Final Project Report
Baxter Creek SS4000-E

June 2011

Course Title:	Project Management
Course Number:	EMGT 545
Instructor:	Dundar F. Kocaoglu, Professor
Term:	Spring
Year:	2011
Prepared by:	Team 3

CONFIDENTIALITY STATEMENT

Intel Corporation has provided information about its products and product development process as part of its continuing efforts in support of technical education at all levels.

Restrictions:

1. The information contained in this presentation has been provided to Portland State University for use in ETM545 only.
2. The material is not to be posted on the internet or on PSU internal web pages or data bases.
3. The material is not to be distributed to anyone other than the project team and the course instructor. This email or other electronic methods, via hard copy or any other method.

ACKNOWLEDGMENT

Team Three thanks Edward Hershberg, who took the time to explain Project Management in great detail. His insight and patience were invaluable in enabling all the project members understand the life cycle of the Baxter Creek Project. The time and effort he devoted helped all of the project members gain a valuable and greatly improved understanding of Project Management**.**

Final Project Report: Baxter Creek SS4000-E Project Case Study and Analysis

Karina Hershberg
Priti Maheshwari
Aarthi Neethirajan
Dinesh Soysa
Michael Uffelman

I. INTRODUCTION

Baxter Creek (SS400-E), manufactured by Intel, is entry level storage system used for small businesses. It is a network attached storage (NAS) box with four hard drives and can store up to 2TB (terabytes). It can be used for both shared files and backups of computer hard disks. It was designed for data protection with system backup, remote boot and system recovery. The key features are flexible storage capacity and built-in data protection. This NAS product was targeted at the SMB/SOHO market.

This project was started in 2005 initiated by the product development team with Edward Hershberg as project lead. Baxter Creek (SS4000 –E) was one of Intel's most successful products that were completed on time and within budget.

The project manager Mr. Edward Hershberg has an undergraduate degree in mathematics and two master's degrees in Geo-Physics and Mechanical Engineering. His professional experience includes over 15 years in Tektronix as product designer and 6 years in Inkjets. Also, in 1999, he was the cofounder of Network Elements Inc., that develops optical networking modules integrating high-speed optics, electronics and wire speed, multi protocol ASCIs. Due to the meltdown of telecom technology, Network elements Inc., was shut down in 2005. He started with Intel in 2005 as a program manger and currently works as a PXT lead at the platform execution team.

Intel (Integrated Electronics Corporation), largest chip manufacturer in the world was founded in 1968 to build semiconductor memory products. Intel introduced the world's first microprocessor in 1971. They make motherboard chipsets, network interface controllers and integrated circuits, flash memory, graphic chips, embedded processors and other devices related to communications and computing. The biggest customers of Intel are Hewlett-Packard and Dell Intel's market capitalization as of February 2011 is $122.41 billion.

II. BAXTER CREEK PROJECT

\

The Baxter Creek case study provided an excellent example of project management concepts and techniques implemented in a real world situation. The project closely followed an easily traceable progression through a standard product lifecycle. It began with a project selection and evaluation phase, which was closely followed by the establishment of the project's organizational structure, management plan and ongoing management tools. These initial stages are critical and can greatly impact the long term success or failure of the project. Intel's internal description of the project life cycle is Exploration-Planning-Development-Production. This next section will look at the tools and methods that were used in the early phases of Exploration and Planning. The following section will then highlight the tools and methods used in the later phases of Development and Production.

III. PROJECT EVALUATION

A. *Viability*

The first step for any project is to determine if the project is even viable. The Intel steps of Exploration and Planning are equivalent to the Conceptual and Definition phases presented in the class lecture. These phases include financial analysis, market evaluation and a study on achievability of the product's necessary performance requirements. Baxter Creek considered all these factors during the project selection and evaluation processes in the Exploration and Definition phases.

The goal of the early phases is to answer four basic questions- what is the cost, the schedule, the function and the purpose of the project? These questions can be addressed through a variety of methods. Cost requires financial research on both what the project will cost to complete and what the project might bring in as a source of revenue. Schedule depends on the resources that are needed and the resources that are available. The project function is an understanding of what the project must achieve to meet the needs of the end goal. In the case of a product based project, the function is the features and capabilities the product must have to meet the demands of the market. The purpose of the project is a question of what need or gap does the project fill and how does the project help achieve the overall goals of the main organization. The answers to these questions will guide the decision process on whether or not the project should continue to be supported.

The conceptual phase and definition phases of Baxter Creek looked at all four questions described above. One of the most important questions to be answered before a project can continue into the execution phases of a project lifecycle is the purpose of the project. In other words, what goal will be achieved with this project? In the case of Baxter Creek, it was determined that there was potential in the small business/home storage market for new product placement. At the time of the project, Intel did not have a product in the low end market segment and it was determined that there was an opportunity to enter the space and gain a portion of the market share. Although the technology roadmap for the organization cannot be shared in this report due to its proprietary nature, the Baxter Creek product fit into the strategic plan for the organization and its goals for market growth in the coming years. Therefore the purpose of Baxter Creek was to allow the Intel Storage Group to enter into a new market segment.

B. *Financial Basis*

The next issue that needed to be considered was the financial justification for the project. The marketing and finance teams produced a financial analysis of the project. The analysis included a project net present value (NPV) with sensitivity calculation, as shown in Figure 1.

- **Base NPV = $x.yM on $zzM of Rev and $wM of Investment**
  - Lifetime GM = xx%
- **Project return highly dependent on ASPs**
  - Competition already has set ASPs in this space
  - 10% drop reduces NPV by $wM

Figure 1: Net Present Value Projections used for financial justification

The financial study also included a pricing and volumes forecast. The initial project proposal only predicted the product to sell during the 2006-2007 calendar years. Based on market analysis and the determination that the proposed product had a small window of opportunity within the market, Baxter Creek was intended to be a fast to market product. This fast design cycle required all the components (hardware, software, specs) to hit development completion at the same time. This meant that this schedule used for this initial product evaluation was critical to the overall likelihood of success of the project. The other component of the volumes forecast was a prediction of volumes and pricing. To be considered a profitable project, there were

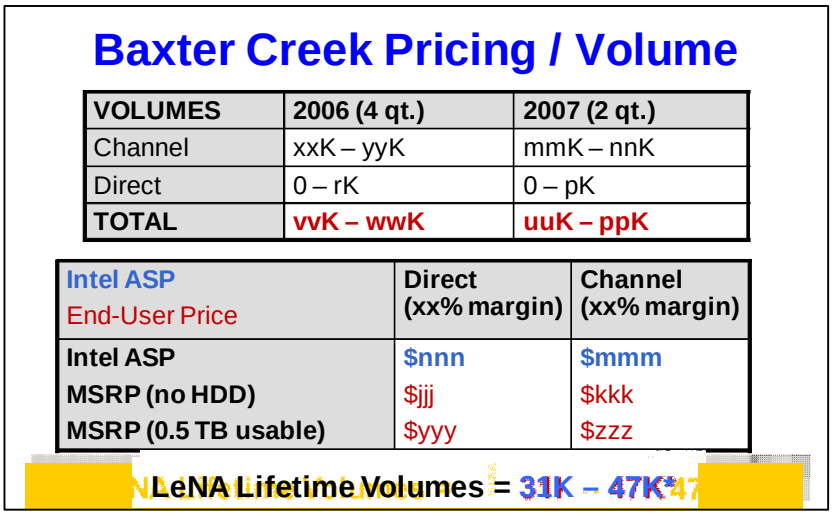

Figure 2: Volume and Pricing goals for the final product.

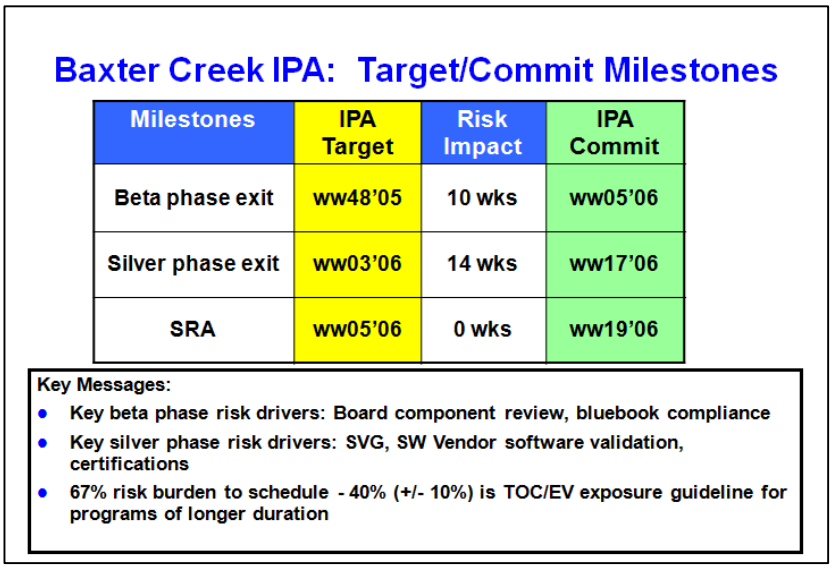

Figure 3

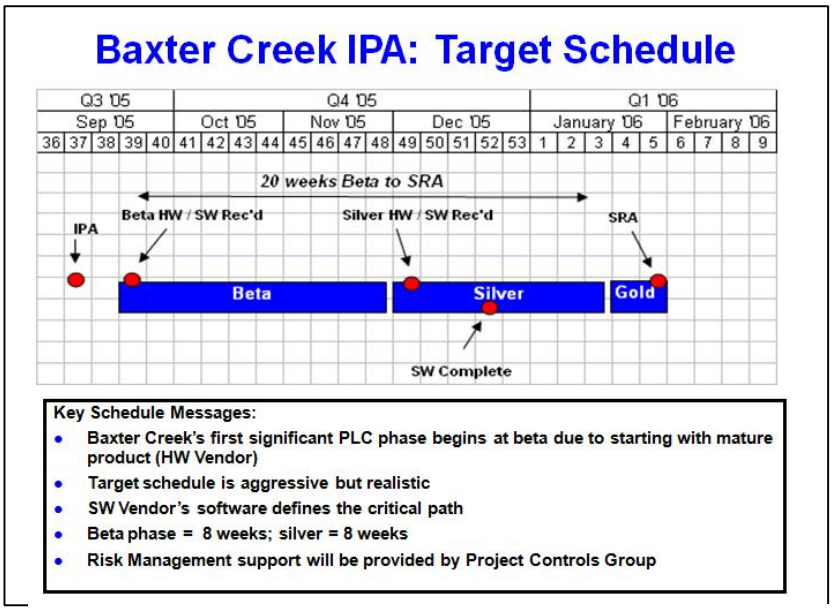

Figure 4

volume and price goals that would need to be achieved during the expected market window for sales of the product as seen in Figure 2.

The second question that needed to be addressed was the issue of schedule. As previously discussed, schedule was a huge driver in the chance for success on the project. Since it was such a critical issue it was important that an aggressive, but achievable, schedule was established at the beginning of the project and closely maintained throughout the life of the project.

The creation of a detailed schedule falls under both the conceptual and definition phases of project life cycles. In the case of Baxter Creek, once it was determined that a successful schedule was possible, a more detailed schedule with set milestones could be created. These are demonstrated in Figure 3 and Figure 4.

A. Projected Risks

An additional consideration in the scheduling component is the issue of risks that could impact the success and timing of the project. Although risk is also considered in the function aspect of project consideration, it will be included in the scheduling section. Due to the critical timing factor of Baxter Creek's launch, the biggest risk to the project was any aspect that might cause a scheduling delay. In order to assess the risk of a delay in schedule, the various teams working on Baxter Creek (hardware, software, marketing, manufacturing, documentation) were asked to provide information on the aspects of their development areas which could run into problems. They then provided information about how likely it was the problem would occur and what the potential schedule impact would be. Figure 5 and Figure 6 show an example of one group's analysis on the highest risk items in their area, including

the potential for occurrence and impact to schedule.

These sub-group tables were then combined into an overall project tracking sheet, as shown in Figure 7. This allowed for close monitoring throughout the project of the risk areas at both the micro and macro levels. With this complete the project could move on to finalizing the project concept and preparing for development and production.

Baxter Creek IPA: Storage Validation ( )

Key Messages:
- A brand-new A/P list has been put together for the SOHO market . SV/SE needs to come up to speed on the items in the A/P list
- Detailed Test Report needs to be reviewed to understand what can be leveraged.
- Defect-tracking system needs to be in place prior to start of the execution phase.

Baxter Creek Roles and Responsibilities List	SV	HW Vendor	SW Vendor	Intel
Activity	Owned	Owned	Owned	Approved
SW Verification			X	X
HW Verification		X		X
SW Verification Audit	X			
HW Verification Audit	X			
Stress & CV testing	X			
Input in AP List Creation and Maintenance	X			

Risk / Issue	Description / Impact (If... Then... format)	Milestone	Probability	Impact	Risk Code
No Bug Tracking system identified	May result in communication issues and visibility on progress of defects, hence impacting timely resolution	SRA	50-74%	>4 wks	1
Detail HW Vendor report is not available	Assuming that Vendor Test coverage is extensive. SV is planning audit-type testing	SRA	25-49%	>4 wks	1
New catogories of Peripherals - for SV/SE	If the issues can not be resolved with routine effort - the specific peripherals have to be dropped from the THOL	Program	50-74%	>4 wks	2

THOL = Tested HW & OS List

Figure 5: Risk Analysis Example used for the Project

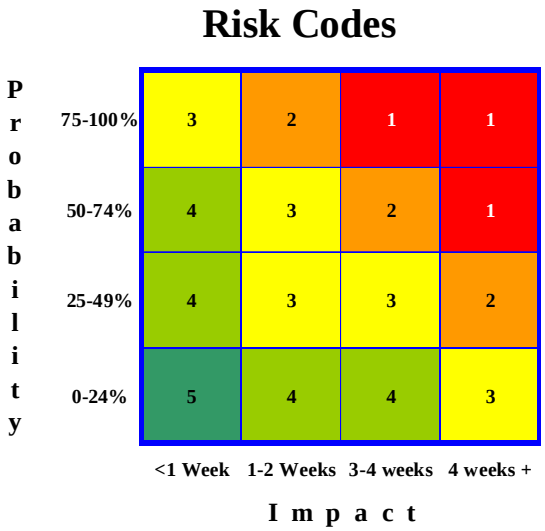

Figure 6: Risk Chart used for analysis

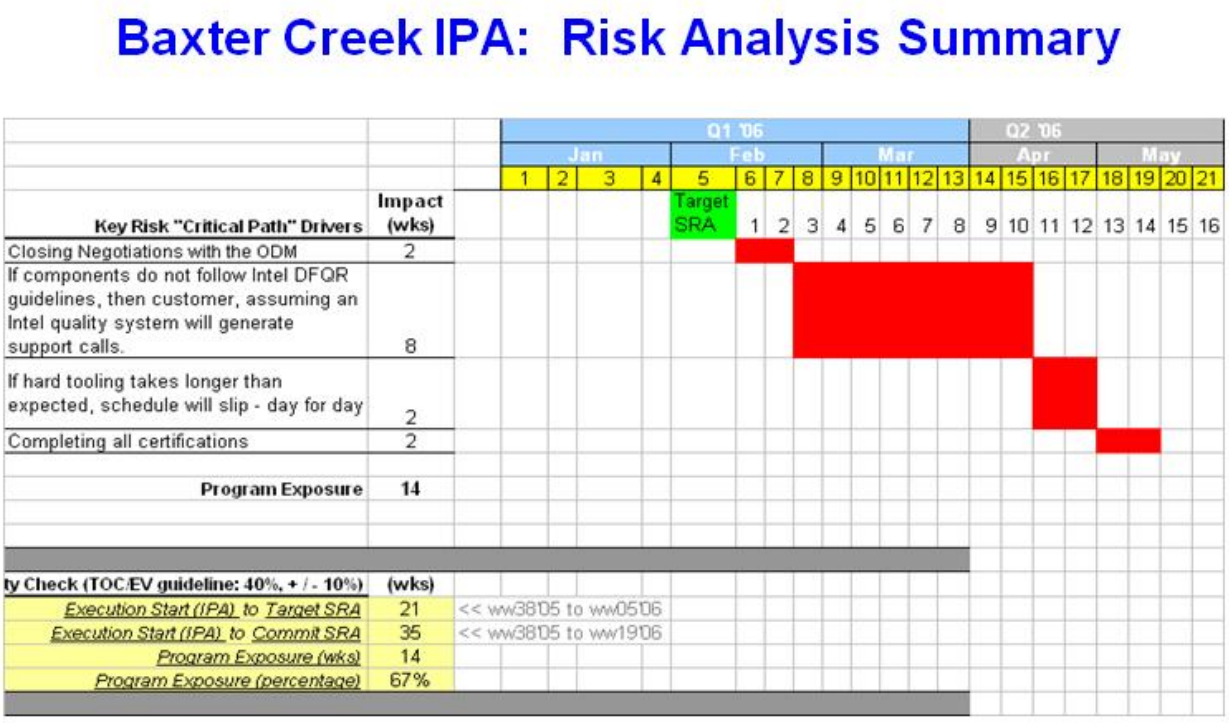

Figure 7: Risk Analysis integrated with schedule

IV. Finalization of Project Concept and Project Definition

Included in the scheduling component of the definition and planning phases was the determination of the resource allocation for the project and the organizational structure that would be used. In the case of Baxter Creek, clear assignments of ownership were established in the creation of a Product Development Team (PDT). The stakeholders for the various functions needed for successful completion of the project were solidified during the Implementation Plan Approval (IPA) milestone in the Planning/Definition phase. The template for the PDT for Baxter Creek is shown in Figure 8.

Although the PDT clearly defined the responsible internal stakeholders, since Baxter Creek required close collaboration with external vendors a matrix for ownership between Intel and the external vendors also had to be established. These relationships were communicated in the Responsibility Matrix shown in Figure 9.

Baxter Creek IPA: PDT

FUNCTION	STAKEHOLDER		FUNCTION	STAKEHOLDER
Marketing			MTO S - Manuf	
PME				
TME				
RPG PME				
RPG TME			Validation	
Systems (Electrical)				
Systems (Mechanical)			Certification	
HW Development			Finance	
OIP (O S/IO/Performance)			Contracts / Relationships	
			EPSD Operations	
System Integration			Process Controls Group	
			Program/Project Manager	
Quality			Program Director	

Figure 8

Baxter Creek IPA: Responsibility Matrix

Program Roles and Responsibilities	Intel	HW Vendor	SW Vendor	Intel
Activity	Owned	Owned	Owned	Approved
Product Features and Performance	X			
Validation Plan	X			
Environmental testing/qualification plan	X			
HW performance		X		X
SW performance			X	X
Program schedule and coordination	X			
Milestone approval	X			
Risk management	X			

Figure 9

The establishment of who owns what is critical for any project. But just as important is the establishment of who answers to whom. As described in "Project Management: A Managerial Approach" the Project Matrix Organization is a combination of the Pure and Functional organizational structures but with a heavier emphasis on the Pure style [1]. Baxter Creek was structured as a Project Matrix Organization where the project manager had a dedicated team of members from various functional groups but then reported up to a project director who was managing multiple projects within the main organizational group. One of the keys to the organizational structure of Baxter Creek was that the project manager had the authority to make decisions about both the direction of the project, as well as the roles and responsibilities of the team members. The interrelationship between the groups and the structure of authority for the project was illustrated for the team in the slide shown in Figure 10.

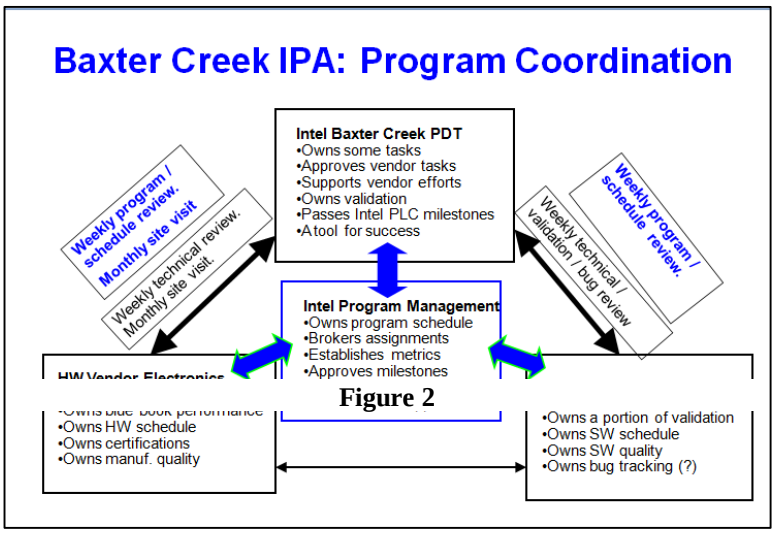

Figure 10

The last question that needs to be answered in the Conceptual and Definition Phase is function. When the output of the project is a product, this question looks at the performance and feature requirements for that product. In the case of Baxter Creek, the initial market analysis determined that in order to be successful with consumers, there were certain features and performance targets that the product needed to achieve. This led to a feature and performance goal list that all the groups – hardware and software- had to work towards to achieve. But the goals of a project can sometimes be outside the realm of realistic achievement when considered with the larger goals of the project. Therefore the project sets limits on the tolerance threshold for the desired features that define where the project would ideally like to be and where it needs to be to still achieve the ultimate goal of the project. Baxter Creek defined these limits during the Definition phase of the project so that the teams understood where they ideally should be at each milestone and where they absolutely had to be in order to successful launch the project. This breakdown is demonstrated in Figure 11.

Baxter Creek IPA: Success Criteria

Indicator	Goal	Threshold	Owner
Features (PRD)	100% of priority 1 50% of priority 2	95% of priority 1 20% of priority 2	
Negotiated Cost	$<330	$385	
ASP @ Launch	$549	$490	
Development Cost	Prog. Spending <$1.00M	Prog. Spending >$1.2M	
Schedule	SRA target 05	SRA commit ww19	
ECOs (within 90 days for sys SRA)	Zero	3	
OQM	99.5%	99%	
Number of priority 1 and 2 defects at release	0 Sev1/2 Trackers	0 Sev1 and ≤3 Sev2 in Verify/Verify Release with clear mitigations identified	

Figure 11

After all the aspects of the Exploration and Planning phases for project justification were completed, the upper management of the organization determined that Baxter Creek was a viable project and cleared it to proceed into the Development and Production phases of the Intel project cycle.

V. Development and Production

Once the project, resources, budget, and schedule were planned, the foundation was laid for successful project execution. Due to the fact that the project planning has been set up successfully, the project was forecasted to run

relatively smoothly. An example was the level of effort that is put into the project plan. Since there was a significant amount of work put into planning, a foundation was laid for success. Mr. Hershberg described the key to success on his projects overall with a table. He charged a diagram involving level of effort over time (Figure 12).

A successful project will most likely follow the pattern of good planning beforehand. If the PM spends a large amount of effort up front, then the project will run relatively smoothly and little effort will be required to take care of risks and/or unforeseen circumstances. However if there is not good planning in the initial phases, then the PM will have to spend a significant amount of work as the project progresses. In addition, since much of the effort will involve risk mitigation involving these circumstances, the quality of work performed will be affected.

A. Project Tools

For project execution there were a number of tools that were used for the PM to execute. These tools are common not only at Intel, but across the PM community. Project planning methodology involves "hard" tools such as project software as well as "soft" tools such as project meetings [2]. The tools for this project focused around meetings held by Mr. Hershberg, as well as the PM software specific to Intel (Microsoft Project).tools created by Mr. Hershberg and used throughout the project to keep the project running.

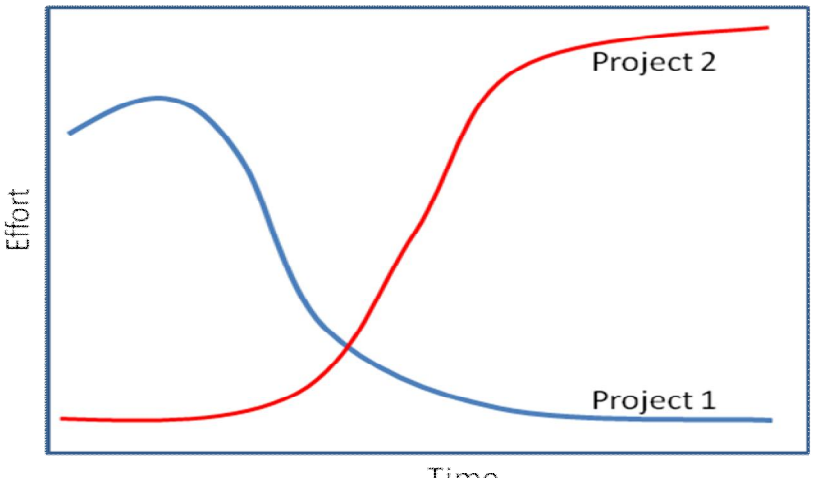

Figure 12: For Project 1, noted effort is put in the early stages of the project resulting in a smooth project flow and less work for the PM. For Project 2, little effort is put inot the early planning stages, resulting in an increased workload later in the project.

For the "hard" tools the scheduling software was discussed and several techniques were identified. In order to track the schedule, both a Gant chart as well as network diagram was used for scheduling. The Gant chart was used to track resources and details of each portion of the schedule. The PM often referred to the Gant chart to track and monitor smaller details and fine points on the project.

A network was used as well and it accurately mirrored the Gant chart, but it was used differently. The network was used by the PM to gain a bigger picture of the project overall. In Figure 13 we can see how the Gant chart and network are used to portray different views of an identical schedule. The PM discussed these techniques, adding a perspective which emphasized the importance of both a Gant chart as well as network diagram.

One other method was discussed as well. Mr. Hershberg called it "calendar view" (Figure 13) and discussed how he referred to the schedule on a calendar to plan against a specific risk. There was a holiday that coincided with the final stages of the project. Mr. Hershberg used calendar view to reference the impact that the holiday might have on the overall schedule and communicate that with the team.

Mr. Hershberg's meetings were held at regular intervals and were also credited with successful execution of the project. The meetings maintained a specific format and were very structured with an agenda, specific objectives, and meeting tasks for each team member as seen in Figure 13.

These soft tools included meeting formats specific to the project. The meetings were held at regular intervals and agendas were adhered to when necessary in order to keep all team members focused. These were described by Mr. Hershberg as crucial to the success of the project.

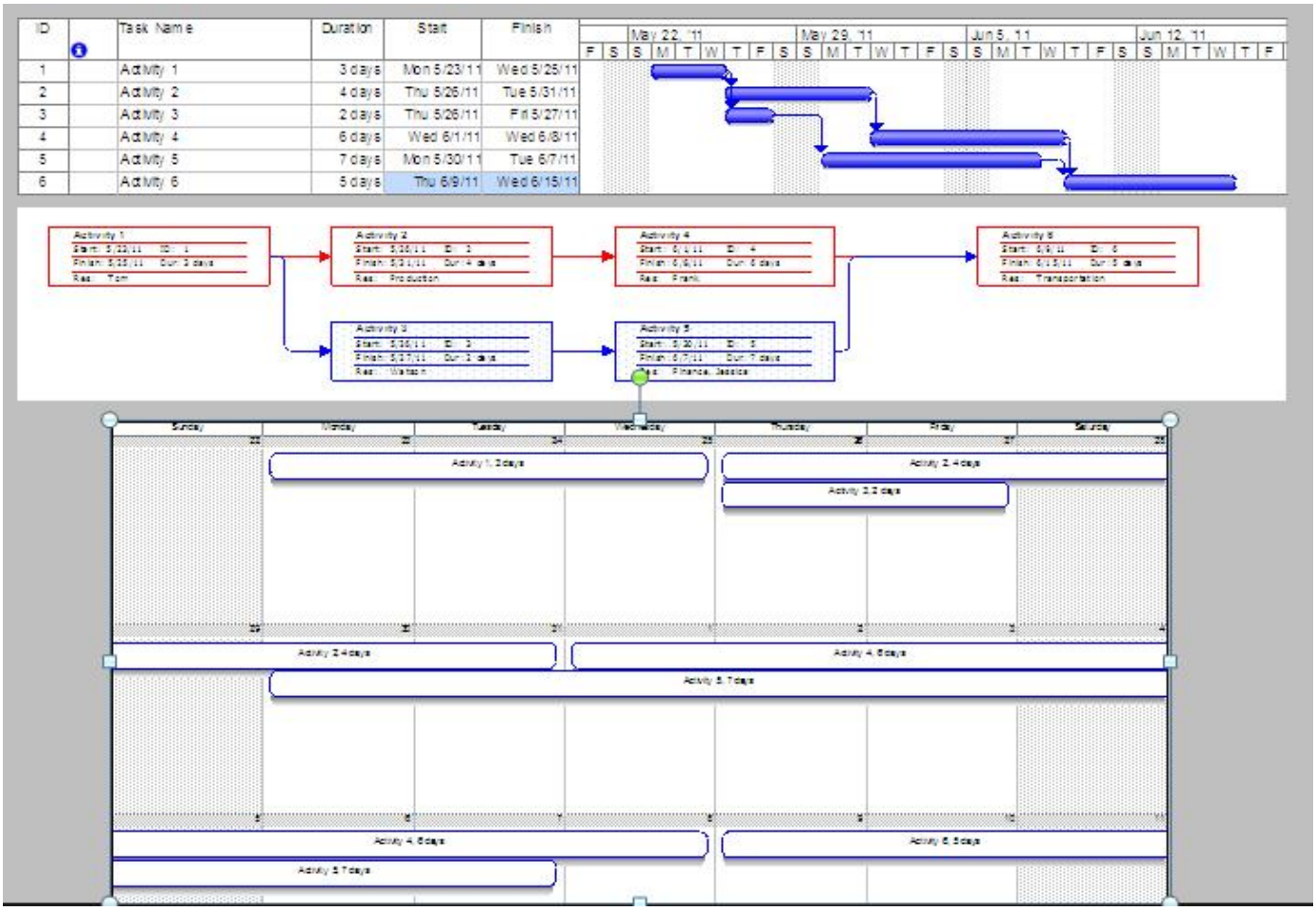

Figure 13: Gant Chart, Network Diagram, and calendar view examples

B. Project Manager's Authority

Most of the project progressed smoothly, however there was one issue that came up near the end. There was a problem with the product packaging. The subcontractor responsible for developing the packaging for the final project had made an error with regard to the final packaging. The project was near the end and there was very limited time left on the schedule for slip. The PM had to make a decision and instead of going through a process which would have involved redoing the final packaging he made a decision to override certain decisions and work with the subcontractor to fix the problem last minute. This freedom of decision was key to the project being a success and was credited to the PM having the ability to make decisions without a cumbersome vetting process.

VI. PROJECT RESULTS

The project was successfully finished and there were no schedule slippage. This project was on schedule after many other projects which had schedule slippage. The project was outstanding in sales. It was estimated to sell 24000 units but they end up selling 45000 units which is almost twice of estimated value. As a part of incentives, during the project the project manager was given a promotion and all the people associated with this project were given this product "Baxter Creek" as an appreciation which is very with Intel. There was one follow up project of Celeron chipset box but it was a very small project and the product was also not very successful.

VII. Conclusion and Lessons Learned

The team came away from the case study with some very valuable lessons learned:

- It is very important for the project manager to have formal authority to take decisions about team and project. This reduces the turnaround time in decision making which results in faster task completion. On the spot decisions should be done by the project manager whenever immediate action is required.
- Project manager must ensure that the project is done correctly right from the beginning. If the problem is encountered at the end then it becomes very difficult to bring the project back on track and implement successfully.
- Supportive management environment also plays a very important role in doing a project right and successful. Both the team and Upper management must be transparent to each other.
- Project manager should have frequent meetings if the project is in critical stage. Otherwise meetings should be done whenever required.
- Team must comprise of skilled team members and project manager should utilize the skills of people at the best. If team is successful then it should be given some appreciation or incentives to encourage them.

References

[1] Jack R Meredith, Samuel J. Mantel, Jr. "*Project Management: A Managerial Approach,*" 7th ed., John Wiley & Sons, Inc., 2009, pp. 196-197.

[2] William R. Duncan, *A Guide to the Project Management Body of Knowledge.* Newton Square, PA: PMI Standards Committee, 1996, pp. 41.