers:

Component	Description	Comments
RCPX	Product reliability and complexity	I selected NOM for this component as the reliability and complexity characteristics are on par with most enterprise software development.
RUSE	Developed for reuse	While the lessons learned in this project will be applied in another system, the actual system produced by this project will not be designed with reuse in mind. I selected LO for this component.
PDIF	Platform difficulty.	The extended architectural prototyping effort was targeted in selecting the most productive environment, as well as an environment that is easy to procure, configure, and deploy software to. Given the rich tool support in this environment, I rated platform difficulty LO.
PREX	Personnel experience.	I am using a development environment and technology set I have extensive experience with, and thus rated this XHI.
PERS	Personnel capability.	Given I am the primary artifact producer in this project, and am experienced both as an analyst and a developer (plus by definition must have high continuity) I rated this as XHI.
FCIL	Facilities	Given rich software tools (code generators, ORM tools, configuration based replication, caching, txn management, etc) and that this is primarily a single site, one developer project, I raged this as XHI.

For producing the COCOMO 2 estimates, I used the USC-COCOMOII software [4]. Plugging the above information into the tool yields the following results:



COCOMO II produces a range of values for effort and schedule. Looking at effort, the most likely estimate is given at 8.5 person months. From the project plan, the duration is 185 days, which we can approximate as effort given one person performs the bulk of the work. In putting the project plan together, I used duration estimates that assumed on average spending 15 hours a week on the project – this means 5 days duration equate to 15 hours effort. Thus estimated effort from the project plan is 555 hours. COCOMO II defines a person month as 152 hours, which means the effort associated with the most likely COCOMO II estimate is 1292 hours – more than double my estimate.

At this point, I am not too concerned about the differences in the two estimates for the following reasons. First, the size estimation was a crude guess – a more refined size estimate will be produced following the elaboration phase. Second, the estimate range depends on the point in the life cycle we are, and it may be the case we are earlier in the life cycle than the COCOMO II early design model assumes (see Figure 3) – I believe both estimates are within the cone of uncertainty. Finally, the functionality of the system is in many cases simpler than many applications: there is no user interface, no complex algorithms, etc., and thus it may represent less development complexity than the effort multipliers account for.

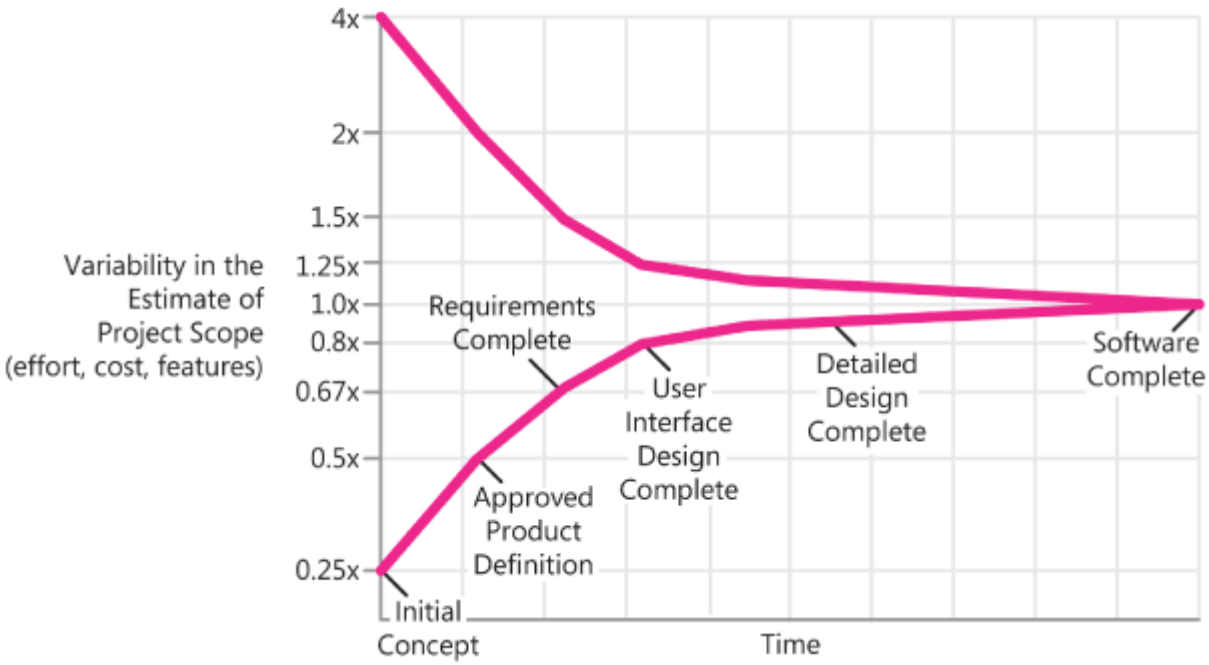


Figure 3 Cone of Estimate Uncertainty (from [5])

References

[1] CIS 895: MSE Project and Portfolio, Department of Computer and Information Sciences, Kansas Status University, http://mse.cis.ksu.edu/documents/MSE-portfolio.pdf (last accessed 10/24/2008).

[2] Barry Boehm, Bradford Clark, Ellis Horowitz, Ray Madachy, Richard Shelby, Chris Westland, "Cost Models for Future Software Life Cycle Processes: COCOMO 2.0," Annals of Software Engineering, (1995).

[3] COCOMO II Model Definition Model, Center for Software Engineering, University of Southern California, http://csse.usc.edu/csse/research/COCOMOII/cocomo2000.0/CII_modelman2000.0.pdf (last accessed 10/24/2008).

[4] COCOMO II.2000.0 Software, Center for Software Engineering, University of Southern California.

[5] Software Estimation: Demystifying the Black Art, Steve McConnell, Microsoft Press, 2006.