APPENDIX M:
EVM

MOBILE APPLICATION FOR GEOLOCATION OF IMAGERY AND COLLABORATION

MAGIC

Prepared for:
OR680/SYST798 Capstone Project course at George Mason University

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Earned Value Management (EVM)

The MAGIC team's original approach was to break the project up into four distinct phases. The first 'Project Definition Phase' would result in the completed Project Proposal and an understanding by the team of what the deliverables for the team were. The second and third phases would each result in a 'draft' of these expected deliverables, and corresponded with the 1st and 2nd Progress Report. The idea was that lessons learned from the first iteration would inform and focus the activities of the second, and so on. The fourth and final phase was to finalize all deliverables, and prepare the final report and presentation, effectively being a third iteration.

MAGIC Project Tasks		JAN	FEB				MAR					APR				MAY
Tasks	**Description**	27	3	10	17	24	3	10	17	24	31	7	14	21	28	5
Project Definition Phase	Define the problem and project scope, and determine feasibility. Phase is complete when the Project Proposal is delivered.															
Problem definition presentation	Initial presentation delivered in class defining the purpose of the MAGIC project.		15													
Define initial tasks / hours / EVM plan	Forms the basis for Earned Value Management (EVM), and to be re-evaluated each phase. This spreadsheet is an initial draft.			15												
Problem definition / scope presentation	Presentation delivered to the class focusing on the scope of the project.			20												
Define preliminary requirements	Write primary requirements based on the described needs of the sponsor. This is part of the Project Proposal.			5	10											
Write a Project Plan	Describes how we (the MAGIC team) will operate (roles / responsibilities, interaction with sponsor, meeting-times, tools, etc)			5	10											
Write the Project Proposal	A class-deliverable to include the project definition, preliminary requirements, technical approach, expected results, and the project plan.				20											
Initial Iteration	Identify an initial set of users and use-cases; derive an initial system architecture and requirements flow-down; and perform an initial cost-analysis and ROI assessment. Ends with the 10 March Progress Reports.															
Update tasks / hours / EVM plan	Update the task-list and planned hours (this spreadsheet).					10	3	3								
Identify potential users	Identify a set of likely users of the capability. They will form the options described in the business case. This initial set of users will be re-evaluated (and probably de-scoped) during the 2nd iteration.					15	5									
Develop Concept of Operations	Includes use-cases and scenarios for the various options explored in the business case.					10	10									
Perform Technical Feasibility Analysis	Determine if the potential performance meets the needs of potential users. Perform trade study between various available platforms. Assess scope of networking / collaboration integration. Pick the recommended option to be modeled in CORE.						10	10								
Initial CORE Model	Define an initial functional and physical architecture in CORE; map requirements to physical / functional elements within the CORE model.						5	10								
Cost-analysis and ROI assessment	Estimate the development costs, and estimate the return on investment.						15	10								
Compile Business Case	Pull information from the concept of operations, the technical feasibility analysis, and others into an initial business case.					2	3	3								
Prepare the Progress Report	A class-deliverable presentation (~15 minutes). Will cover the Initial Iteration.							20								
Second Iteration	Update / down-select the set of users and use-cases; update the system architecture and requirements flow-down; update the cost-analysis and ROI assessment. Ends with the 14 April Progress Report.															
Update tasks / hours / EVM plan	Update the task-list and planned hours (this spreadsheet).								10	3	3	3	3			
Update the target users	Update and / or down-select the set of target users. These will form the basis for the options considered in the Business Case.								15	5						
Update Concept of Operations	Includes use-cases and scenarios for the various options explored in the business case.								10	10						
Update Technical Feasibility Analysis	Update assessment of whether the potential performance meets the needs of potential users. Update trade study between various available platforms. Update scope of networking / collaboration integration. Pick the recommended option to be modeled in CORE.									5	15	5				
Update CORE Model	Update the functional / physical architectures, and requirement mapping based on the down-selected set of target users / use-cases.									5	5	15	10			
Refine cost-analysis and ROI assessment	Update development cost and ROI estimates.									15	15	10	10			
Re-compile Business Case	Pull information from the concept of operations, the technical feasibility analysis, and others into an initial business case.								4	4	4	4	4			
Prepare the 2nd Progress Report	A class-deliverable presentation (~25 minutes). Will cover the Second Iteration.											10	20			
Outbrief Preparation	Finalize all analyses and documents; meet with professor; dry-run the presentation; and deliver the final presentation.															
Set up web page	Set up the MAGIC Project web page													5	5	5
Finalize Concept of Operations														5		
Finalize Technical Feasibility Analysis														5	5	
Finalize CORE Model	Finalize the CORE Model, to include functional / physical architectures and requirements													5	10	
Finalize cost-analysis and ROI assessment	Finalize development cost and ROI estimates.													5	5	
Meet with professor	Prepare for and execute meeting with the professor to discuss progress and plan for final presentation													5		
Final Presentation Dry Run	Prepare for and perform a dry-run of the final presentation.													10	20	
Final Report (Business Case)	Prepare for and deliver the final report (due 2 May)													10	10	
Final Presentation	Prepare for and perform the final presentation.															30
TOTAL HOURS PER WEEK		0	15	45	40	37	51	56	39	47	42	47	47	50	55	35
CUMULATIVE HOURS		0	15	60	100	137	188	244	283	330	372	419	466	516	571	606
WEEK		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Figure 1: Initial Task Structure and Planned Hour Baseline

This approach drove the task-structure used for EVM, and the planned hours expected for each task; see Figure 1. This planned hour and task baseline was followed until the end of the first

iteration, corresponding to the first Progress Report. At this time, it became obvious to the team that a 'draft' of all the deliverables provided at each Progress Report was impossible: there were too many dependencies between deliverables, such that one could not be started until another was at an appropriate level of fidelity.

The MAGIC team underwent a re-baselining of the task-structure and the planned hours to address the issues encountered by the iterative approach. Tasks were now grouped by major deliverable, and an 'overhead' group called 'Project Management' that covered common tasks such as team-meetings and administrative activities. The new EVM baseline went into effect on 17 March 2011.

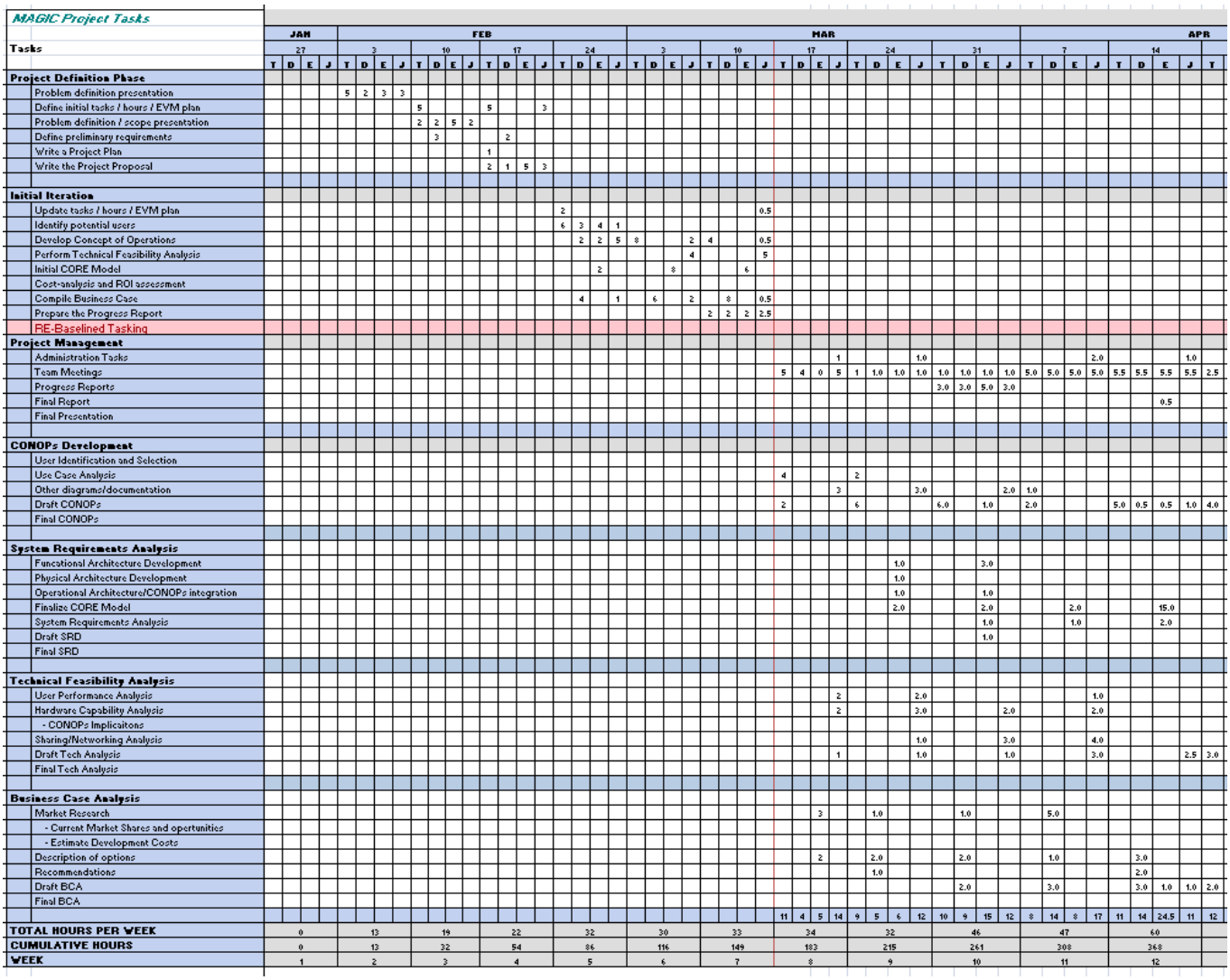
MAGIC Project Tasks																
	JAN	FEB				MAR					APR					MAY
Tasks	27	3	10	17	24	3	10	17	24	31	7	14	21	28	5	
RE-Baselined Tasking																
Project Management																
Administration Tasks								10	2	2	2	2	2	3	3	
Team Meetings								15	8	8	8	8	8	8	8	
Progress Reports								10		4			4	0	4	
Final Report														12	12	
Final Presentation															8	
CONOPs Development																
User Identification and Selection																
Use Case Analysis								6	6	2						
Other diagrams/documentation								2	2	2	2					
Draft CONOPs								2	2	4	6	6	6			
Final CONOPs														8		
System Requirements Analysis																
Funcational Architecture Development									2	8	8					
Physical Architecture Development									2							
Operational Architecture/CONOPs integration											8	8				
Finalize CORE Model												2				
System Requirements Analysis												4	8			
Draft SRD												2	4			
Final SRD														8		
Technical Feasibility Analysis																
User Performance Analysis								2	2							
Hardware Capability Analysis								6	6	2						
- CONOPs Implicaitons																
Sharing/Networking Analysis								2	2	6	6					
Draft Tech Analysis												6	2			
Final Tech Analysis														4		
Business Case Analysis																
Market Research								4	4	4						
- Current Market Shares and opertunities																
- Estimate Development Costs																
Description of options								4	4	4						
Recommendations											6					
Draft BCA											2	8	8			
Final BCA														8		
TOTAL HOURS PER WEEK	0	15	45	40	37	51	56	63	42	46	48	46	42	51	35	
CUMULATIVE HOURS	0	15	60	100	137	188	244	307	349	395	443	489	531	582	617	
WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

Figure 2: New Task Structure and Planned Hour Baseline

Every Thursday during the semester, each team member entered the hours they spent per task over the past week; then the team decided collectively what percent of each task had been completed in the past week. Figure 3 shows the percent complete of each task estimated by the team each week; this formed the basis of the Earned Value.

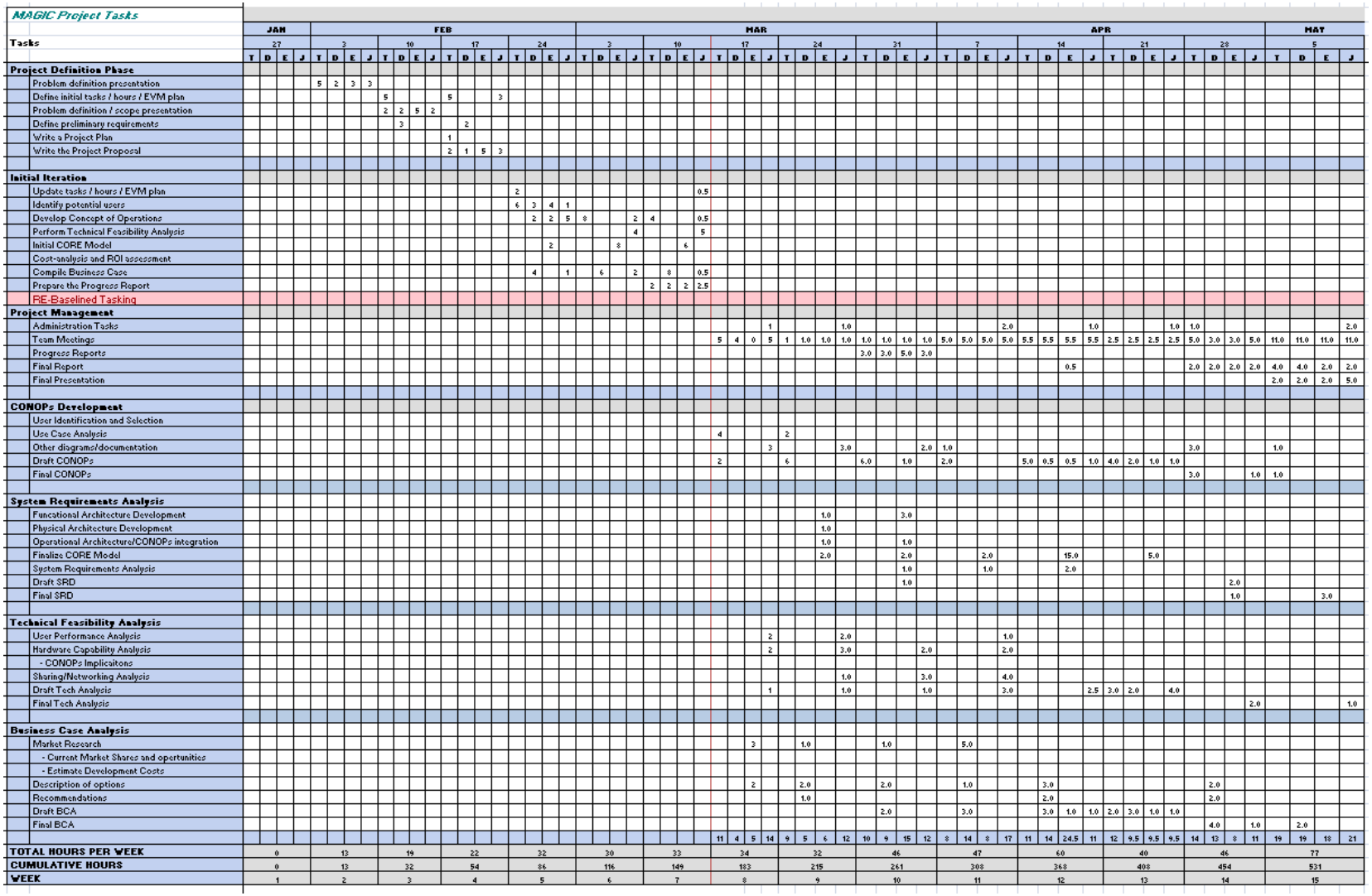
MAGIC Project Tasks																
		FEB				MAR					APR				MAY	
Tasks	27	3	10	17	24	3	10	17	24	31	7	14	21	28	5	Total % Complete
Project Definition Phase																
Problem definition presentation		100%														1
Define initial tasks / hours / EVM plan			50%													0.5
Problem definition / scope presentation			50%													0.5
Define preliminary requirements			40%	40%												0.8
Write a Project Plan				50%												0.5
Write the Project Proposal				50%												0.5
0																
Initial Iteration																
Update tasks / hours / EVM plan					50%											0.5
Identify potential users					50%											0.5
Develop Concept of Operations					10%	15%										0.25
Perform Technical Feasibility Analysis						20%										0.2
Initial CORE Model					15%	5%	10%									0.3
Cost-analysis and ROI assessment																0
Compile Business Case					10%	10%	10%									0.3
Prepare the Progress Report						0%										0
RE-Baselined Tasking																
Project Management																
Administration Tasks								12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	1
Team Meetings								12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%	1
Progress Reports												50.00%			50.00%	1
Final Report												5.00%		45.00%	50.00%	1
Final Presentation															100.00%	1
CONOPs Development																
User Identification and Selection								100%								1
Use Case Analysis								75%	15%	10%						1
Other diagrams/documentation								45%	15%	15%	15%			5%	5%	1
Draft CONOPs								15%	20%	15%	20%	5%	10%	15%		1
Final CONOPs														60%	40%	1
System Requirements Analysis																
Funcational Architecture Development								10%	20%	15%	20%	35%				1
Physical Architecture Development								85%	15%							1
Operational Architecture/CONOPs								5%	5%	10%	10%	40%	30%			1
Finalize CORE Model									25%	15%	10%	35%	10%	5%		1
System Requirements Analysis								5%			5%	45%	45%			1
Draft SRD													50%	20%	30%	1
Final SRD															100%	1
Technical Feasibility Analysis																
User Performance Analysis								85%	5%	5%	5%					1
Hardware Capability Analysis								60%	20%	10%	10%					1
- CONOPs Implicaitons																
Sharing/Networking Analysis								20%	10%	40%	20%	10%				1
Draft Tech Analysis								50%		20%	10%	15%	5%			1
Final Tech Analysis													10%	80%	10%	1
Business Case Analysis																
Market Research								50%	20%	20%	10%					1
- Current Market Shares and opertunities																0
- Estimate Development Costs																0
Description of options								30%	10%	10%	10%	10%	5%	15%	10%	1
Recommendations								15%	15%	15%	15%	5%	5%	15%	15%	1
Draft BCA								20%	20%	10%	10%	10%	10%	20%		1
Final BCA														40%	60%	1
Earned Value per week	0	15	19.5	23.5	23.05	8.55	2.3	39.65	35.1	30.3	26.5	102.3	31.9	100.9	215.7	674.25
CUMULATIVE HOURS	0	15	34.5	58	81.05	89.6	91.9	131.55	166.65	196.95	223.45	325.75	357.65	458.55	674.25	2904.85
WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	120

Figure 3: Percent of Each Task Completed Per Week



MAGIC Project Tasks	JAN				FEB												MAR																				APR											
Tasks	27				3				10				17				24				3				10				17				24				31				7				14			
	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T
Project Definition Phase																																																
Problem definition presentation					5	2	3	3																																								
Define initial tasks / hours / EVM plan									5				5			3																																
Problem definition / scope presentation									2	2	5	2																																				
Define preliminary requirements										3				2																																		
Write a Project Plan													1																																			
Write the Project Proposal													2	1	5	3																																
Initial Iteration																																																
Update tasks / hours / EVM plan																2								0.5																								
Identify potential users																6	3	4	1																														
Develop Concept of Operations																	2	2	5	8			2	4			0.5																				
Perform Technical Feasibility Analysis																							4				5																				
Initial CORE Model																		2				8				6																				
Cost-analysis and ROI assessment																																															
Compile Business Case																	4		1		6		2		8		0.5																				
Prepare the Progress Report																									2	2	2	2.5																				
RE-Baselined Tasking																																															
Project Management																																															
Administration Tasks																															1				1.0								2.0				1.0	
Team Meetings																													5	4	0	5	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0	5.0	5.0	5.5	5.5	5.5	5.5	2.5
Progress Reports																																				3.0	3.0	5.0	3.0								
Final Report																																													0.5		
Final Presentation																																															
CONOPs Development																																															
User Identification and Selection																																															
Use Case Analysis																													4				2														
Other diagrams/documentation																															3				3.0				2.0	1.0						
Draft CONOPs																													2				6			6.0		1.0		2.0			5.0	0.5	0.5	1.0	4.0
Final CONOPs																																															
System Requirements Analysis																																															
Funcational Architecture Development																																		1.0			3.0									
Physical Architecture Development																																		1.0												
Operational Architecture/CONOPs integration																																		1.0			1.0								
Finalize CORE Model																																		2.0			2.0			2.0			15.0		
System Requirements Analysis																																					1.0			1.0			2.0		
Draft SRD																																					1.0								
Final SRD																																														
Technical Feasibility Analysis																																															
User Performance Analysis																															2				2.0								1.0				
Hardware Capability Analysis																															2				3.0				2.0				2.0				
- CONOPs Implicaitons																																															
Sharing/Networking Analysis																																					1.0				3.0				4.0			
Draft Tech Analysis																															1				1.0				1.0				3.0				2.5	3.0
Final Tech Analysis																																															
Business Case Analysis																																															
Market Research																															3			1.0				1.0				5.0					
- Current Market Shares and oportunities																																															
- Estimate Development Costs																																															
Description of options																															2			2.0				2.0				1.0				3.0		
Recommendations																																		1.0												2.0		
Draft BCA																																						2.0				3.0				3.0	1.0	1.0	2.0
Final BCA																																															
																													11	4	5	14	9	5	6	12	10	9	15	12	8	14	8	17	11	14	24.5	11	12
TOTAL HOURS PER WEEK	0				13				19				22				32				30				33				34				32				46				47				60			
CUMULATIVE HOURS	0				13				32				54				86				116				149				183				215				261				308				368			
WEEK	1				2				3				4				5				6				7				8				9				10				11				12			

Figure 4 shows the hours logged for each task by each team member; T = Tom, D = Dawin, E = Erika, and J = Jeff. This formed the basis of the Actual Cost.



MAGIC Project Tasks	JAN				FEB												MAR																APR												MAY			
Tasks	27				3				10				17				24				3				10				17				24				31				7				14				21				28				5			
	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J	T	D	E	J
Project Definition Phase																																																								
Problem definition presentation					5	2	3	3																																																
Define initial tasks / hours / EVM plan									5				5			3																																									
Problem definition / scope presentation									2	2	5	2																																													
Define preliminary requirements										3				2																																										
Write a Project Plan													1																																											
Write the Project Proposal													2	1	5	3																																								
Initial Iteration																	2											0.5																												
Update tasks / hours / EVM plan																	6	3	4	1																																				
Identify potential users																		2	2	5	8		2	4			0.5																												
Develop Concept of Operations																							4				5																												
Perform Technical Feasibility Analysis																						8				6																												
Initial CORE Model																					6		2		8		0.5																												
Cost-analysis and ROI assessment																	4		1			6		2																																
Compile Business Case																									2	2	2	2.5																												
Prepare the Progress Report																																																								
RE-Baselined Tasking																																																								
Project Management																																																								
Administration Tasks																													1				1.0												2.0				1.0				1.0	1.0						2.0
Team Meetings																													5	4	0	5	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0	5.0	5.0	5.5	5.5	5.5	5.5	2.5	2.5	2.5	2.5	5.0	3.0	3.0	5.0	11.0	11.0	11.0	11.0
Progress Reports																																				3.0	3.0	5.0	3.0																		
Final Report																																													0.5						2.0	2.0	2.0	2.0	4.0	4.0	2.0	2.0
Final Presentation																																																					2.0	2.0	2.0	5.0
CONOPs Development																																																							
User Identification and Selection																																																							
Use Case Analysis																													4			2																								
Other diagrams/documentation																																3				3.0			2.0	1.0												1.0			
Draft CONOPs																													2			6				6.0		1.0		2.0			5.0	0.5	0.5	1.0	4.0	2.0	1.0	1.0						
Final CONOPs																																																				3.0			1.0	1.0			
System Requirements Analysis																																																							
Functional Architecture Development																																			1.0			3.0																		
Physical Architecture Development																																			1.0																					
Operational Architecture/CONOPs integration																																			1.0			1.0																		
Finalize CORE Model																																			2.0			2.0			2.0			15.0			5.0								
System Requirements Analysis																																						1.0			1.0			2.0											
Draft SRD																																						1.0														2.0			
Final SRD																																																			1.0			3.0		
Technical Feasibility Analysis																																																							
User Performance Analysis																																2				2.0										1.0										
Hardware Capability Analysis																																2				3.0			2.0							2.0									
- CONOPs Implicaitons																																																							
Sharing/Networking Analysis																																				1.0			3.0							4.0									
Draft Tech Analysis																																1				1.0			1.0							3.0				2.5	3.0	2.0		4.0			
Final Tech Analysis																																																					2.0			1.0
Business Case Analysis																																																						
Market Research																															3			1.0				1.0				5.0														
- Current Market Shares and opertunities																																																						
- Estimate Development Costs																																																						
Description of options																															2			2.0				2.0				1.0				3.0						2.0			
Recommendations																																			1.0												2.0				2.0			
Draft BCA																																						2.0				3.0			3.0	1.0	1.0	2.0	3.0	1.0	1.0				
Final BCA																																																						4.0		1.0		2.0			
																													11	4	5	14	9	5	6	12	10	9	15	12	8	14	8	17	11	14	24.5	11	12	9.5	9.5	9.5	14	12	8	11	19	19	18	21
TOTAL HOURS PER WEEK	0				13				19				22				32				30				33				34				32				46				47				60				40				46				77			
CUMULATIVE HOURS	0				13				32				54				86				116				149				183				215				261				308				368				408				454				531			
WEEK	1				2				3				4				5				6				7				8				9				10				11				12				13				14				15			

Figure 4: Actual Hours Logged (before and after re-baselining)

The resulting Earned Value curve is depicted in Figure 5.

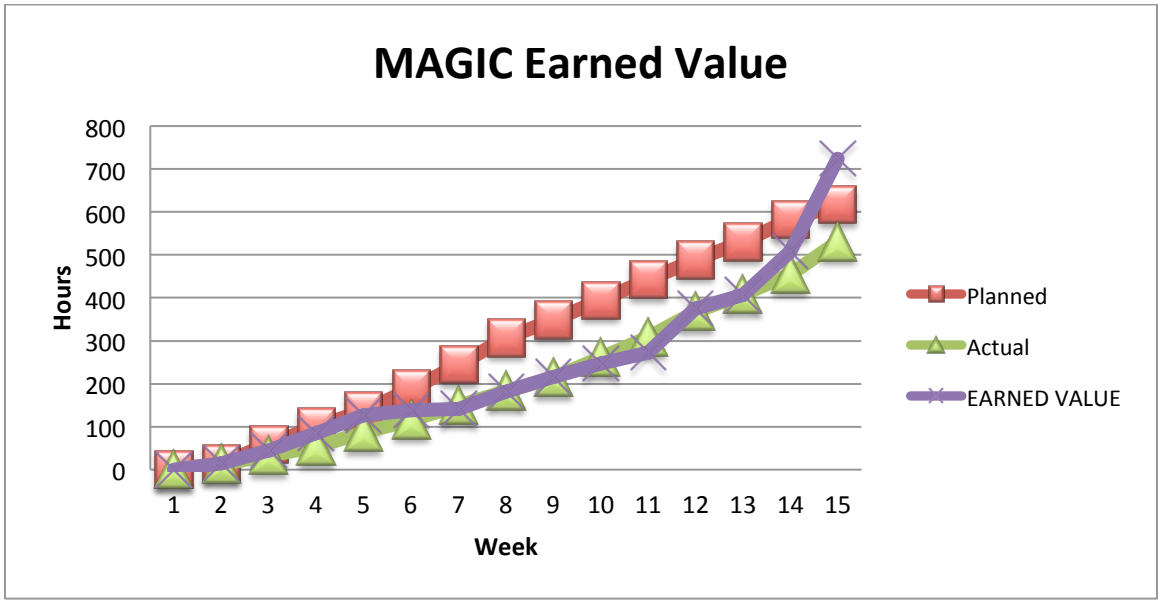


Figure 5: Earned Value for the MAGIC Project

There is an error in the formulas of our spreadsheet; Earned Value should not exceed Planned Value. The source of the error is likely related to the re-baseline that occurred after Week 7. An EVM curve should have been created for the initial baseline (covering weeks 1-7), and a separate one for the re-baseline (covering weeks 8-15).