ITM 750: IT Project Management Group Project

Group: 13

Case: Green Computing Integration Management

Name	Contribution
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Part A

Part 1: Project Integration Management

Task 1: Green Computing Research

Essentially, Green Computing is the development and practice of using IT and computers in an approach that is eco-friendly. This includes the environmentally responsible use of hardware and software. Disposal of hardware in a way that does not negatively impact the environment is key. However, development of efficient software and IT systems aids in the reduction of hardware disposal and therefore also is a major key in Green Computing.

Data Center and Overall Energy Efficiency

Data centers produce large amounts of waste energy. To ensure the smooth operation of the sensitive equipment, the entire room is cooled down. Cooling of a data center can easily become very expensive. Mike Walker writes about three tips which involve the basic ideas behind data center climate control, reducing wasted hardware being the first. This means removing less used servers, using more efficient equipment, and server virtualization. Second, manage airflow; this includes racking servers in a way that will keep them cool and have them exhaust excess heat efficiently, and enclosing servers so the enclosure can be cooled as opposed to the whole room. Lastly, using newer, less climate-sensitive equipment. The newer servers will lead to less work for the humidifiers and dehumidifiers, thus saving energy.

The above three tips are methods guaranteed to be seen in IBM's data center in Boulder, Colorado which was expanded in 2008. The 115, 000 ft^2 green computing expansion, $86, 000, 000 in cost, was part of IBM's mission to double its capacity by 2010, without increasing their

energy use. The organization used water-cooling economizers (and other water-cooling technologies) to efficiently cool down air pulled in from outdoors. With this expansion, IBM secured a $480 million contract with the Hartford Financial Services Group.

Disposal of Electronic Waste and Recycling

The usage of electronics has been rising exponentially within the last decade. During this time, electronic waste is becoming a huge issue partially because a lot of these materials can be reused or recycled. An estimated 61 million personal computers became obsolete in 2004. Fortunately, electronic recycling has become a worldwide environmental concern. Here in Toronto, on the radio, on TV, and in the written media, we here about battery recycling. Many electronic stores even have an electronics disposal center.

"Electronic wastes contain numerous toxic substances, including lead, mercury, cadmium, copper, lithium and brominated flame retardants," which is why Staples Inc. teamed up with US Environmental Protection Agency's eCycling program. With the $46, 000 EPA grant for the project, several electronics companies, in association with Staples, are on board such as Apple, Dell, Epson America, HP, Lexmark, Panasonic, Sharp, Sony and Brother International Corp. According to a study done by Trucost, if gold recycling could be increased to 100% (hypothetically) the electronics industry would benefit from an estimated $100 million in cost savings as opposed to the $14.6 million in 2015

Telecommuting

The use of telecommuting is growing in the workplace in almost all industries. The ability to work from a remote location not only saves costs, but makes global expansion possible without breaking the bank. A survey in 2009 of 2, 000 Cisco employees found that 40% of employees are not even located in the same city is the manager they report to. The savings from telecommuting are tremendous! “Cisco's strategic consulting arm found that the company has saved $277 million by allowing employees to telework.” To put things into perspective, Paul Marrero of Caaspre Consulting, LLC mentions that, a room in your home does not consume anywhere close to as much an office building. The biggest cost of introducing telecommuting is the actual software which is a minimal cost to incur considering the savings.

Virtualization of Server Resources

IT companies, departments, and data centers likely have many servers that have dedicated purposes and are lightly-used. This means more hardware which means more costs. Today, those costs can be reduced using server virtualization. The idea here is multiple servers that are lightly used can be loaded on one (specially built) physical server.

VMWare, a software development company, reported that most non-virtualized servers are used only 8-15% of the time they are powered on and remain idle otherwise. Though idle, these servers continue to use up energy due the necessity to cool them, and to keep them running. This is one of multiple reasons British Telecom decided to use virtualization software. After cutting the related physical hardware in half, the company saved about two megawatts of power, which amounts to $2.4 million annual energy expense savings.

Thin Client Solutions

Thin clients are light-weight computers developed to be used for remote access work. These computers depend on a connection to a more powerful computer (usually a server) to perform tasks. Thin clients use less production materials, and use up to 90% less energy than a traditional computer, leading to a reduced environmental impact.

An article reported that in 2007 HP spent $214 million in the acquisition of Neoware, a thin client vendor. By 2009 HP added new thin client systems to its product line with prices ranging from $200-$500. Using these thin clients and HP's MultiSeat system, virtualized desktops are being deployed in schools as a huge cost saver.

Use of Open Source Software

Open source software is software for which the source code is made available to others to use, change, and distribute. In an article, Venkat Mangudi talks about the many 'green' benefits of open source software development. He mentions that global cooperation on technology development is vital to efficient development. Other eco-friendly benefits mentioned in the article include: the use of thin clients, reduced power consumption, and reduced operating costs for companies.

The apparel industry is using this aspect of green computing not only to use IT in an environmentally conscious way, but the actual open source software being used, *Eco Index*, aids the organizations involved in reducing their carbon footprint. The website measures land use, water use, waste created, energy use, etc. to give companies a better idea and benchmark on how

their operations are affecting the environment. Using this information they are able to reduce any negative impacts over time.

Development of new software to address green computing for internal use and potential sale to other organizations

In today's world new software to make green computing more practical is on the rise. IBM, one of the leaders in data center efficiency, has developed a software suite to address green computing by way of server virtualization. Unveiled at one of their annual Pulse events, IBM says this software suite can go through and virtualize many servers in a data center in less than an hour, which means each server will be virtualized in seconds.

Of course, owning huge data centers, IBM is using this software for its own use. The software is also available for purchase. In 2009, the cloud computing market was estimated at $17 billion. In 2013, it was estimated to be $45 billion. With this magnitude of market growth, IBM will without a doubt yield a respectable return on investment.

Task 2 Financial Section

Financial Analysis for Green Computing Research Project

Created by: Project Manager		**Date:**				
Note: Change the inputs, shown in green below (i.e. interest rate, number of years, costs, and benefits). Be sure to double-check the formulas based on the inputs.						
Discount rate	7.00%					
Assume the project is completed in Year 0			**Year**			
	0	1	2	3	**Total**	
Costs	500,000	2,000,000	600,000	600,000		
Discount factor	1.00	0.93	0.87	0.82		
Discounted costs	**500,000**	**1,860,000**	**522,000**	**492,000**	**3,374,000**	
Benefits	0	500,000	2,500,000	2,500,000		
Discount factor	1.00	0.93	0.87	0.82		
Discounted benefits	**0**	**465,000**	**2,175,000**	**2,050,000**	**4,690,000**	
Discounted benefits - costs	(500,000)	(1,395,000)	1,653,000	1,558,000	**1,316,000** ←	**NPV**
Cumulative benefits - costs	(500,000)	(1,895,000)	(242,000)	1,316,000		
				↑		
ROI →	**39%**			**Payback in Year 3**		

Task 3: Project Charter

Project Charter

Project Title: Green Computing Research Project
Project Start Date: November 25, 2016 **Projected Finish Date:** May 25, 2017
Budget Information: The budget assigned to this project is $500,000

Project Manager: Name, (647)-000-0000, ProjectManager@WeAreBig.com
Project Objectives: The objective of this project is to research and discover possible applications of green computing, including:

- Thin client solutions
- Telecommuting
- Data center and overall energy efficiency
- Disposal of electronic waste and recycling
- Virtualization of server resources
- Use of open source software
- Development of new software to address green computing for internal use and potential sale to other organization

Main Project Success Criteria: The main goal of this project is to provide an extensive report that includes a comprehensive financial analysis along with recommendations on which green computing technologies to implement. Official project requests forms for the recommended solutions will also be created.

Approach:

- There will be five people working full-time on this project for six months and call people in to help if needed
- Ben will be involved in selecting the project manager, and the project manager will help to select the rest of the team
- If possible the project team will be internal employees but external applications will also be reviewed.
- The team may consist of people located all across the world, therefore allowing them to work virtually on the project.
- Along with managing the project, the Project Manager will be responsible for the research, writing and editing for the project.
- The budget will also be used for expert consultants and book and article purchases as needed.

Roles and Responsibilities

Role	Name	Organization	Contact Information

Project Sponsor	Ben	We Are Big Inc. / CIO	Ben@WeAreBig.com
Program Manager	Ito	We Are Big Inc.	Ito@WeAreBig.com
Senior Technical Specialist	Matt	We Are Big Inc.	Matt@WeAreBig.com
Senior Systems Analyst	Teresa	We Are Big Inc.	Teresa@WeAreBig.com
Senior Consultant	James	We Are Big Inc.	James@WeAreBig.com
Researcher/Editor	Le	We Are Big Inc	Le@WeAreBig.com
Part-Time Editor/Consultant	Deb	We Are Big Inc.	Deb@WeAreBig.com

Sign-off: (Signatures of all above stakeholders. Can sign by their names in table above.)

Part 4: Change Control Process

The Change control process is an integral part of project integration management because in most cases the project needs some changes, whether it be small changes or large changes these changes need to be monitored and controlled in order to ensure that the project does not get

delayed or negatively affected. In order to manage changes within a project properly there are documents that need to be filled out and approved by managers to make them aware of the changes. The documents that we are going to use to manage changes are; change request forms, change log, and updating the project management plan with the changes completed. Although some change requests can be completed verbally with this project all of our change requests must be written in order to visually document the changes, so there are no discrepancies with the board of manager's information and the project manager's information. As well as these documents there is a select group of people within the company that can approve these change requests, these people are called the Change Control Board (CCB), important stakeholders within the company make up this CCB. The main job of the CCB is to either accept or reject changes to the project, if the change is large and will significantly change the project scope and execution date the CCB has reasonable grounds to reject the change request form. For our project it is required that the CCB has weekly meetings to revise and discuss the possible changes to the project, to ensure that these changes are not a surprise to any of the stakeholders and to ensure that they are addressed in a timely manner, not last minute. In our organization the individuals that would be included in the CCB are Natalie, Ito, as well as the ten senior managers, and Ben. Everyone in the CCB has significant stake in the project and are aware of the project scope and project management plan, therefore they are all fit to oversee changes that could occur in the project. Once the CCB approves the change requests then the project scope and project management plan can be updated as well as the WBS, and the project team can continue to work on the project. The change request forms can either be completed by the project manager, or the member of the project team that would like to request the change. If our team follows this project

change plan, the project changes are likely to go smoothly without delaying the execution date of the project.

Part 2: Project Scope Management

Task 1: Requirements Matrix for Project Name

Requirement No.	Name	Category	Source	Status

R01	Green Hardware Installation and Replacement	Software	Project Charter	In Progress
R02	Hardware Compatibility	Hardware	Project Charter and internal organizational hardware systems	In Progress
R03	Cloud computing Installation	Software	Project Charter	In Progress
R04	Internal and External Telecommunication	Software	Project Charter internal operating systems	In Progress
R05	Use of Virtual Internal Servers	Software	Project Charter	In Progress
R6	Use of Open Source Software	Software	Project Charter	In Progress

R7	Eliminate Electronic Waste	Software	Project Charter	In Progress
R8	Internal Software Quality Testing	Software	Project Charter	In Progress
R9	Training and Implementation	Managerial	Project Charter	In Progress
R10	Cross Organizational Implementation (sales)	Managerial	Project Charter	In Progress

Task 2: Scope Statement

Project Title: Green Computing **Date:** **Prepared by:**

Project Justification:
The purpose of this project is to promote green computing within the organization reduce the amount of energy wasted. By using cloud computing and replacing existing technologies with new and improved eco-friendly technologies, we can reduce the amount of wasted energy. With a safe disposal of hardware and electronic waste we can also use our energy efficiently. By using open source networks we can improve the telecommunications within the organization and make it easier and more efficient to share data. By implementing green technologies and methodologies, we can reduce the wastage of energy and improve our organizational image.

Product Characteristics and Requirements:

1. Improving data center and overall energy efficiency
2. Efficient disposal of electronic waste
3. Advanced telecommuting
4. Virtualization of server resources
5. Thin client solutions
6. Use of open source software
7. Creation of new and improved software which can be used internally and used as a positional point of sale with other companies

Summary of Project Deliverables
Project management-related deliverables: business case, charter, team contract, scope statement, WBS, schedule, cost baseline, status reports, final project presentation, final project report, lessons-learned report, and any other documents required to manage the project.
Product-related deliverables: research reports, design documents, software code, hardware, etc.

1. Cloud Computing Server (software)

Eco-Friendly Technologies (hardware)

New Organizational Policies

1. Electronic Recycling Process
2. Improved client relations

3. Stronger, more efficient database server
Project Success Criteria: The success of the project will be determined by factors such as time management, communication, resource allocation and effective budgeting. From a literal perspective, by the effective addition of green computing, it should enhance the and naturalize the company in terms of having a eco-friendly image.

Part 3: Work Breakdown Structure (WBS)

1.0 Initiating
- 1.1 Stakeholder Identification
- 1.2 Stakeholder Register Completed
- 1.3 Research Green Computing

1.3.1 Research Organization
1.3.2 Investigate Return On Investment
1.4 Prepare Business Case
1.4.1 Prepare Financial Business Case
1.5 Create Project Charter
1.6 Project Charter Completed
1.7 Kickoff Meeting
1.8 Kickoff Meeting Completed
1.9 Prepare Change Request Form
2.0 Planning
2.1 Project Schedule
2.2 Create Requirement Traceability Matrix
2.3 Develop Scope Statement
2.3.1 Project Justification
2.3.2 Product Characteristics and Requirements
2.3.3 Summary of Project Deliverables
2.3.4 Project Success Criteria
2.4 Develop Work Breakdown Structure
2.4.1 Initiating
2.4.2 Planning
2.4.3 Executing
2.4.4 Monitoring and Controlling
2.4.5 Closing
2.5 Create Gantt Chart
2.6 Identify Critical Path
2.7 Create Emergency Plan
3.0 Executing
3.1 Research Reports
3.1.1 Data Center and Overall Energy Efficiency
3.1.2 Identify Current Data Center and its Energy Efficiency
3.1.3 Search for Possible Solutions.
3.2 Disposal of Electronic Waste and Recycling
3.2.1 Identify the Pros and Cons
3.2.2 Identify Impact on Employees
3.2.3 Identify Impact on Environment
3.2.4 Identify Change in Income of the Business
3.3 Telecommuting
3.3.1 Identify the Pros and Cons
3.3.2 Identify Impact on Employees
3.3.3 Identify Impact on Environment
3.3.4 Identify Change in Income of the Business.
3.4 Virtualization of Server Resources
3.4.1 Identify Benefits and Costs
3.4.2 Flexibility of Virtualization
3.4.3 Lower Costs
3.5 Thin Client Solutions

- 3.6 Use of Open Source Software
- 3.7 Development of New Software
- 3.8 Develop Project Ideas
  - 3.8.1 Develop 20 Project Ideas
  - 3.8.2 Recommend Top 4 Project Ideas
- 3.9 Research Reports Completed
- 3.10 Develop Project Ideas Completed

4.0 Monitoring and Controlling
- 4.1 Actual Hours Tracking
- 4.2 Cost Baseline
- 4.3 Project Documents Updates
- 4.4 Project Report 1
- 4.5 Project Report 2
- 4.6 Team Review Meetings
  - 4.6.1 Team Review Meeting
  - 4.6.2 Team Review Meeting
  - 4.6.3 Team Review Meeting
  - 4.6.4 Team Review Meeting
  - 4.6.5 Team Review Meeting
  - 4.6.6 Team Review Meeting
  - 4.6.7 Team Review Meeting
  - 4.6.8 Team Review Meeting
  - 4.6.9 Team Review Meeting
  - 4.6.10 Team Review Meeting
  - 4.6.11 Team Review Meeting
  - 4.6.12 Team Review Meeting

5.0 Closing
- 5.1 Final Project Report
- 5.2 Final Project Presentation
- 5.3 Project Completed

Task 4: Gantt Chart

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
0		Research on Green Computing	1 day	Fri 16-11-25	Fri 16-11-25	
1		**1 Initiating**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
2		1.1 Stakeholder identification				
3		1.2 Stakeholder register completed				
4		**1.3 Research Green Computing**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
5		1.3.1 Research organization				
6		1.3.2 Investigate return on investment				
7		**1.4 Prepare business case**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
8		1.4.1 Prepare financial business case				
9		1.5 Create project charter				
10		1.6 Project charter completed				
11		1.7 Kickoff meeting				
12		1.8 Kickoff meeting completed				
13		1.9 Prepare change request form				
14		**2 Planning**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
15		2.1 Project schedule				
16		2.2 Create requiremet traceability matrix				
17		**2.3 Develop scope statement**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
18		2.3.1 Project justification				
19		2.3.2 Product characteristics and requirements				
20		2.3.3 Summary of project deliverables				
21		2.3.4 Project success criteria				
22		**2.4 Develop work breakdown structure (WBS)**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	

Project: Research on Green Com
Date: Thu 16-11-24

Task, Split, Milestone, Summary, Project Summary, Inactive Task, Inactive Milestone, Inactive Summary, Manual Task, Duration-only, Manual Summary Rollup, Manual Summary, Start-only, Finish-only, External Tasks, External Milestone, Deadline, Progress, Manual Progress

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ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
23		2.4.1 Initiating				
24		2.4.2 Planning				
25		2.4.3 Executing				
26		2.4.4 Monitoring and controlling				
27		2.4.5 Closing				
28		2.5 Create Gantt Chart				
29		2.6 Identify critical path				
30		2.7 Create emergency plan				
31		**3 Executing**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
32		**3.1 Research reports**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
33		3.1.1 Data center and overal energy efficiency				
34		3.1.2 Identify current data center and its efficiency				
35		3.1.3 Search for possible solutions				
36		**3.2 Disposal of electronic waste and recycling**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
37		3.2.1 Identify the pros and cons				
38		3.2.2 Identify impact on employees				
39		3.2.3 Identify impact on environment				
40		3.2.4 Identify change in income of the business				
41		**3.3 Telecommuting**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
42		3.3.1 Identify the pros and cons				
43		3.3.2 Identify impact on employees				
44		3.3.3 Identify impact on environment				
45		3.3.4 Identify change in income of the business				

Project: Research on Green Com
Date: Thu 16-11-24

Task, Split, Milestone, Summary, Project Summary, Inactive Task, Inactive Milestone, Inactive Summary, Manual Task, Duration-only, Manual Summary Rollup, Manual Summary, Start-only, Finish-only, External Tasks, External Milestone, Deadline, Progress, Manual Progress

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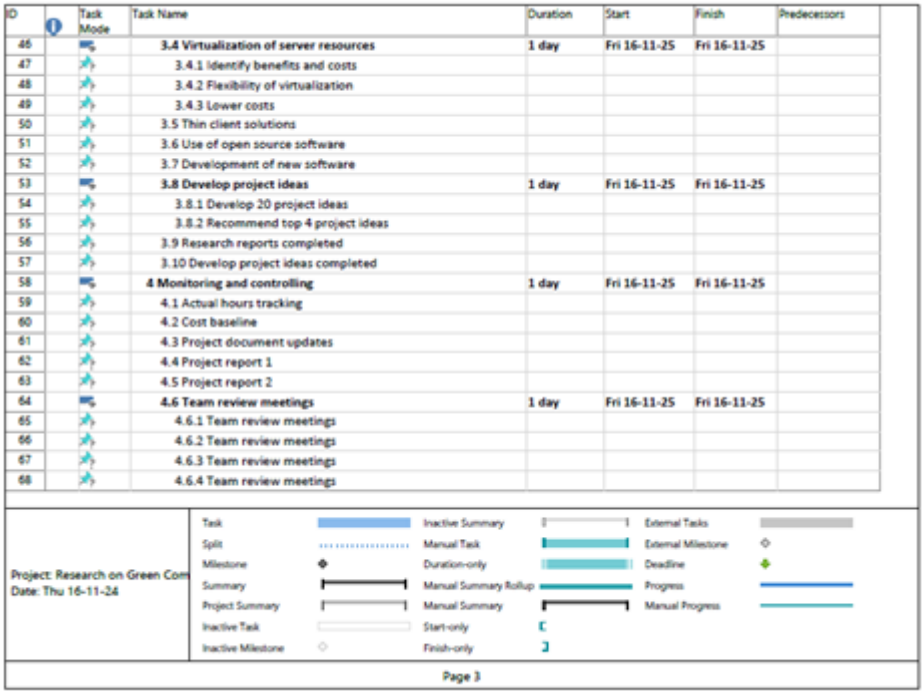

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
46		**3.4 Virtualization of server resources**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
47		3.4.1 Identify benefits and costs				
48		3.4.2 Flexibility of virtualization				
49		3.4.3 Lower costs				
50		3.5 Thin client solutions				
51		3.6 Use of open source software				
52		3.7 Development of new software				
53		**3.8 Develop project ideas**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
54		3.8.1 Develop 20 project ideas				
55		3.8.2 Recommend top 4 project ideas				
56		3.9 Research reports completed				
57		3.10 Develop project ideas completed				
58		**4 Monitoring and controlling**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
59		4.1 Actual hours tracking				
60		4.2 Cost baseline				
61		4.3 Project document updates				
62		4.4 Project report 1				
63		4.5 Project report 2				
64		**4.6 Team review meetings**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
65		4.6.1 Team review meetings				
66		4.6.2 Team review meetings				
67		4.6.3 Team review meetings				
68		4.6.4 Team review meetings				

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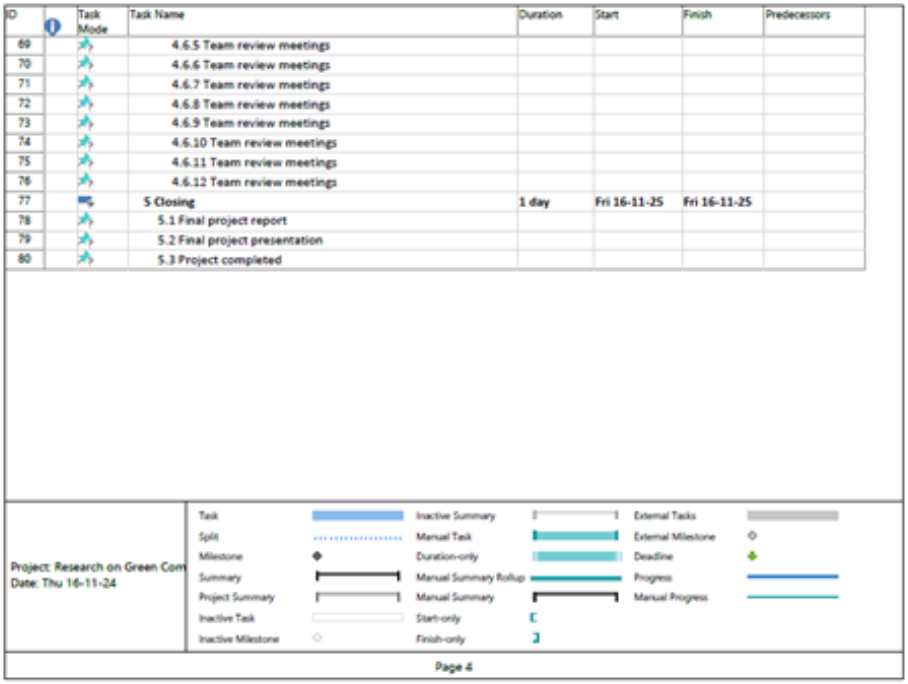

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
69		4.6.5 Team review meetings				
70		4.6.6 Team review meetings				
71		4.6.7 Team review meetings				
72		4.6.8 Team review meetings				
73		4.6.9 Team review meetings				
74		4.6.10 Team review meetings				
75		4.6.11 Team review meetings				
76		4.6.12 Team review meetings				
77		**5 Closing**	**1 day**	**Fri 16-11-25**	**Fri 16-11-25**	
78		5.1 Final project report				
79		5.2 Final project presentation				
80		5.3 Project completed				

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Part B

Part 3: Project Time Management

Task 1: Activities to estimate resources and durations

One of the activities which can be implemented to help estimate resources and durations is critical path. A critical path represents the series of activities necessary for the minimum time needed to fulfil an operation. The appropriate tasks and durations are shown in the network diagram. Like the Gantt Chart, the representation of the project in a network diagram illustrates the main tasks. Each task can be collapsed to show the inner tasks within the whole task or made visible. Link tasks are also made visible to easily represent which tasks depend on another task. Red arrows show the ascending steps the project follows from one task to the other. The blue arrow represents which tasks must be completed for the new task to start. The critical path concept helps determine the relationships amongst essential tasks. Evidently, the critical path helps improve project scheduling. If work proceeds and more information is made available towards the project, the critical path adjusts to represent the overall workflow of the project. By observing the critical path for the project schedule, it is easy to determine which task affects the target completion date of the project. Analyzing the report through the representation of the network diagram helps determine any slack or float the project holds. Slack and float represents the amount of time an activity can be delayed. Noticing this problem can help fulfil the project by the exact or even earlier finish date.

Another activity that can be put in use to help estimate resources and duration is the PERT technique. The Program Evaluation and Review Technique (PERT) is used to estimate project duration. PERT applies the critical path method (CPM) to a weighted average duration estimate. Critical Path Method implies specific, discrete estimation whereas PERT utilizes probabilistic time estimates. This involves duration estimates based on using hopeful, more likely, and pessimistic estimates of activity durations. PERT calculates a weighted average to

estimate duration. The benefit of using PERT to estimate activity duration, takes into account the risk of uncertainty in the individual activity for the total duration of the project.

Analogous estimates can also help estimate resource and duration. Analogous estimates can be referred as top-down estimates. This estimate acquires the cost of previous similar projects as the base of estimating the cost of the current project, along with the duration of that project. This technique requires expert judgment and is cost friendly. The accuracy of Analogous estimation contributes great deal towards the degree of similarity between previous and current projects.

Task 2: Estimation of task duration (Gantt Chart) & Network Diagram

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
0		Research on Green Computing	181 days	Fri 16-11-25	Thu 17-05-25	
1		**1 Initiating**	**41 days**	**Fri 16-11-25**	**Fri 17-01-20**	
2		1.1 Stakeholder identification	3 wks	Fri 16-11-25	Thu 16-12-15	
3		1.2 Stakeholder register completed	0 days	Fri 16-11-25	Fri 16-11-25	
4		**1.3 Research Green Computing**	**8 days**	**Fri 16-11-25**	**Tue 16-12-06**	
5		1.3.1 Research organization	1 wk	Fri 16-11-25	Thu 16-12-01	
6		1.3.2 Investigate return on investment	3 days	Fri 16-11-25	Tue 16-11-29	
7		**1.4 Prepare business case**	**15 days**	**Fri 16-11-25**	**Thu 16-12-15**	
8		1.4.1 Prepare financial business case	2 wks	Fri 16-11-25	Thu 16-12-08	
9		1.5 Create project charter	3 days	Fri 16-11-25	Tue 16-11-29	
10		1.6 Project charter completed	0 days	Fri 16-11-25	Fri 16-11-25	
11		1.7 Kickoff meeting	3 days	Fri 16-11-25	Tue 16-11-29	
12		1.8 Kickoff meeting completed	0 days	Fri 16-11-25	Fri 16-11-25	
13		1.9 Prepare change request form	2 days	Fri 16-11-25	Mon 16-11-28	
14		**2 Planning**	**21 days**	**Wed 17-01-25**	**Wed 17-02-22**	
15		2.1 Project schedule	5 days	Wed 17-01-25	Tue 17-01-31	
16		2.2 Create requiremet traceability matrix	3 days	Wed 17-01-25	Fri 17-01-27	
17		**2.3 Develop scope statement**	**3 days**	**Wed 17-01-25**	**Fri 17-01-27**	
18		2.3.1 Project justification	3 days	Wed 17-01-25	Fri 17-01-27	
19		2.3.2 Product characteristics and requirements	3 days	Wed 17-01-25	Fri 17-01-27	
20		2.3.3 Summary of project deliverables	3 days	Wed 17-01-25	Fri 17-01-27	
21		2.3.4 Project success criteria	2 days	Wed 17-01-25	Thu 17-01-26	
22		**2.4 Develop work breakdown structure (WBS)**	**13 days**	**Wed 17-01-25**	**Fri 17-02-10**	

Project: Research on Green Com
Date: Fri 16-11-25

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

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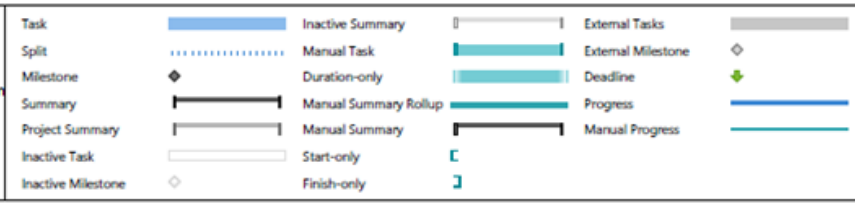
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
23		2.4.1 Initiating	1 wk	Wed 17-01-25	Tue 17-01-31	
24		2.4.2 Planning	1 wk	Wed 17-01-25	Tue 17-01-31	
25		2.4.3 Executing	2 wks	Wed 17-01-25	Tue 17-02-07	
26		2.4.4 Monitoring and controlling	1 wk	Wed 17-01-25	Tue 17-01-31	
27		2.4.5 Closing	1 wk	Wed 17-01-25	Tue 17-01-31	
28		2.5 Create Gantt Chart	1 day	Wed 17-01-25	Wed 17-01-25	
29		2.6 Identify critical path	1 day	Wed 17-01-25	Wed 17-01-25	
30		2.7 Create emergency plan	2 days	Wed 17-01-25	Thu 17-01-26	
31		**3 Executing**	**30 days**	**Fri 17-02-24**	**Thu 17-04-06**	
32		**3.1 Research reports**	**2 days**	**Fri 17-02-24**	**Mon 17-02-27**	
33		3.1.1 Data center and overal energy efficiency	2 days	Fri 17-02-24	Mon 17-02-27	
34		3.1.2 Identify current data center and its efficiency	2 days	Fri 17-02-24	Mon 17-02-27	
35		3.1.3 Search for possible solutions	2 days	Fri 17-02-24	Mon 17-02-27	
36		**3.2 Disposal of electronic waste and recycling**	**2 days**	**Fri 17-02-24**	**Mon 17-02-27**	
37		3.2.1 Identify the pros and cons	2 days	Fri 17-02-24	Mon 17-02-27	
38		3.2.2 Identify impact on employees	2 days	Fri 17-02-24	Mon 17-02-27	
39		3.2.3 Identify impact on environment	2 days	Fri 17-02-24	Mon 17-02-27	
40		3.2.4 Identify change in income of the business	2 days	Fri 17-02-24	Mon 17-02-27	
41		**3.3 Telecommuting**	**2 days**	**Fri 17-02-24**	**Mon 17-02-27**	
42		3.3.1 Identify the pros and cons	2 days	Fri 17-02-24	Mon 17-02-27	
43		3.3.2 Identify impact on employees	2 days	Fri 17-02-24	Mon 17-02-27	
44		3.3.3 Identify impact on environment	2 days	Fri 17-02-24	Mon 17-02-27	
45		3.3.4 Identify change in income of the business	2 days	Fri 17-02-24	Mon 17-02-27	

Project: Research on Green Com
Date: Fri 16-11-25



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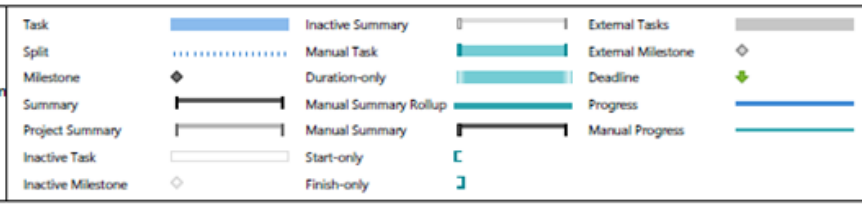
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
46		**3.4 Virtualization of server resources**	**3 days**	**Fri 17-02-24**	**Tue 17-02-28**	
47		3.4.1 Identify benefits and costs	3 days	Fri 17-02-24	Tue 17-02-28	
48		3.4.2 Flexibility of virtualization	3 days	Fri 17-02-24	Tue 17-02-28	
49		3.4.3 Lower costs	2 days	Fri 17-02-24	Mon 17-02-27	
50		3.5 Thin client solutions	2 days	Fri 17-02-24	Mon 17-02-27	
51		3.6 Use of open source software	1 day	Fri 17-02-24	Fri 17-02-24	
52		3.7 Development of new software	1 day	Fri 17-02-24	Fri 17-02-24	
53		**3.8 Develop project ideas**	**2 days**	**Fri 17-02-24**	**Mon 17-02-27**	
54		3.8.1 Develop 20 project ideas	2 days	Fri 17-02-24	Mon 17-02-27	
55		3.8.2 Recommend top 4 project ideas	1 day	Fri 17-02-24	Fri 17-02-24	
56		3.9 Research reports completed	0 days	Fri 17-02-24	Fri 17-02-24	
57		3.10 Develop project ideas completed	0 days	Fri 17-02-24	Fri 17-02-24	
58		**4 Monitoring and controlling**	**31 days**	**Tue 17-04-25**	**Tue 17-06-06**	
59		4.1 Actual hours tracking	2 days	Tue 17-04-25	Wed 17-04-26	
60		4.2 Cost baseline	2 days	Tue 17-04-25	Wed 17-04-26	
61		4.3 Project document updates	1 day	Tue 17-04-25	Tue 17-04-25	
62		4.4 Project report 1	0 days	Tue 17-04-25	Tue 17-04-25	
63		4.5 Project report 2	0 days	Tue 17-04-25	Tue 17-04-25	
64		**4.6 Team review meetings**	**9 days**	**Tue 17-04-25**	**Fri 17-05-05**	
65		4.6.1 Team review meetings	3 days	Tue 17-04-25	Thu 17-04-27	
66		4.6.2 Team review meetings	3 days	Tue 17-04-25	Thu 17-04-27	
67		4.6.3 Team review meetings	2 days	Tue 17-04-25	Wed 17-04-26	
68		4.6.4 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	

Project: Research on Green Com
Date: Fri 16-11-25



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
69		4.6.5 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
70		4.6.6 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
71		4.6.7 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
72		4.6.8 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
73		4.6.9 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
74		4.6.10 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
75		4.6.11 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
76		4.6.12 Team review meetings	1 day	Tue 17-04-25	Tue 17-04-25	
77		**5 Closing**	**6 days**	**Thu 17-05-18**	**Thu 17-05-25**	
78		5.1 Final project report	7 days	Fri 17-05-12	Mon 17-05-22	
79		5.2 Final project presentation	6 days	Thu 17-05-18	Thu 17-05-25	
80		5.3 Project completed	0 days	Mon 17-05-22	Mon 17-05-22	

Project: Research on Green Com
Date: Fri 16-11-25

Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

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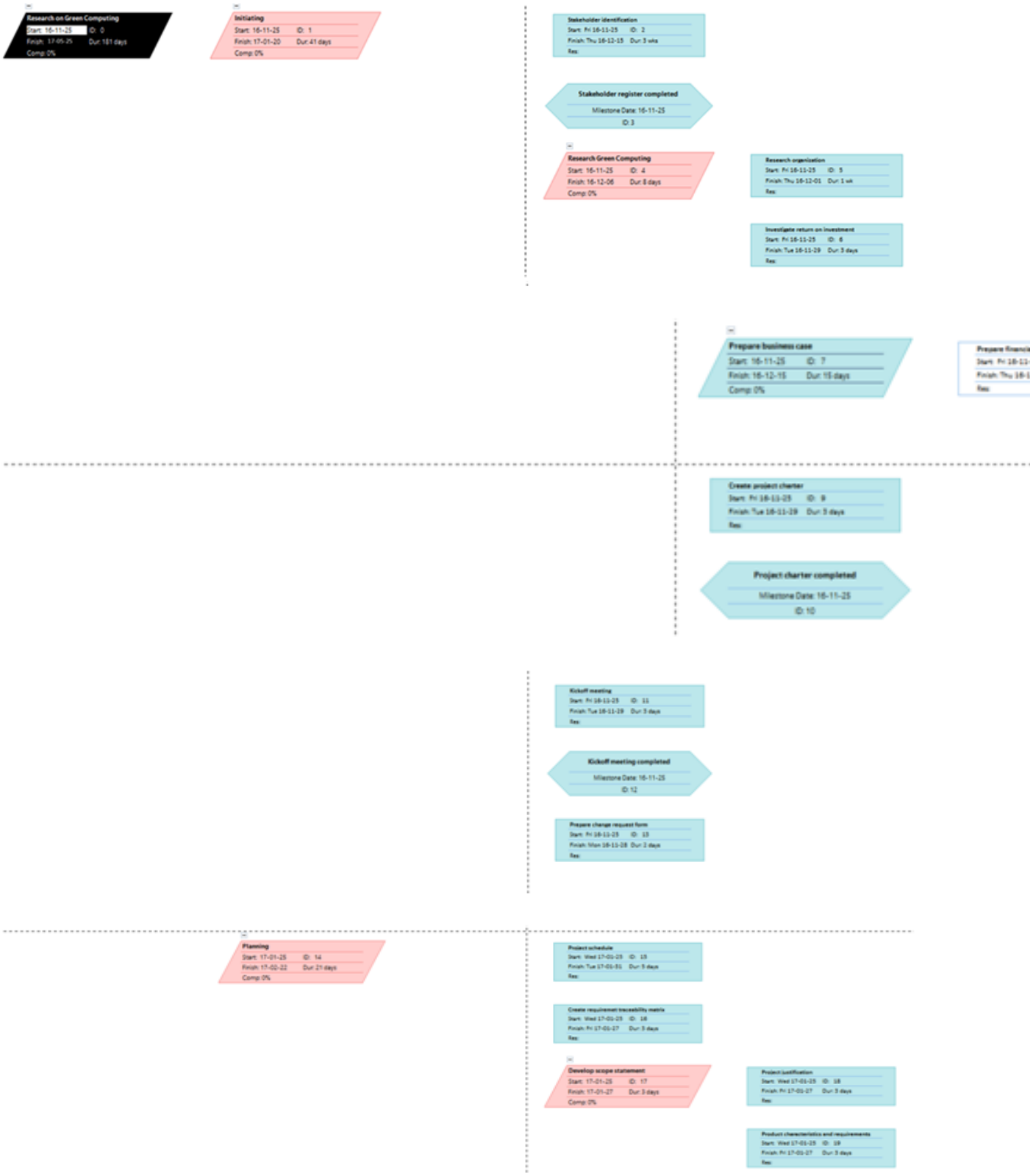
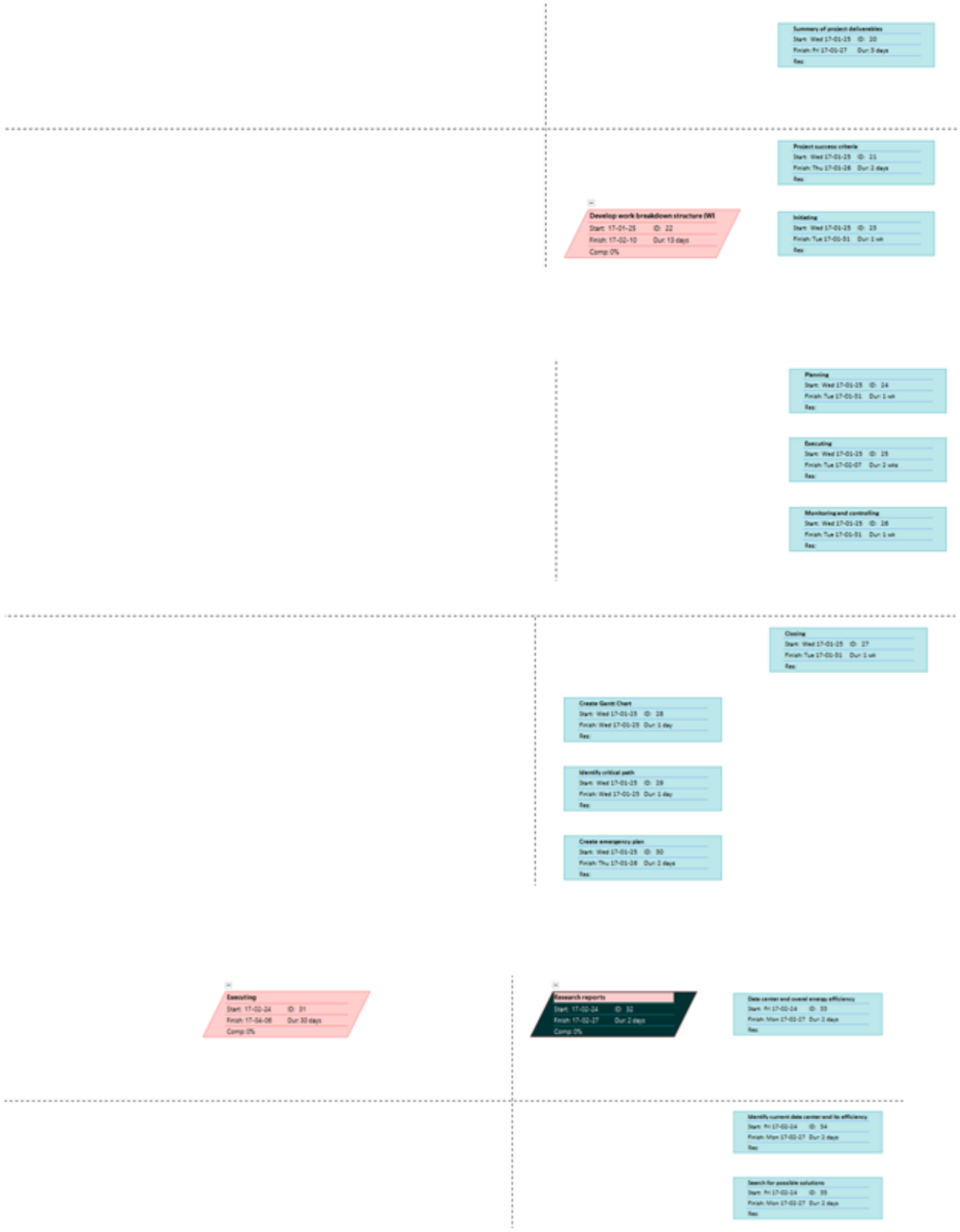
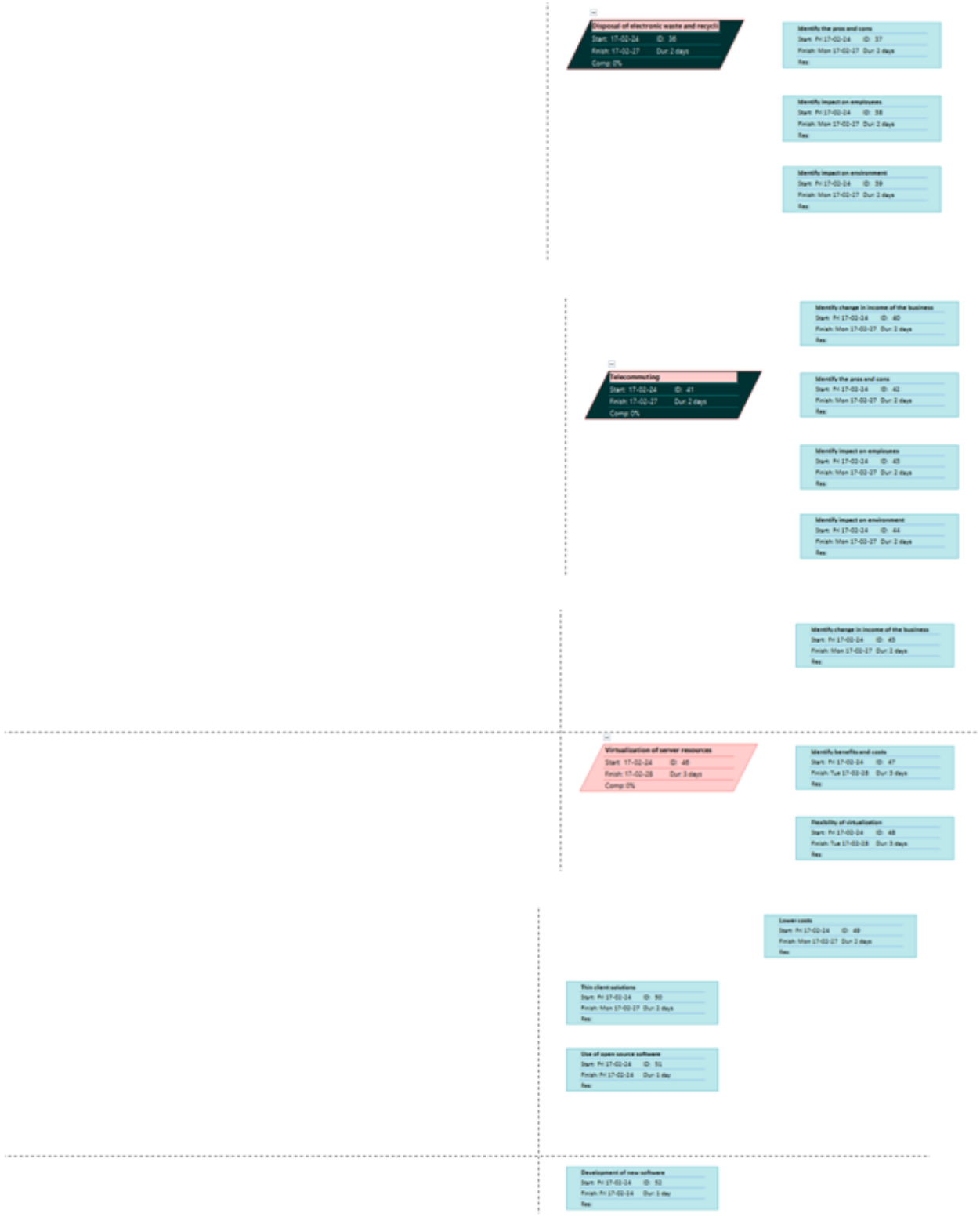
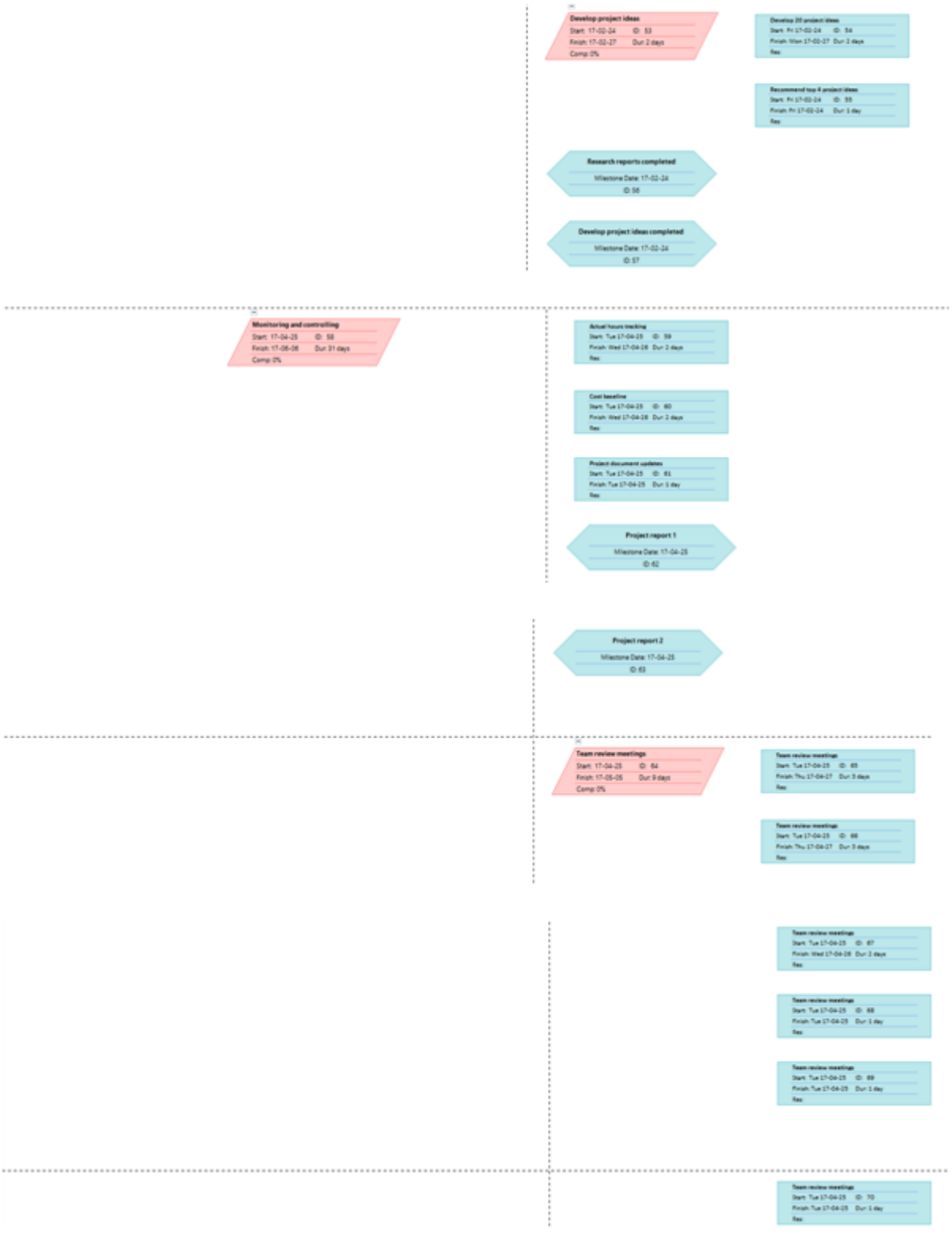
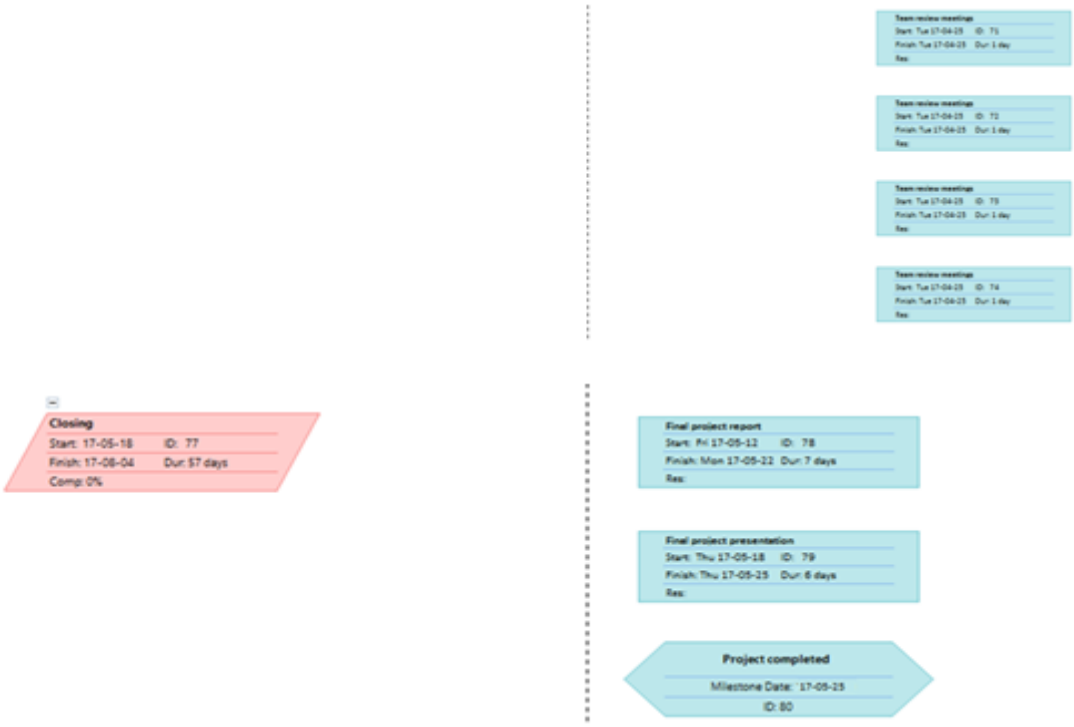

Research on Green Computing
Start: 16-11-25 ID: 0
Finish: 17-05-25 Dur: 181 days
Comp: 0%
Initiating
Start: 16-11-25 ID: 1
Finish: 17-01-20 Dur: 41 days
Comp: 0%
Stakeholder identification
Start: Fri 16-11-25 ID: 2
Finish: Thu 16-12-15 Dur: 3 wks
Res:
Stakeholder register completed
Milestone Date: 16-11-25
ID: 3
Research Green Computing
Start: 16-11-25 ID: 4
Finish: 16-12-06 Dur: 8 days
Comp: 0%
Research organization
Start: Fri 16-11-25 ID: 5
Finish: Thu 16-12-01 Dur: 1 wk
Res:
Investigate return on investment
Start: Fri 16-11-25 ID: 6
Finish: Tue 16-11-29 Dur: 3 days
Res:
Prepare business case
Start: 16-11-25 ID: 7
Finish: 16-12-15 Dur: 15 days
Comp: 0%
Create project charter
Start: Fri 16-11-25 ID: 9
Finish: Tue 16-11-29 Dur: 3 days
Res:
Project charter completed
Milestone Date: 16-11-25
ID: 10
Kickoff meeting
Start: Fri 16-11-25 ID: 11
Finish: Tue 16-11-29 Dur: 3 days
Res:
Kickoff meeting completed
Milestone Date: 16-11-25
ID: 12
Prepare change request form
Start: Fri 16-11-25 ID: 13
Finish: Mon 16-11-28 Dur: 2 days
Res:
Planning
Start: 17-01-25 ID: 14
Finish: 17-02-22 Dur: 21 days
Comp: 0%
Project schedule
Start: Wed 17-01-25 ID: 15
Finish: Tue 17-01-31 Dur: 5 days
Res:
Create requirement traceability matrix
Start: Wed 17-01-25 ID: 16
Finish: Fri 17-01-27 Dur: 3 days
Res:
Develop scope statement
Start: 17-01-25 ID: 17
Finish: 17-01-27 Dur: 3 days
Comp: 0%
Project justification
Start: Wed 17-01-25 ID: 18
Finish: Fri 17-01-27 Dur: 3 days
Res:
Product characteristics and requirements
Start: Wed 17-01-25 ID: 19
Finish: Fri 17-01-27 Dur: 3 days
Res:


Summary of project deliverables
Start: Wed 17-01-25 ID: 20
Finish: Fri 17-01-27 Dur: 3 days
Res:
Project success criteria
Start: Wed 17-01-25 ID: 21
Finish: Thu 17-01-26 Dur: 2 days
Res:
Develop work breakdown structure (WI
Start: 17-01-25 ID: 22
Finish: 17-02-10 Dur: 13 days
Comp: 0%
Initiating
Start: Wed 17-01-25 ID: 23
Finish: Tue 17-01-31 Dur: 1 wk
Res:
Planning
Start: Wed 17-01-25 ID: 24
Finish: Tue 17-01-31 Dur: 1 wk
Res:
Executing
Start: Wed 17-01-25 ID: 25
Finish: Tue 17-02-07 Dur: 2 wks
Res:
Monitoring and controlling
Start: Wed 17-01-25 ID: 26
Finish: Tue 17-01-31 Dur: 1 wk
Res:
Closing
Start: Wed 17-01-25 ID: 27
Finish: Tue 17-01-31 Dur: 1 wk
Res:
Create Gantt Chart
Start: Wed 17-01-25 ID: 28
Finish: Wed 17-01-25 Dur: 1 day
Res:
Identify critical path
Start: Wed 17-01-25 ID: 29
Finish: Wed 17-01-25 Dur: 1 day
Res:
Create emergency plan
Start: Wed 17-01-25 ID: 30
Finish: Thu 17-01-26 Dur: 2 days
Res:
Executing
Start: 17-02-24 ID: 31
Finish: 17-04-06 Dur: 30 days
Comp: 0%
Research reports
Start: 17-02-24 ID: 32
Finish: 17-02-27 Dur: 2 days
Comp: 0%
Data center and overal energy efficiency
Start: Fri 17-02-24 ID: 33
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify current data center and its efficiency
Start: Fri 17-02-24 ID: 34
Finish: Mon 17-02-27 Dur: 2 days
Res:
Search for possible solutions
Start: Fri 17-02-24 ID: 35
Finish: Mon 17-02-27 Dur: 2 days
Res:


Disposal of electronic waste and recycli
Start: 17-02-24 ID: 36
Finish: 17-02-27 Dur: 2 days
Comp: 0%
Identify the pros and cons
Start: Fri 17-02-24 ID: 37
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify impact on employees
Start: Fri 17-02-24 ID: 38
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify impact on environment
Start: Fri 17-02-24 ID: 39
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify change in income of the business
Start: Fri 17-02-24 ID: 40
Finish: Mon 17-02-27 Dur: 2 days
Res:
Telecommuting
Start: 17-02-24 ID: 41
Finish: 17-02-27 Dur: 2 days
Comp: 0%
Identify the pros and cons
Start: Fri 17-02-24 ID: 42
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify impact on employees
Start: Fri 17-02-24 ID: 43
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify impact on environment
Start: Fri 17-02-24 ID: 44
Finish: Mon 17-02-27 Dur: 2 days
Res:
Identify change in income of the business
Start: Fri 17-02-24 ID: 45
Finish: Mon 17-02-27 Dur: 2 days
Res:
Virtualization of server resources
Start: 17-02-24 ID: 46
Finish: 17-02-28 Dur: 3 days
Comp: 0%
Identify benefits and costs
Start: Fri 17-02-24 ID: 47
Finish: Tue 17-02-28 Dur: 3 days
Res:
Flexibility of virtualization
Start: Fri 17-02-24 ID: 48
Finish: Tue 17-02-28 Dur: 3 days
Res:
Lower costs
Start: Fri 17-02-24 ID: 49
Finish: Mon 17-02-27 Dur: 2 days
Res:
Thin client solutions
Start: Fri 17-02-24 ID: 50
Finish: Mon 17-02-27 Dur: 2 days
Res:
Use of open source software
Start: Fri 17-02-24 ID: 51
Finish: Fri 17-02-24 Dur: 1 day
Res:
Development of new software
Start: Fri 17-02-24 ID: 52
Finish: Fri 17-02-24 Dur: 1 day
Res:


Develop project ideas
Start: 17-02-24 ID: 53
Finish: 17-02-27 Dur: 2 days
Comp: 0%
Develop 20 project ideas
Start: Fri 17-02-24 ID: 54
Finish: Mon 17-02-27 Dur: 2 days
Res:
Recommend top 4 project ideas
Start: Fri 17-02-24 ID: 55
Finish: Fri 17-02-24 Dur: 1 day
Res:
Research reports completed
Milestone Date: 17-02-24
ID: 56
Develop project ideas completed
Milestone Date: 17-02-24
ID: 57
Monitoring and controlling
Start: 17-04-25 ID: 58
Finish: 17-06-06 Dur: 31 days
Comp: 0%
Actual hours tracking
Start: Tue 17-04-25 ID: 59
Finish: Wed 17-04-26 Dur: 2 days
Res:
Cost baseline
Start: Tue 17-04-25 ID: 60
Finish: Wed 17-04-26 Dur: 2 days
Res:
Project document updates
Start: Tue 17-04-25 ID: 61
Finish: Tue 17-04-25 Dur: 1 day
Res:
Project report 1
Milestone Date: 17-04-25
ID: 62
Project report 2
Milestone Date: 17-04-25
ID: 63
Team review meetings
Start: 17-04-25 ID: 64
Finish: 17-05-05 Dur: 9 days
Comp: 0%
Team review meetings
Start: Tue 17-04-25 ID: 65
Finish: Thu 17-04-27 Dur: 3 days
Res:
Team review meetings
Start: Tue 17-04-25 ID: 66
Finish: Thu 17-04-27 Dur: 3 days
Res:
Team review meetings
Start: Tue 17-04-25 ID: 67
Finish: Wed 17-04-26 Dur: 2 days
Res:
Team review meetings
Start: Tue 17-04-25 ID: 68
Finish: Tue 17-04-25 Dur: 1 day
Res:
Team review meetings
Start: Tue 17-04-25 ID: 69
Finish: Tue 17-04-25 Dur: 1 day
Res:
Team review meetings
Start: Tue 17-04-25 ID: 70
Finish: Tue 17-04-25 Dur: 1 day
Res:



Part 4*:* Project Cost Management

Task 1: Cost Estimate

WBS Items	#Units/Hrs.	Cost/Unit/Hr.	Subtotals	WBS Level 1 Totals	% Of Total
1. Initiating				$15,700	3.7%
1.1 Stakeholder identification	30	$100	$3,000		
1.2 Stakeholder register completed	5	$100	$500		
1.3 Research green computing	30	$90	$2,700		
1.4 Prepare business case	10	$100	$1,000		
1.5 Create project charter	8	$100	$800		
1.6 Kick-off meeting	9	$100	$900		
1.7 Prepare change request form	8	$100	$800		
1.8 Travel	1	$6,000	$6,000		
2. Planning				$14,100	3.3%
2.1 Project schedule	10	$100	$1,000		
2.2 Create requirement traceability matrix	15	$100	$1,500		
2.3 Develop scope statement	20	$100	$2,000		
2.4 Develop work breakdown structure	30	$100	$3,000		
2.5 Create Gantt chart	20	$80	$1,600		
2.6 Identify critical path	50	$80	$4,000		
2.7 Create emergency plan	10	$100	$1,000		
3. Executing				$231,300	54.7%
3.1 Research reports	300	$90	$27,000		
3.1.1 Data center and overall efficiency	500	$90	$45,000		
3.1.2 Disposal of electronic waste and recycling	100	$90	$9,000		

3.1.3 Telecommuting	100	$90	$9,000		
3.1.4 Virtualization of server resources	600	$90	$54,000		
3.1.5 Thin client solutions	205	$80	$16,400		
3.1.6 Use of open source software	205	$80	$16,400		
3.1.7 Development of new software	250	$200	$50,000		
3.2 Develop project ideas	50	$90	$4,500		
4. Monitoring and Controlling				$83,300	19.7%
4.1 Actual hours tracking	485	$100	$48,500		
4.2 Cost baseline	20	$90	$1,800		
4.3 Project documents updates	100	$90	$9,000		
4.4 Project report 1	90	$100	$9,000		
4.5 Project report 2	90	$100	$9,000		
4.6 Team review meetings	60	$100	$6,000		
5. Closing				$8,000	1.9%
5.1 Final project report	60	$100	$6,000		
5.2 Final project presentation	20	$100	$2,000		
6. Reserves (20%)			$70,480	$70,480	16.7%
Total Project Cost Estimate				$422,880	

Assumptions:

1. Total Cost < 500,000 (422,880 is Total Cost)
2. Total Internal Cost ~ 300,000 (296,400 is Total Internal Cost)
3. Time: 6 Months
4. Labour/ Hour
    a. Project Manager: $100
    b. Teresa, James, Le: $90
    c. Matt: $80
    d. External: $200
5. Hours
    a. Project Manager: 960 (160/Monthly)
    b. Teresa, James, Le: 1,800 (600 Each, 100/Monthly)

c. Matt: 480 (80/ Monthly)
d. External: 250 (~41.5/ Monthly)

Task 2: Cost Baseline

	Months						
WBS Items	1	2	3	4	5	6	**Totals**
1. Initiating							
1.1 Stakeholder identification	3,000						3,000
1.2 Stakeholder register completed	500						500
1.3 Research green computing	2,700						2,700
1.4 Prepare business case	1,000						1,000
1.5 Create project charter	800						800
1.6 Kick-off meeting	900						900
1.7 Prepare change request form	800						800
1.8 Travel	6,000						6,000
2. Planning							
2.1 Project schedule	800	200					1,000
2.2 Create requirement traceability matrix	1,200	300					1,500
2.3 Develop scope statement	1,800	200					2,000
2.4 Develop work breakdown structure	2,500	500					3,000
2.5 Create Gantt chart		1,600					1,600
2.6 Identify critical path		4,000					4,000
2.7 Create emergency plan		1,000					1,000
3. Executing							
3.1 Research reports		6,000	7,000	7,000	7,000		27,000
3.1.1 Data center and overall efficiency		5,000	8,000	20,000	12,000		45,000
3.1.2 Disposal of electronic waste and recycling		2,000	3,000	2,000	2,000		9,000
3.1.3 Telecommuting		2,000	3,000	2,000	2,000		9,000
3.1.4 Virtualization of server resources		10,800	10,800	10,800	10,800	10,800	54,000
3.1.5 Thin client solutions			3,000	8,000	4,000	1,400	16,400
3.1.6 Use of open source software			2,000	7,000	5,000	2,400	16,400
3.1.7 Development of new software		10,000	10,000	10,000	10,000	10,000	50,000
3.2 Develop project ideas					2,000	2,500	4,500
4. Monitoring and Controlling							
4.1 Actual hours tracking	5,000	6,000	9,000	9,000	9,000	10,500	48,500
4.2 Cost baseline	1,800						1,800
4.3 Project documents updates	1,000	1,000	1,000	1,000	3,000	2,000	9,000
4.4 Project report 1		3,000	4,000	2,000			9,000
4.5 Project report 2				3,000	3,000	3,000	9,000
4.6 Team review meetings	1,000	1,000	1,000	1,000	1,000	1,000	6,000
5. Closing							
5.1 Final project report						6,000	6,000
5.2 Final project presentation						2,000	2,000
6. Reserves (20%)		5,480	10,000	20,000	20,000	15,000	70,480
Totals	30,800	60,080	71,800	102,800	90,800	66,600	422,880

Task 3:

PV = $160,000 EV = $150,000 AC = $180,000 BAC = $500,000

Cost Variance: refers to the earned value subtract the actual cost. If variance is a negative integer, which simply means that the performing work costs more than the planned and estimated

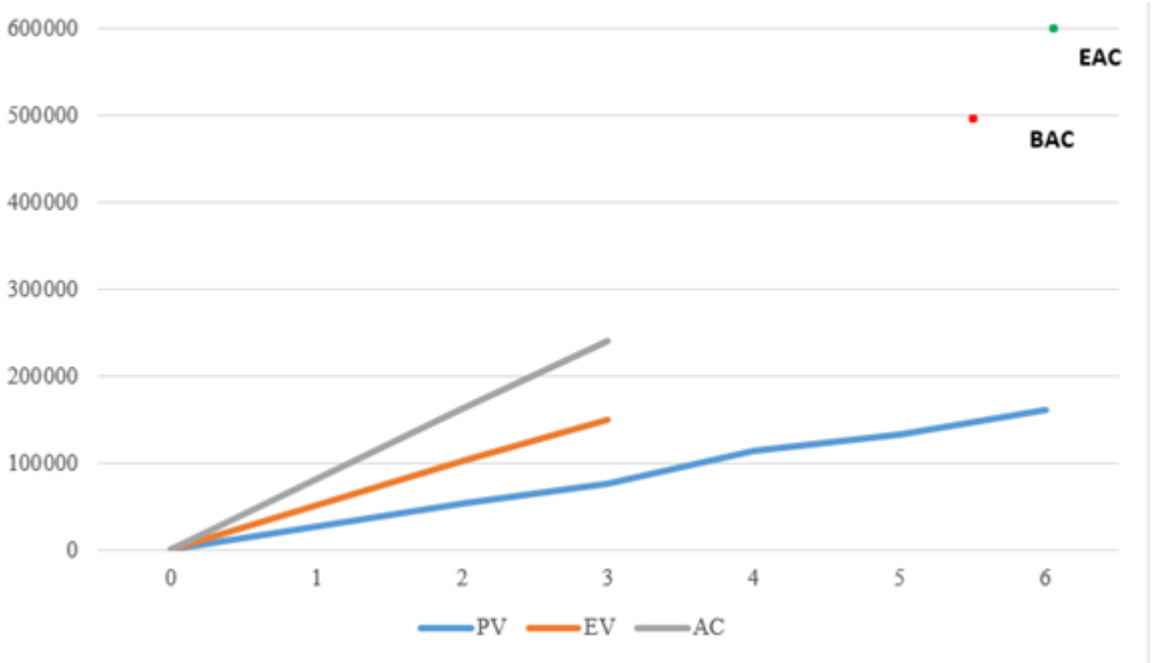
budget. If cost variance is a positive number then the performing work is less than planned. In terms of this business case earned value is less than actual cost, which means that the output results in a negative number. -30,000 is the cost variance which states that the work that is being performed is costing more than expected and is resulting in a negative impact.

Schedule Variance: refers to the earned value minus the planned value. A negative number for schedule variance simply means that it took much longer than planned to perform the work or task at hand. On the flip side, a positive number for schedule variance means that the task or work took less time than planned for. In terms of the green computing project, it is evident that after performing the calculations, the scheduling variance results to -10,000. This number says a lot about the project in terms of cost management. It dictates that the work or tasks being performed are costing the company as they are taking more time to perform than expected.

Cost Performance Index: is expressed as a ratio that represents and compares earned value with actual cost. It is calculated by dividing earned value by actual cost. If the outcome equals to 1 (100%), then the planned and actual costs are equal in terms of value. If the CPI is under 1 (100%) then it means that the project is over the estimated or planned budget. If the CPI is greater than 1 (100%) then it means that the project is under the projected budget. In terms of the green computing case, the CPI is 0.8333. This value is under 1 which mean that this project is over the estimated or planned budget.

Standard Performance Index: is represented by a ratio of earned value to planned value. If the result of the SPI calculation is 1 (100%) it means that the project is on schedule. If the ratio holds a value under 1 then it means that the project is behind in terms of schedule and of the SPI is greater than 1 it means that the project is ahead of schedule. In this scenario, we are given an earned value of 150,000 and a planned value of 160,000 which results in a SPI of 0.9375. This ratio states that the project is behind in schedule.

Estimate at Completion: refers to an estimated cost of completing a project based on performance to date. This calculation is expressed as a ratio and involves the budget at completion (BAC) and the cost performance index (CPI). In this case the BAC value is at 500,000 and the CPI, as stated earlier, is 0.8333. Therefore the EAC is at $600,024.001.



Based on this project of green computing, this graph indicates the longevity of the project. Using key information such as the earned value, planned value and actual cost, we can

predict the cost management in a three month period. This chart is very important as it displays how the project will perform in the months to come. If the project runs as expected, it would finish in 6 months' time and would be at a total cost of $500,000. However looking at the previous calculations of schedule variance and cost variance, it is evident that this project may take longer than expected. In addition by analyzing this chart, we can determine that the budget at completion is lower than the estimate at completion. This indicates that there is a $100,024 worth of over budgeting that was not planned for. This difference among BAC and EAC is a cost to the company as it is going to take much longer to complete the project.

After analyzing the 6 month cost timeline for the green computing project, it is evident that this project is not performing as planned. This project is running behind schedule and costing the company extra money which ultimately led to under budgeting. After computing cost variance and schedule variance calculations, it was clear that this project was in trouble. After both numbers being negative, it was evident that it took much longer than planned to perform tasks while the work being performed was costing more than the estimated budget. After analyzing the CPI and SPI, we can further determine that this project is both behind schedule and under budgeted for. By having both ratios under 1 (100%), it dictated that the project would extend beyond the 6 month period. EAC calculations are very important in this situation. It would represent the total estimation of cost at the projected completion date. Since the EAC is greater than the BAC (budget at completion), it suggests that this project is going to cost more than planned for. The EAC showed that the cost is slightly over $100,000 than planned for.

In terms of the perceived progress of this project, it is significantly important to communicate with top level management and project sponsors. Communication is key, as letting management know about your financial stance in the project is vital. Weather the project is failing or succeeding, it is important to notify managers and sponsors so that everyone is on the same page. In terms of this project, by reporting to upper level management, it can make everyone clear on the future of the project. Management can offer insights about the project and determine if they are satisfied with the progress or if they would like to terminate the project or take corrective action.

Task 4: Corrective Action

Several tasks that involve input from outside stakeholders have taken longer and cost more than originally planned, as well travel cost estimates were underestimated resulting in a smaller budget than actually needed.

There are a few things that can be done to begin to correct these problems; the first thing that should be done is to notify important stakeholders of the possible cost change, the second thing that can be done is to complete a change request form in order to ask for a change is the project cost baseline, as well an updated project management plan and cost estimate plan needs to be created in order to change the respective cost estimates.

In respect to the actual costs of the project itself a few things can be done to try to correct the inaccurate cost estimates, the project manager can perhaps try to ask the main project stakeholders for extra funding in order to cover the under allocated costs, stakeholders however

might be reluctant to provide extra funding on projects under short notice. Another thing that might help the project would be to fix the under allocation of costs by sacrificing costs on other areas of the project for example, if travelling costs and outside consultant costs are more than expected, there may be other areas of the project that can be cut down on. Another option might be to use internal consultants from the company, which would likely be cheaper than external consultants.

It is extremely important that these changes and cost estimates be updated. They should also be communicated efficiently to the upper management of the project and key stakeholders in order to keep them in the loop and keep them happy in regards to the project timing.

Part C

Part 5: Project Quality Management

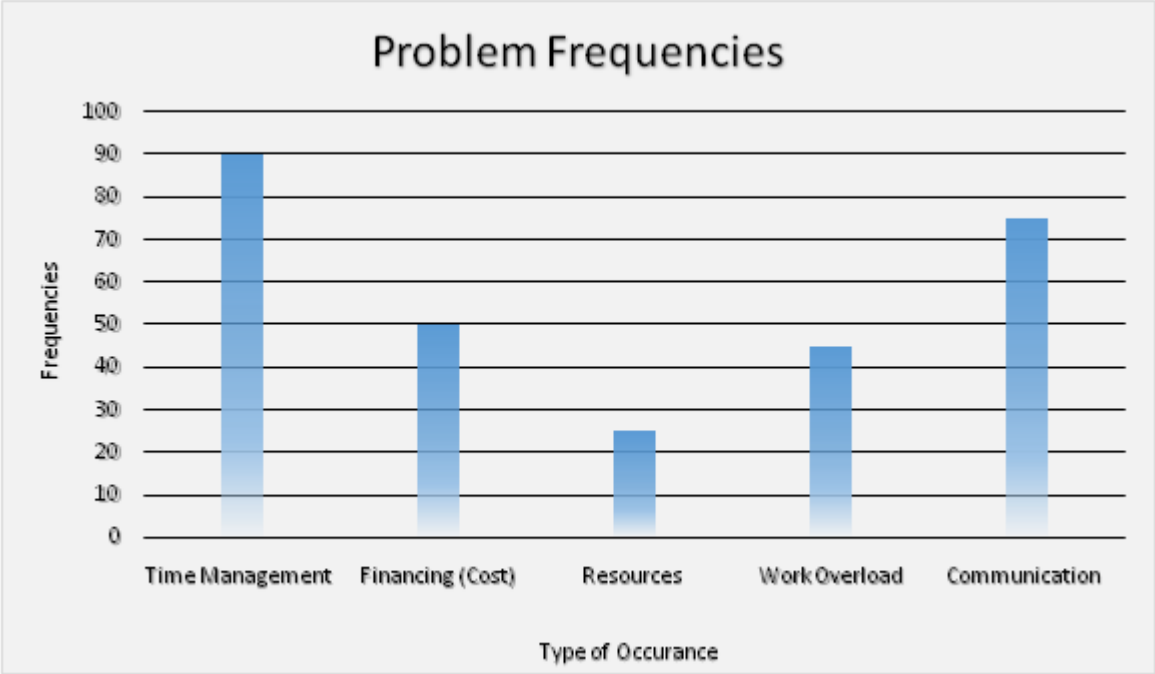
Task 1:

Requirements	Details
Green Computer Model Integration	The use of smaller computers for research on green technologies Integration of green recycling method where old technology is disposed or fabricated and used to make new products Integrate energy efficient policies within the organization in terms of usage Use technology only from companies who are recognized in producing green products Update all technology that is outdated with products from energy star The use of cloud computing software to store data

Efficient Project Planning and Goal Setting	Ensure that the project is following the scheduling procedure by constantly reviewing the project charter and the project integration management plan (P.I.M.P) Managing and allocating for slack or float time of any kind in the duration of the project, managing this aspect of the project will allow for completion on time Set reasonable goals for the project team to work towards
Effective Financial Analysis	Note that the budget for this project is $500,000 and ensure that we do not go over the budget Use EV, CV and SV calculations to ensure weather the project is falling within the lines of the planned budget Use CPI and SPI to determine whether the project is under and over budget
Resource Allocation	Ensuring the usage of energy efficient resources to implement the green computing project Recognized companies who are known for producing energy efficient products include: - Pulse Energy - Dell - Philips Electronics - Apple Conducting meetings, interviews and generating new innovations to enhance the usage and understanding of green computing The usage of cloud computing for data storage
Maintaining The Project Scope	Analyzing all the components of the project scope and ensuring each aspect is completed Data center and overall energy efficiency - Disposal of electronic waste and recycling - Telecommuting - Virtualization of server resources - Thin client solutions - Use of open source software - Development of new software to address green computing for internal use and potential sale to other organizations
Effective Communication and Reporting	Communication with program managers, sponsors and project managers is important

	Scheduling meeting based on progression of project (in person or over skype) Reporting and issues and financial problems to management an important part of communication

Task 2: Tools of Quality



When participating in a project, there are many problems and issues that can arise in terms of project management. Presented above is a Histogram, which is one of the seven tools for quality control. A Histogram represents a distribution of variables. In terms of the green computing project, a histogram can be used to measure the problems that can arise in terms of executing this project. From time management to communication, this histogram displays the frequency distribution of the probability of each problem occurring. In terms of the green

computing project, the most frequent problem that would occur and would cause the project to be delayed would be time management. Time management is a crucial aspect of project completion. If a task is completed beyond the due date it can have a setback on the entire project, thus causing a ripple effect. When projects are completed late or past the expected completion period, it can upset program managers and sponsors. As a result the project team and the manager can be looked down upon as it could affect their professional career.

A scenario that would make use of the histogram presented above would relate to project planning. In terms of the green computing project, suppose that the project manager is generating a schedule of when each task of the project is to be completed. He or she also needs to plan for and problems that may occur. By using the histogram efficiently, the project manager is able to focus on the most probable problem that may occur in a project and plan for it immediately. In terms of this project, it is evident that time management is the most significant aspect of this project. Since the histogram allows individuals to predict what project management issues are most likely to occur, they can have more of an efficient way of tackling and prioritizing issues executing the project.

Part 6: Project Human Resource Management

Task 1: Responsibility Assignment Matrix

WBS Activities ↓	OBS Units →	Project Sponsor	Program Manager	Project Management Team	Senior Tech Specialist	Senior Systems Analyst	Senior Consultant	Researcher/Editor	Part-Time Editor/Consultant
	1.1	R I	A I	R A					
	1.2	R I	A I	R A					
	1.3.1			R A	I	I		R A	C
	1.3.2			R A				R A	C
	1.4			C		R A			
	1.5					R A			
	1.6	I		I		R A			
	1.7	R I	I	R A	A	A	A	A	A
	1.8	R I	I	R A	A	A	A	A	A
	1.9					R A			
	2.1			R A	R A	R A	C		
	2.2			R A	R A	R A	C		
	2.3	C		R A	R A	R A	C		
	2.4			R A	R A	R A	C		
	2.5			R A	R A	R A	C		
	2.6			R A	R A	R A	C		
	2.7			R A	R A	R A	C		
	3.1			R A	I			R A	
	3.2			R A	I			R A	
	3.3			R A	I			R A	
	3.4			R A	I			R A	
	3.5			R A	I			R A	
	3.6			R A	I			R A	
	3.7			R A	I			R A	
	3.8			C	R A	R A		C	
	3.9			R A	I			R A	
	3.10			C	R A	R A		C	
	4.1			I		R A			
	4.2			I		R A			C
	4.3			I		R A		R A	
	4.4	I		A I	R		R	R A	R A
	4.5	I		A I	R		R	R A	R A
	4.6			R A	I	I	I	I	I
	5.1			R A				R A	R
	5.2			R A					
	5.3	A I	I	R A					

R: Responsible
A: Accountable
C: Consulted
I: Informed

Task 2: Human Resource Concerns

Effectively managing the project team is a vital factor to the success of a project. The members of the project team need to be well-motivated, and comfortable to achieve optimal performance. Creating an environment where optimal performance can be reached by the project

team is known is project human resource management. The project manager's role in HR management is to ensure the team members are at ease, interact peacefully with each other, and to resolve any conflicts or concerns that may arise. In this project, Matt, the Senior Technical Specialist introduced collaborative tools that will be used throughout the course of the project, which raised concerns for two members.

The first concern was raised by Senior Consultant James. James is having an issue accepting the use of wikis. The idea that others will be able to edit work that will be done by him makes James feel uncomfortable. One possible explanation for the emotions that James is feeling is one of the five dysfunctions of teams; absence of trust. James may feel that the team members' changes to his work have potential to affect the research reports negatively. The second concern was raised by Researcher and Editor Le. Her issue is with the use of webcam video during collaborative live chats. It is possible that Le is just shy, she may have security/privacy concerns with telecommuting from an out-of-office location, or she may still be uncomfortable with the rest of the team just to name a few explanations.

In both cases, these are important issues that cannot be dismissed and must be addressed appropriately. With regards to the two issues, team building activities may be beneficial. This could include ice breaker type activities to build rapport and trust between the members. Also, team building could involve allowing the team to spend sufficient time using Tuckman's team building stages. During these activities the project manager can observe and aim to pinpoint key issues that are leading to James and Le's discomfort regarding their respective concerns. Creating an opportunity to observe the team together will aid the project manager to address the

issues more thoroughly. Once observations have been made and the concerns have been discussed with the team members a strategy to solve these specific cases would be to use the smoothing (aka accommodating) conflict handling mode. For example, if one were emphasize the communication aspect of the live chat, and deemphasize the use of video, Le's issue could be resolved by allowing her to stick to audio, or text. The task importance is low; video is not an absolute necessity. Le will be directly working with these team members, therefore the relationship importance is high. As for James' concern, the task importance can be deemed high; collaboration on most parts of the project will aid in leading to more thorough results. The relationship importance here is also high, similar to Le's situation, due to the fact that these team members will be working directly together. Here, the confrontation mode can be utilized to create a "win/win" situation, in which James has to approve changes to the reports before they are finalized.

Part 7: Project Communication Management

Task 1: Wikis

Wikis are generally websites that allow users to collaborate their ideas and edit each other's work, it allows pretty much all authorized users to make edits and changes to each other's work. Many groups use wikis to simplify their projects in respect to all of the group members

being on the same page when it comes to work being done. There are many mixed reviews when it comes to wikis and groups that use them.

Some groups that use wikis like the open aspect of the platform, liking the fact that they can all see the work that is being done. Wikis also allow users to post information in a timely manner, not having to send it to individual people for editing.

However, many groups also dislike wikis very much due to the same fact that everyone can see their deliverables and can make changes to it. In order to use wikis in an effective manner, the group must have a high trust level within each member of it. Group member must trust that having other members editing their work would not "mess up" their work. Having others edit their work might cause work to be done poorly due to the fact that some members of the group may not have the same knowledge areas as others, this problem can cause severe backlash within the group if one feels someone has correctly contributed to their work. Many people do not like other contributing to their work because of the fact that having many people edit your work can cause it to stray from the direction that you intended it to go in. If many people with many different views contribute to the same piece of work, it is more likely that the piece of work might be skewed or misinterpreted, that is the main reason that many professionals do not like the use of wikis for important projects and documents.

Task 2: Approaching Conflicts

Communication is one of the most key aspects of having a project completed properly and on time. Ergo, lack of communication can cause a project to fail. One of the problems that

can be fixed regarding communication is the problem of team members rambling and become talkative, making meetings go over the allocated time. One way to fix this issue is having a time constraint on each team member and staying strict to the time constraint. For example, the project team could implement a limit of 10 minutes per topic or having an individual limit like having each member only allowed to speak for 5 minutes, in order to keep meetings on time. Having the time limits clearly communicated to each team member will allow them to realize the importance on time and will also help them keep their inputs short, concise, and to the point, causing rambling to be at a minimum.

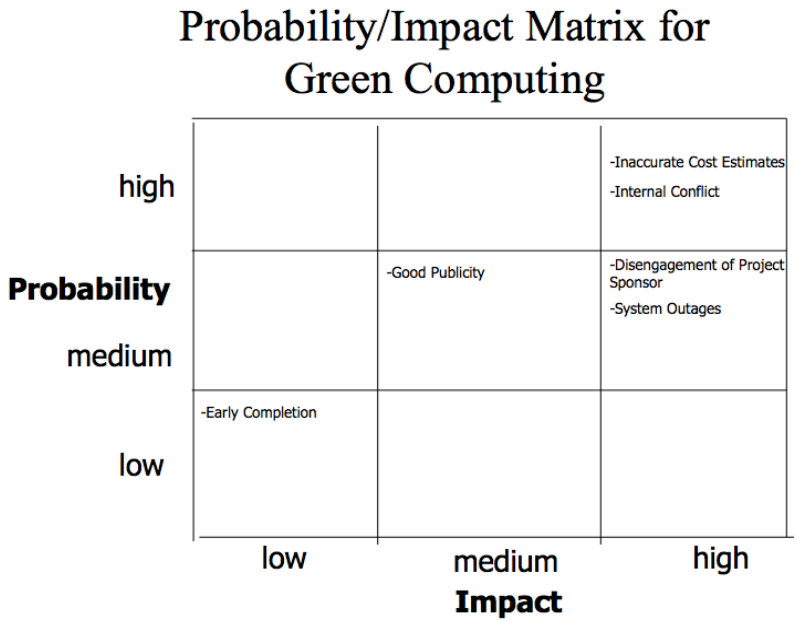
Another issue that can be resolved is the issue of members not using open platforms to post their documents due to the fear that documents will get improperly edited by other members. Having team members send their documents to individual members causes a lack of openness in the group. Instead the team should use a platform that allows members to post their documents for all to see, but does not allow open editing. They should use a platform in which members have to request to edit their documents, and that request can be denied or accepted by either the project manager or the document creator. Having this platform would give document creators piece of mind knowing that not everyone can freely edit their documents. Also it would still allow every member of the group to have access to view the document, in order to ensure there is no lack of communication. Having an openness about communication in the group will allow the project to be completed properly and on time.

Part 8: Project Risk Management

Task 1: Risk Register

No.	Rank	Risk	Description	Category	Root Cause	Triggers	Potential Responses	Risk Owner	Probability	Impact	Status
R33	1	Inaccurate Cost Estimates	If a part of the project gets delayed, we might have to rely more on external labour, which would lead to increases in cost.	Cost	Team member unable to get a task completed	Misunderstanding of job responsibilities	Have a clause that allows for extra funds when needed	Project Manager	High	High	Project manager will have final meeting to discuss total costs
R11	2	Internal Conflict	Team members may not like working with each other, internal conflict might occur, which could lead to the delay of the project.	Team	Self-centered	Lack of focus during meetings	One on one meetings with potentially unsatisfied team members	Project Manager	High	High	Completed
R48	3	Disengagement of Project Sponsor	If project sponsor has other interest, disengagement of the project sponsor might occur, which could lead to the end of the project.	Executive	Other important interests	No willingness to listen	Regular one on one meetings, to keep project sponsor engaged	Project Manager	Medium	High	Completed
R3	4	System Outages	While dealing with technology, a system outage might occur, which could lead to an extensive delay.	Technology	Faulty hardware	Low-quality supplier	Contract agreement that allows for a full refund, if the hardware crashes	Project Manager	Medium	High	Completed
R67	5	Early Completion	If team is cohesive, an early completion might occur, which would be a sign of a successful project.	Time	Team Cohesiveness	Early engagement to get task done in a timely fashion	Helping the team members who may be in danger of falling behind	Project Manager	Low	Low	Project manger helps team members.
R20	6	Good Publicity	If project is done perfectly, good publicity might occur, which would be great for future projects.	Public Relations	Project completed under budget and on time	Given extra time and budget from the start of the project	Staying on top everything to make sure it is running smoothly	Project Manager	Medium	Medium	Waiting, on the completion of the project.

Task 2: Probability/ Impact Matrix



Probability for Each Risk			
Risks	**Probability (1-10)**	**Impact (1-10)**	**Risk Factor (P x I)**
Inaccurate Cost Estimates	10	10	100
Internal Conflict	9	9	81
Disengagement of Project Sponsor	5	10	50
System Outages	6	10	60
Good Publicity	5	5	25
Early Completion	2	1	2

One of the most important parts of a project is the project risk management. Project risk management's goal is to identify, analyze and respond to a risk that might come throughout the life of a project. A risk is an uncertainty that can have a negative or a positive effect on meeting project objectives. So, we used a risk register to come up with 6 risks, 4 negative and 2 positive risks. The negative risks that we came up with are the following; 1) Inaccurate Cost Estimates, 2) Internal Conflict, 3) Disengagement of Project Sponsor, and 4) System Outages. The positive risks are: 1) Good Publicity, and 2) Early Completion.

1 Negative Risk: The most important risk in our risk register was inaccurate cost estimates. This type of risk can come up many different ways; however the fastest way it can

affect Green Computing, is if there is a delay in the project. For example, if a team member is unable to get something done in time, the costs are going up every hour, and with this our cost estimates are going up as well. To limit the delay we would call upon external labour, which is definitely not cheap at $200/hr., and there it is, suddenly your original cost estimates are inaccurate. The main reason of why this happens, is usually because team members have a misunderstanding of their job responsibilities, and if you don't know exactly what you are doing it will lead to delays. As seen in the probability/impact matrix, we labelled it as very high in probability and very high in impact. Also it had the highest possible risk factor of 100. So, how can we justify it? Simply put, the probability of this happening is 10 because most IT projects do go over the estimates. It doesn't matter how many reserves you have if something significant goes wrong, such as the system that you create fails, then the whole estimation will change. Similarly, impact also has a perfect score of 10, because if the cost estimation were inaccurate the impact on the whole project would be significant. The project sponsor might pull the whole project off the table if costs are over what he expected, and even if he doesn't the impact is still huge because as project manager and a team, you are mainly judged if you were to complete the project within the requirements.

1 Positive Risk: The positive risk that we would like to analyze is early completion. As we know a dream of a project manager is to complete a project before the deadline, and the best way to do that is if the whole team works as one cohesive unit. As they say talent win games, but teamwork wins championships. In this scenario if all of the team members did what they are good at, they might end up finishing their parts, however the whole system might not work cohesively. If they were to do all of the parts together then not only would everything work but

also we would be done before the completion date. The main reason why the project could be done before the deadline is if everyone is fully engaged from day one. As seen in the probability/impact matrix, we labelled it as very low in probability and very low in impact. Out of all the risks, early completion had the lowest risk factor of 2. So, why is the risk factor so small compared to the inaccurate cost estimates? The probability of early completion is 2 because most projects do not finish before the deadline, but there are always some that have a chance, and in this case if everything is well managed then there would be a chance at an early completion. The impact score is a bit lower at 1, due to the fact that if the project does finish before the deadline it won't have any impact on the overall project.

Task 3: Response Strategy

There are four basic response strategies for negative risks:

1) Risk Avoidance: eliminating a specific threat, usually by eliminating its causes
2) Risk Acceptance: accepting the consequences if a risk occurs.
3) Risk Transference: shifting the consequence of a risk and responsibility for its management to a third party.
4) Risk Mitigation: reducing the impact of a risk event by reducing the probability of its occurrence.

The best response strategy for the negative risk, internal conflict is risk avoidance. Why let a risk occur, when you could stop it before it happens. An internal conflict usually happens when the team cannot work together. In the risk register one of the main reason this happens is because there are self-centered individuals on the team. As a project manager you know that the main threat of a malfunctioning team is a self-centered individual. So the correct decision would

to take action right away by calling a one on one meeting. By having a meeting, the individual would realize that they have to change their behaviour. If the meeting does not work, the only thing left to do, is to ask the individual if he or she really wants to be part of the team, if not then the individual has to leave the project. So, with these risk avoidance strategies you would never be in a situation where conflicts would arise.

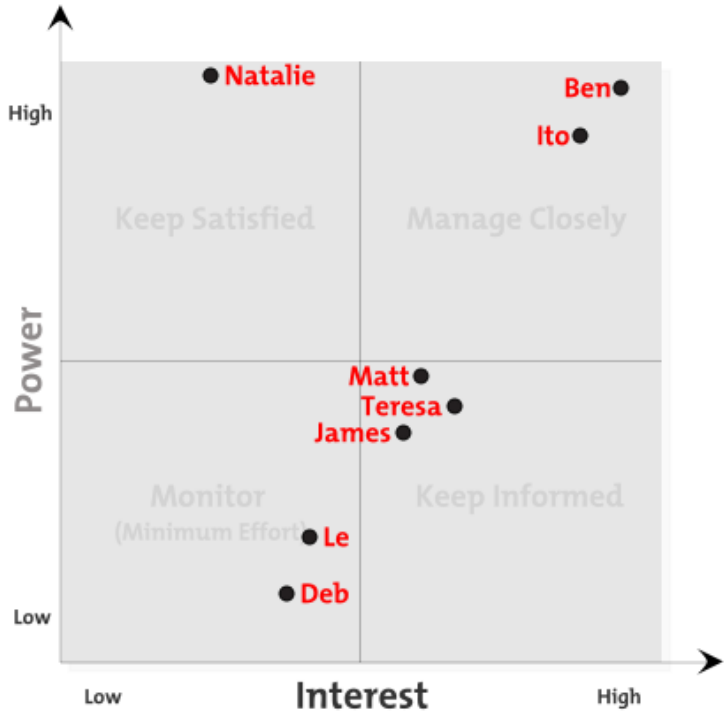
There are four basic responses to positive risks:

1) Risk Exploitation: doing whatever you can to make sure the positive risk happens.
2) Risk Sharing: allocating ownership of the risk to another party.
3) Risk Enhancement: changing the size of the opportunity by identifying and maximizing key drivers of the positive risk.
4) Risk Acceptance: when the project team does not take any actions toward a risk.

The best response strategy for the positive risk, early completion is risk exploitation. The best way to make sure that a positive risk happens, is to make sure you do everything in your power to make it happen. Early completion happens when you complete a project before the actual deadline. So to make sure that happens you have to use all the tools you can. Firstly, you have to make sure that everyone knows their responsibilities. Always have a start time for each task and an end time, so you know what you have to get done and by when to complete the project before the deadline. As mentioned earlier, communicating is a key contributor to success, if everyone is communicating the tasks will be completed much faster. The last thing you could do to make sure that early completion happens, is to work overtime. Instead of going home early, make sure you don't leave work until your daily tasks are completed. With this in mind, the positive risk, early completion will be achievable.

Part 9: Project Stakeholder Management

Task 1: Power/ Interest Grid



Natalie - Vice President of Operations

Ito - Program Manager

Ben - CIO and Project Sponsor

Matt - Senior Technical Specialist

Teresa - Senior Systems Analyst

James - Senior Consultant

Le - Editor/Researcher (New Hire)

Deb - Editor/Consultant (Part-Time)

Task 2: Stakeholder Management Plan

Name	Power/Interest	Current Engagement	Potential Management Strategies
Ito	High/High	Upset	Ito can be tough on project Managers, however he does appreciate when people have solid research, financial analyses and using technology for what-if projections. He needs to be kept updated on the progress of the project so he knows what to expect at

			the monthly program review. Manage closely, and provide short frequent updates.
Ben	High/High	Supportive	Ben is very helpful and always open to questions or concerns. This is a high priority project on Ben's list, and he believes that the Project Managers job goes beyond just managing the project. Frequent updates should be given to Ben in regards to the progress and budget of the project, as an increase in budget may be required.
Matt	Medium/Medium	Neutral	Matt is a great resource as he is very hardworking. He is a nice guy, however he is very reserved. Needs to be convinced to be more social with the team and share his ideas with his fellow team members
Le	Low/Medium	Neutral	Le is very quiet, so she is not comfortable speaking in public. However she is an excellent writer and researcher. Le needs ti be convinced to start to become more comfortable with public speaking and virtual interactions with other team members.
James	Medium/Medium	Reluctant	James is very talkative and is excited to be working on this project. He and Teresa get along well, as they are both very talkative. However he is reluctant to learn new technologies and enjoys sharing ideas face to face. Needs to be convinced to be open to new technologies and to learn these new technologies to share his ideas

Task 3: Issue Log

3. Issue Log

Prepared by: Project Manager **Date:**

Issue #	Issue Description	Impact on Project	Date Reported	Reported By	Assigned To	Priority (M/H/L)	Due Date	Status	Comments
1	Meetings are ending late due to talkative members on the team.	Project is being delayed because meetings are cutting into other tasks		Teresa	PM	M		Closed	Each member now has a time constraint during meetings

2	Members do not want to use open platforms to post documents as they feel it may be improperly edited	Documents and information are not being shared		Matt	PM	M		Closed	Members now use an open platform where editing has to be approved by document creator/PM
3	Some members are using a webcam for conferences whereas others are not	Some members feel uncomfortable/self-conscious using the webcam which affects the way they communicate during meetings		James	PM	L		Closed	Conferences are now only audio based as webcams are unnecessary, unless absolutely needed to present information
4.	Shared site is difficult to use and one cannot view all the work in one place	Causing the team to use different platforms with documents being unorganized		Le	PM	M		Open	In the process of updating the shared site for ease of use and visibility

Appendix: Works Cited

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