UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

PROJECT MANAGEMENT PLAN FOR CONSTRUCTING A GREENHOUSE
AT GEORGETOWN SECONDARY SCHOOL

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FINAL GRADUATION PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE
MASTER IN PROJECT MANAGEMENT (MPM) DEGREE

KINGSTOWN, ST.VINCENT AND THE GRENADINES

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(UCI)

This Final Graduation Project was approved by the University as
partial fulfillment of the requirements to opt for the
Master in Project Management (MPM) Degree

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DEDICATION

This research project is dedicated to my son. He has given me more than one reason to continue to strive for excellence. To my mom, Ivy Jennings, sisters and co-workers, thanks for always pushing me to be a better woman.

ACKNOWLEDGMENTS

I wish to acknowledge the contributions and assistance made by the some persons without whose help; this Final Graduation Project would not have been successfully completed.

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ABBREVIATIONS AND ACRONYMS

- COQ Cost of Quality
- CPI Cost Performance Index
- FGP Final Graduation Project
- GSS Georgetown Secondary School
- HOD Head Of Department
- PMI Project Management Institute
- RACI Responsibility, Accountable, Consult and Inform
- RBS Risk Breakdown Structure
- SWOT Strength, Weakness, Opportunity and Threats
- WBS Work Breakdown Structure

The methodologies used for this research were analytical, inductive-deductive, observation and interviews. The data was analysed for the development of the project management plan for a greenhouse.

The Project Management results indicate that the GSS Greenhouse project has strength as well as weaknesses in certain project management areas. Such as, leadership approach to agile and partial training for employees. In addition, having explored the objectives outlined previously, it can be concluded that rigorous financial planning and promotion must be undertaken to ensure that funds are received for the greenhouse to be a success. The Project Management Plan was developed using the *PMBOK® Guide* 6th Edition. It provided a new methodology for the project team to build a more comprehensive project management plan for Georgetown Secondary School Greenhouse Project.

It is recommended that the project team at GSS use the planning process and documents developed during the development of the Project Management Plan for the Construction of the Greenhouse as a basis for implementing a methodology for similar projects in the future. Furthermore, the team at GSS should seek to utilize and document management and storage systems, organize, store and create a central location for project planning documents and future Organizational Process Asset. Finally, the use of irrigation and greenhouse technologies should be promoted to mitigate the impacts of climate change and to document and disseminate lessons learnt to project beneficiaries.

INTRODUCTION

1.1. Background

The Georgetown Secondary School is a co-ed school that comprises of over four hundred and twenty five students (425). The school is located in the rural area of the country.The school's philosophy and commitment are that it recognises that the teaching-learning process is the raison d'etre of the school and that it exists to meet the educational needs of both its students and the wider community. The school has been at the pinnacle of success in sports in St. Vincent and the Grenadines having performed exceptionally well in many inter-school footballs, volleyball, cricket and netball competitions.

In late 2018, the school began to explore ways to get the students to become more aware of their environment and to be cognizant of climate change; as result, the idea to construct a greenhouse was conceived. The stakeholders believe that this will give students a hands-on experience in environmental science and agriculture. They therefore perceive their role in national development as that of fostering partnerships between the school and stakeholders. As such, the school focus would be that of the educational development of the surrounding community.

1.2. Statement of the Problem

Over the last twenty five (25) years, the Eastern Caribbean has experienced adverse climate conditions with the passage of severe storms and hurricane. Therefore, the stakeholders of the Georgetown Secondary School (GSS) recognised the importance of our planet and seek ideas to help mitigate the issue. The project will provide the students with every opportunity to understand the fragility of their surroundings and how they can care for, cultivate and preserve the environment and our food supply. The greenhouse will allow the GSS to expand their curriculum and opportunities for students in variety of areas, such as; science, food and nutrition and business. In addition, the project will provide training in the areas of irrigation and greenhouse technologies.

1.3. Purpose

The aim of this Final Graduation Project (FGP) is to create a project management plan that will eventually guide the project execution to maximise its success chances. Given that the company have had unsuccessful project experiences in the past, the creation and use of the project management plan will help to better define project objectives, success criteria, resources allocation and in general plan everything that is needed for the project success. In addition, this project management plan will become the school's asset that might be used as the basis for future project plans. The project for the construction of a greenhouse is important for the GSS and thus it must be professionally managed to fulfill the social, economical, scientific and cultural needs of the community in which it will be located.

1.4. General objective

To develop a project management plan to manage the construction of a greenhouse at the Georgetown Secondary School.

1.5. Specific objectives

1. To create a project charter that formally authorizes the project and provides the project manager with the authority to apply organizational resources to the project in order to produce the project management plan;

2. To create a scope management plan to ensures that all works required are included to successfully complete the project;

3. To create a schedule management plan to support the development and management of a project schedule that ensures the project is completed within the time constraints;

4. To create a cost management plan to define the processes for developing and managing the project budget that ensures the project is completed within the budget constraints;

5. To develop a quality management plan to identify the quality requirements for the project to ensure the results meet expectations for approval within the time, cost and scope constraints;

6. To develop a resource management plan to ensure that all resources are identified and managed effectively to complete the project within time, cost and scope constraints;

7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information;

8. To create a risk management plan to identify and examine risks to the successful completion of the project and develop plans to minimize the likelihood of the risks;

9. To develop a procurement management plan to be used to obtain products, services or results required by the project;

10. To develop a stakeholder management plan to identify and support all the project stakeholders to ensure effective stakeholder engagement;

THEORETICAL FRAMEWORK

2.1 Company/Enterprise framework

2.1.1. Company/Enterprise background

In February 1999, the Georgetown Secondary School (GSS) was established. It is a co-ed institution. Today, the school has four hundred and forty-five students (445) and offers over twenty-six subjects. In 2019, the idea to construct a Greenhouse was given birth. This project management plan is based on the construction of a greenhouse at the school. The greenhouse will allow the GSS to expand the curriculum and opportunities for students in a variety of areas. The school plans to integrate the greenhouse into the following classes: biology, food and nutrition, business and agricultural science.

2.1.2. Mission and vision statements of Georgetown Secondary School

Vision

To produce well-rounded students who can adapt to the challenges of an evolving world, having success as their goal. This, we would accomplish through the presentation of a comprehensive curriculum to a population spanning the entire ability band and with diverse interests and competencies through trained teachers and employing modern technology. Source information: (Georgetown Secondary School School Development plan 2018-2019)

Mission

The Georgetown Secondary School endeavours to encourage an appreciation for the value of learning in an effort to enhance all students' ability to think rationally, strive for excellence, develop a strong sense of worth and respect for both self and others.

Georgetown Secondary School aspires to instill in all students a coherent set of spiritual, personal, social, patriotic and aesthetic values and a commitment to them.

We believe that all these ideals will produce well-disciplined and self-motivated students *"Filled with Hope and Spirit*

Source information: (Georgetown Secondary School. School Development plan 2018-2019)

2.1.3. Organizational structure

The school does not have a documented organizational chart. The principal gave advice on the organizational structure of the school that is depicted in Figure 1 below. The principal is responsible for day-to-day operations of the school assisted by his deputy. The Head of Departments (Science, Modern Languages, Social Sciences, Extra-Curricular) all report to the principal and are responsible for the teachers within their departments.
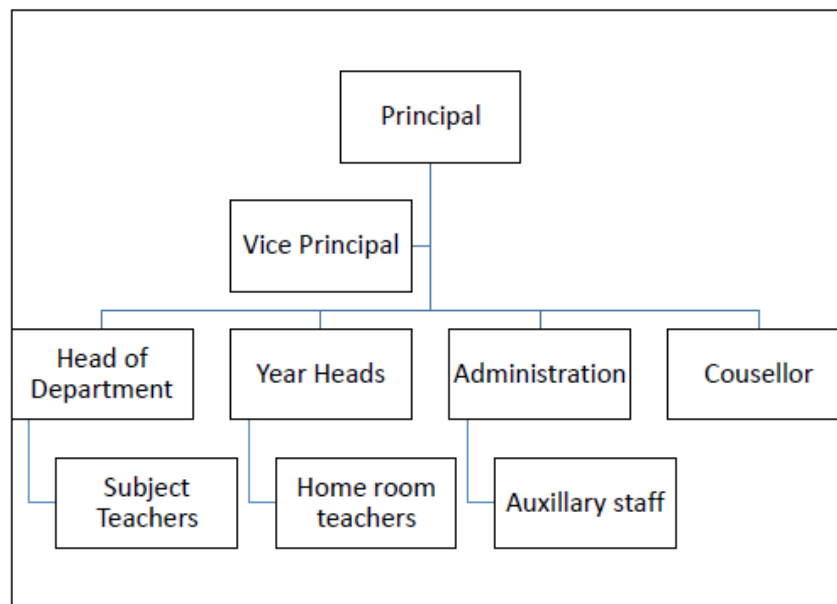
Figure 1 Organizational structure (Source: Author S. Jennings)

2.1.4. Products offered

The GSS offers the following services: twenty-six (26) subjects at the Caribbean Secondary Education Certificate (CSEC); adult after-school classes; training in (volleyball, athletics, netball and cricket); Girls Guides and Brownie Packs.

2.2. Project Management concepts

2.2.1. Project

Different institution defines project based on their work. IPMA defines it as "a time and cost constrained operation to realize a set of defined deliverables (the scope to fulfil the project's objectives) up to quality standards and requirements" (IPMA, 2006).

For ISO, it "consists of a unique set of processes consisting of coordinated and controlled activities with start and end dates, performed to achieve project objectives" (ISO, 2012).

PMBOK Guide defines a project as "a temporary endeavour undertaken to create a unique product or service." (Project Management Institute, 2017, P.4).

GPM (2018) defines a project as "an investment that requires a set of coordinated activities performed over a finite period of time in order to accomplish a unique result in support of a desired outcome."

According to Kerznez (2003). "A project can be considered to be any series of activities and tasks that:

- Have a specific objective to be completed within certain specifications;
- Have defined start and end dates;
- Have funding limits (if applicable);
- Consume human and non-human resources (i.e., money, people, equipment);
- Are multifunctional (i.e., cut across several functional lines).

2.2.2. Project management

In today's business environment, leaders are to manage smartly and efficiently with strict budgets, shorter timelines, limited resources and rapidly changing technology. To have a competitive advantage in the world economy, organisations are embracing project management to consistently deliver business value.

According to the PMBOK Guide (2017) "Project Management (2017) is the "application of knowledge, skills, tools and techniques to project activities to meet the project requirements".

Kerznez (2003) postulates that "project management can mean different things to different people, therefore, suggested the following might be considered an appropriate definition: project management is the art of creating the illusion that any outcome is the result of a series of predetermined, deliberate acts when, in fact, it was dumb luck".

APM Body of Knowledge 7th edition (2019), defines "project management as the application of processes, methods, skills, knowledge and experience to achieve specific project objectives according to the project acceptance criteria within agreed parameters. Project management has final deliverables that are constrained to a finite timescale and budget."

Project management is accomplished through the appropriate application and integration of the project management processes identified for the project. It enables an organisation to execute the project efficiently and effectively." (Project Management Institute, 2017, P.10).

The project management activities involved in the construction of the greenhouse are aimed at ensuring that the project is completed and the objectives are achieved while overcoming the constraints of time, cost, scope and quality.

2.2.3. Project life cycle

In the field of project management, different methodologies, like SCRUM, Agile, Waterfall, etc., "contain guiding processes for those who are doing project management" (Successful Projects, 2016). Although each methodology has its advantages, they all agree that "every project management life cycle contains five steps: initiating, planning, execution, monitoring, and controlling and closure" (Picariello, 2015).

A project life cycle is a "series of phases that a project passes through from its initiation to its closure" (Project Management Institute, 2017, p. 19). APM Body of Knowledge (2019) defines a project management life cycle as a framework comprising a set of distinct high-level stages required to transform an idea of concept into reality in an orderly and efficient manner.

Life cycle offers a systematic and organizes way to undertake project-based work and it can be viewed as the structural underpinning deployment.

Project initiation is the phase where the project starts. It provides an overview of the project, along with the strategies required to attain desired results. It is the phase where the feasibility and business value of the project are determined. The project charter is an essential outcome of this phase.

The planning phase frames a set of plans, which helps to guide the team through the implementation and closing phases. It includes all the essential details related to project goals and objectives. It also includes resource, cost and risk component.

Project execution is the phase where project-related processes are implemented, tasks are assigned, and resources allocated.

The project monitoring and control is all about measuring the performance of the project and tracking progress. The closing phase is where the project is ready to be delivered and is the final stage.

According to (Project Management Institute, 2007, p.14) most construction projects may have five and sometimes shortened to four phases. "These

phases are concept, planning (and development), detailed design, construction, and start-up and turnover."

Figure 2. Project lifecycle. Reprinted from source: (:(www.searxh.org. 2020)

2.2.4. Project management processes

The project management processes are grouped into the following five-process group: (PMBOX Guide sixth edition, 2017. P.23). Figure 4 below shows a graphical representation.

- Initiating Process Group is geared towards obtaining authorization to start the project;
- Planning Process Group - the processes required to establish the scope of the project, refine the objectives and define the course of action;
- Executing Process Group performs the work defined in the project management plan;
- Monitoring and Controlling Process - processes required to track, reviews and regulates the progress and performance of the project
- Closing Process Group - completion of the project.

However, in this plan, only the processes involved in initiating and planning a project will be used to develop the Project Management Plan for the construction of the greenhouse. The Project Management Plan will be a compilation of subsidiary documents created because of each initiating and planning process activity.

2.2.5. Project management knowledge areas

Figure 3. Source: (Arrowhead Consulting, (2020))

A knowledge area is a set of processes associated with a particular topic in project management. There are "49 project management processes identified in the PMBOK® Guide that have been grouped into ten separate knowledge areas (Project Management Institute, 2017, p. 553).

The ten knowledge areas of project management, as defined in Figure 3 above, are as follow: (PMBOK guide sixth edition, 2017, p.553)

Project Integration Management

The processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities. The processes involved in Project Integration Management are outlined in Figure 4 below.

Figure 4: Source: Retrieved from https://www.projectengineer.net/wp-content/uploads/2016/12/pmbok-knowledge-area-project-integration-management-1.png

Project Scope Management

The processes required to ensure that the project includes all the work required, and only the work required to complete the project successfully. The scope management plan will include the following:

- Requirements
- Stakeholders
- Scope Statement
- Work Breakdown Structure (WBS)
- WBS Dictionary
- Roles and Responsibilities
- Deliverables
- Sponsor Acceptance
- Scope Control

. The processes involved in Project Integration Management are outlined in Figure 5 below:
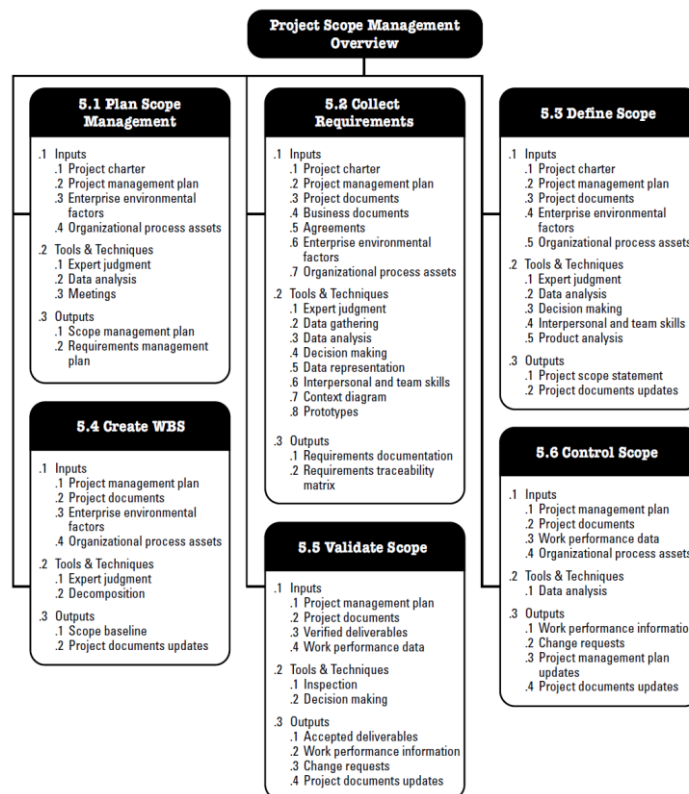
Figure 5-1. Project Scope Management Overview

Figure 5: Source: Retrieved from https://www.projectengineer.net/wp-content/uploads/2016/12/pmbok-knowledge-area-project-scope-management-1.png

Project Schedule Management

These are the processes required to manage the timely completion of the project. The Schedule Management Plan has essentially four parts. Each of these parts can be a heading in the document: Schedule Development, Schedule Control, Schedule Changes and The Project Schedule. The figure below depicts the input, tools and techniques for the schedule plan.

Inputs
.1 Project management plan
.2 Project charter
.3 Enterprise environmental factors
.4 Organizational process assets

Tools & Techniques
.1 Expert judgment
.2 Analytical techniques
.3 Meetings

Outputs
.1 Schedule management plan

Figure 6-3. Plan Schedule Management: Inputs, Tools & Techniques, and Outputs

Figure 6: Tools and Technique to the Schedule (Source: PMI 2017)

Project Cost Management

The processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget. These activities are necessary for the approved budget to be tracked, monitored and controlled. The main aim of the cost management activities is to ensure that the project cost, which may include debt, can be accepted and cost associated risk or and all other project costs are planned and a management strategy is developed and approved. Figure 6 below depicts the tools and techniques that will be utilized.

Plan Cost Management

Inputs	Tools & Techniques	Outputs
.1 Project charter	.1 Expert judgment	.1 Cost management plan
.2 Project management plan	.2 Data analysis	
• Schedule management plan	.3 Meetings	
• Risk management plan		
.3 Enterprise environmental factors		
.4 Organizational process assets		
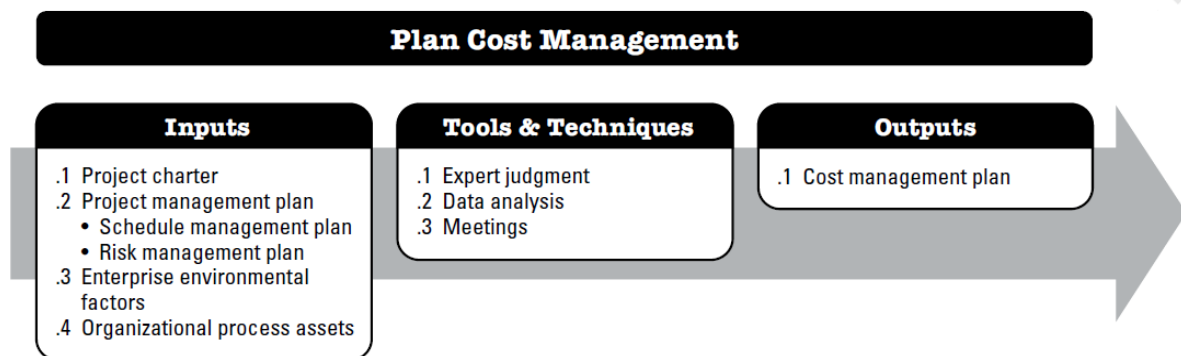
Figure 7-2. Plan Cost Management: Inputs, Tools & Techniques, and Outputs

Figure 7: Tools and Technique to the Schedule (Source: PMI 2017)

Project Quality Management

These are all the processes and activities of the performing organization that determine quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken. Figure 7 below outlined the plan quality management process.
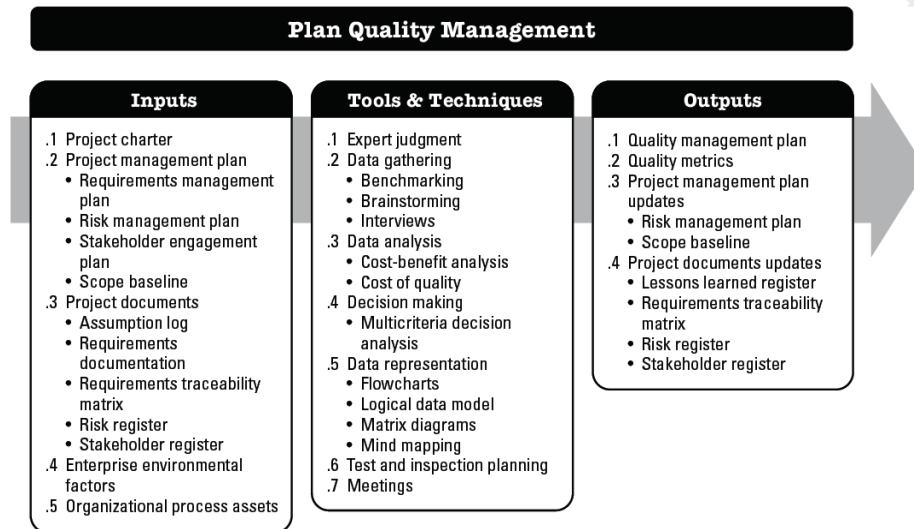
Figure 8-3. Plan Quality Management: Inputs, Tools & Techniques, and Outputs

Figure 8: Source: Retrieved from https://www.projectengineer.net/wp-content/uploads/2016/12/pmbok-knowledge-area-project-quality-management-1.png

Project Resource Management

The processes that organize, manage, and lead the project team. There are six processes; however, only resource management plan will be developed during this project, which is depicted in Figure 6 below.
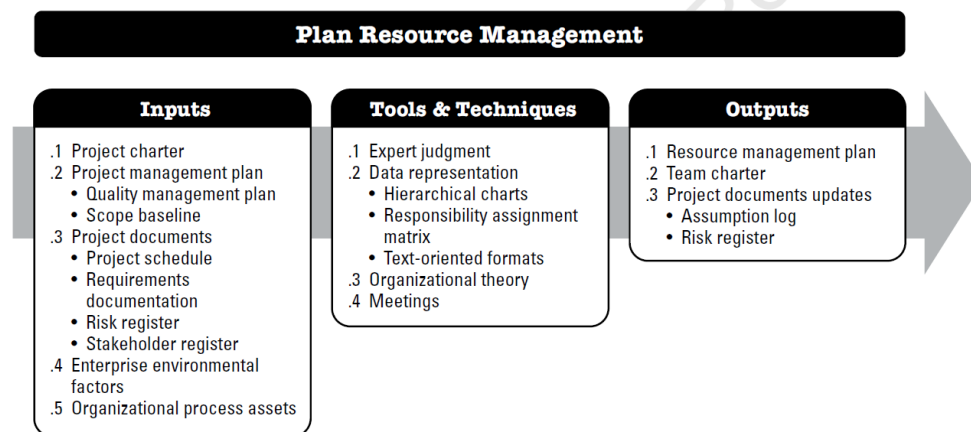
Figure 9-2. Plan Resource Management: Inputs, Tools & Techniques, and Outputs

Figure 9: Plan Resource Management: Inputs, Tools & Techniques and Outputs
(Source: PMI 2017)

Project Communications Management

These processes are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information. The plan communication will be develop for this project is depicted in figure 7 below.

Plan Communications Management

Inputs	Tools & Techniques	Outputs

.1 Project charter
.2 Project management plan
  • Resource management plan
  • Stakeholder engagement plan
.3 Project documents
  • Requirements documentation
  • Stakeholder register
.4 Enterprise environmental factors
.5 Organizational process assets
	.1 Expert judgment
	.2 Communication requirements analysis
	.3 Communication technology
	.4 Communication models
	.5 Communication methods
	.6 Interpersonal and team skills
	  • Communication styles assessment
	  • Political awareness
	  • Cultural awareness
	.7 Data representation
	  • Stakeholder engagement assessment matrix
	.8 Meetings
		.1 Communications management plan
		.2 Project management plan updates
		  • Stakeholder engagement plan
		.3 Project documents updates
		  • Project schedule
		  • Stakeholder register

Figure 10-2. Plan Communications Management: Inputs, Tools & Techniques, and Outputs

Figure 10: Plan Communication Management: Inputs, Tools & Techniques and Outputs (Source: PMI 2017)

Project Risk Management:

The processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project (PMBOK Guide, 2017). Only the following will be developed in the project:

- Plan Risk Management: The process of defining how to conduct risk management activities for a project;
- Identify Risks: The process of determining which risks may affect the project and documenting their characteristics;
- Perform Qualitative Risk Analysis: The process of prioritizing risks for further analysis or action by assessing and combining their probability of occurrence and impact;
- Perform Quantitative Risk Analysis: The process of numerically analyzing the effect of identified risks on overall project objectives;
- Plan Risk Responses: The process of developing options and actions to enhance opportunities and to reduce threats to project objectives.

Figure 8 depicts the tools and techniques that will be used in this process.
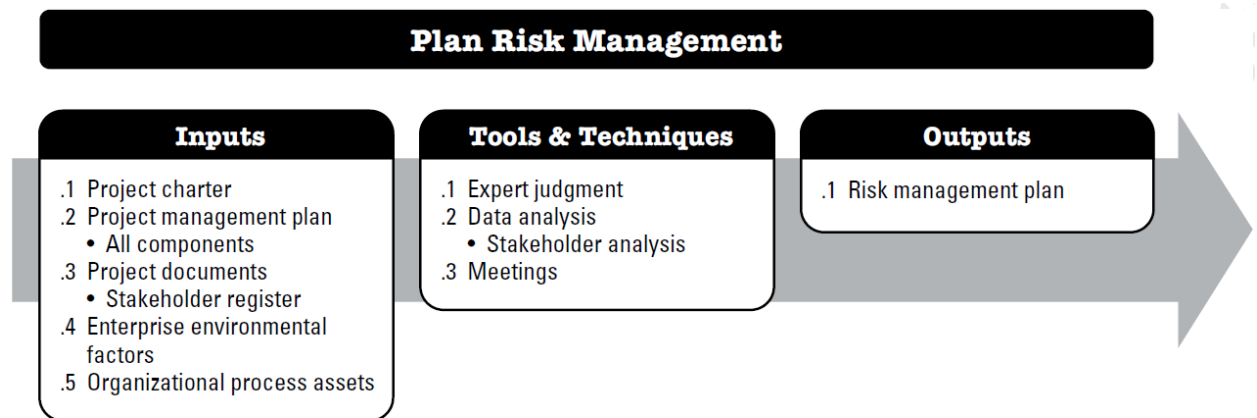
Figure 11-2. Plan Risk Management: Inputs, Tools & Techniques, and Outputs

Figure 11: Plan Risk Management: Inputs, Tools & Techniques and Outputs

(Source: PMI 2017)

Project Procurement Management

The processes necessary to purchase or acquire products, services, or results needed from outside the project team. Processes in this area include procurement planning, solicitation planning, solicitation, source selection, contract administration, and contract closeout. The plan procurement process will be developed and the process are depicted in the figure below.

Project Procurement Management Overview

12.1 Plan Procurement Management

.1 Inputs
  .1 Project charter
  .2 Business documents
  .3 Project management plan
  .4 Project documents
  .5 Enterprise environmental factors
  .6 Organizational process assets

.2 Tools & Techniques
  .1 Expert judgment
  .2 Data gathering
  .3 Data analysis
  .4 Source selection analysis
  .5 Meetings

.3 Outputs
  .1 Procurement management plan
  .2 Procurement strategy
  .3 Bid documents
  .4 Procurement statement of work
  .5 Source selection criteria
  .6 Make-or-buy decisions
  .7 Independent cost estimates
  .8 Change requests
  .9 Project documents updates
  .10 Organizational process assets updates

12.2 Conduct Procurements

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Procurement documentation
  .4 Seller proposals
  .5 Enterprise environmental factors
  .6 Organizational process assets

.2 Tools & Techniques
  .1 Expert judgment
  .2 Advertising
  .3 Bidder conferences
  .4 Data analysis
  .5 Interpersonal and team skills

.3 Outputs
  .1 Selected sellers
  .2 Agreements
  .3 Change requests
  .4 Project management plan updates
  .5 Project documents updates
  .6 Organizational process assets updates

12.3 Control Procurements

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Agreements
  .4 Procurement documentation
  .5 Approved change requests
  .6 Work performance data
  .7 Enterprise environmental factors
  .8 Organizational process assets

.2 Tools & Techniques
  .1 Expert judgment
  .2 Claims administration
  .3 Data analysis
  .4 Inspection
  .5 Audits

.3 Outputs
  .1 Closed procurements
  .2 Work performance information
  .3 Procurement documentation updates
  .4 Change requests
  .5 Project management plan updates
  .6 Project documents updates
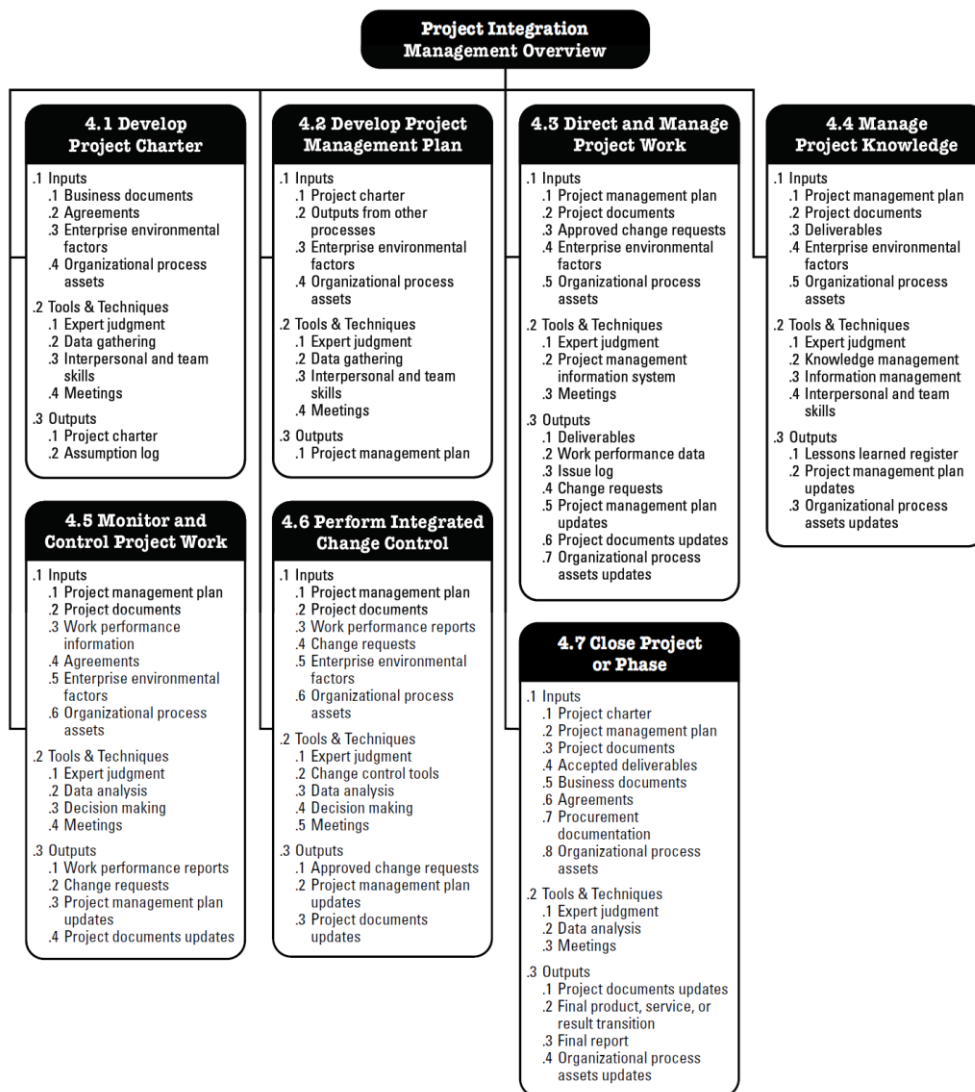 .7 Organizational process assets updates

Figure 12: Source: Retrieved from https://www.projectengineer.net/wp-content/uploads/2016/12/pmbok-knowledge-area-project-procurement-management-1.png

Project Stakeholder Management

The processes required to identify all the people or organizations impacted by the project, analyzing stakeholder expectations and impact on the project, and developing appropriate management strategies for effectively engaging stakeholders in project decisions and execution. The processes are outlined in the figure below.

Project Stakeholder Management Overview

13.1 Identify Stakeholders

.1 Inputs
  .1 Project charter
  .2 Business documents
  .3 Project management plan
  .4 Project documents
  .5 Agreements
  .6 Enterprise environmental factors
  .7 Organizational process assets

.2 Tools & Techniques
  .1 Expert judgment
  .2 Data gathering
  .3 Data analysis
  .4 Data representation
  .5 Meetings

.3 Outputs
  .1 Stakeholder register
  .2 Change requests
  .3 Project management plan updates
  .4 Project documents updates

13.2 Plan Stakeholder Engagement

.1 Inputs
  .1 Project charter
  .2 Project management plan
  .3 Project documents
  .4 Agreements
  .5 Enterprise environmental factors
  .6 Organizational process assets

.2 Tools & Techniques
  .1 Expert judgment
  .2 Data gathering
  .3 Data analysis
  .4 Decision making
  .5 Data representation
  .6 Meetings

.3 Outputs
  .1 Stakeholder engagement plan

13.3 Manage Stakeholder Engagement

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Enterprise environmental factors
  .4 Organizational process assets

.2 Tools & Techniques
  .1 Expert judgment
  .2 Communication skills
  .3 Interpersonal and team skills
  .4 Ground rules
  .5 Meetings

.3 Outputs
  .1 Change requests
  .2 Project management plan updates
  .3 Project documents updates

13.4 Monitor Stakeholder Engagement

.1 Inputs
  .1 Project management plan
  .2 Project documents
  .3 Work performance data
  .4 Enterprise environmental factors
  .5 Organizational process assets

.2 Tools & Techniques
  .1 Data analysis
  .2 Decision making
  .3 Data representation
  .4 Communication skills
  .5 Interpersonal and team skills
  .6 Meetings

.3 Outputs
  .1 Work performance information
  .2 Change requests
  .3 Project management plan updates
  .4 Project documents updates

Figure 13: Source: Retrieved from https://www.projectengineer.net/wp-content/uploads/2016/12/pmbok-knowledge-area-project-stakeholder-management-1.png

2.3 Greenhouse

A greenhouse is a building with glass walls and a glass roof. Greenhouses are used to grow plants such as tomatoes and tropical flowers. A greenhouse stays warm inside, even during the winter. In the daytime, sunlight shines into the greenhouse and warms the plants and air inside. At nighttime, it is colder outside, but the greenhouse stays warm inside.

2.3.1 Sustainability

Sustainability is ensuring that our present needs are met by consuming resources in a responsible way, while all the time endeavoring to avoid precluding future posterity of their ability to meet their own needs. (Mineral Products Association (MPA), 2016).

METHODOLOGICAL FRAMEWORK

3.1. Information sources

"Information", 2013 describes an information source as a source of information for somebody, i.e. anything that might inform a person about something or provide knowledge to somebody.

Primary sources are original materials. They are from the time involved and have not been filtered through interpretation or evaluation. Primary sources are original materials on which other research is based. They are usually the first formal appearance of results in physical, print or electronic format. They present original thinking, report a discovery, or share new information. In this FGP, the primary information will be derived from interview and meetings with lead personnel.
(Ashikuzzaman Ashik, 2020)

3.1.2 Secondary sources

Secondary sources value, discuss or comment on the primary source, or on sources analogous to the primary source that is being analysed. These include research articles, biographies and textbooks.
The secondary sources that used in this project management plan are PMBOK guide, MPM notes, internets and textbooks.

Chart 1: Information sources (Source: S. Jennings, Author)

Objectives	Information Sources	
	Primary	**Secondary**
1. To create a project charter that formally authorizes the project.	Meeting and interview with project manager (Agriculture Teacher)	PMBOK Guide and PMI database.
2. To create a scope management plan	Meeting with the lead Project manager	PMBOK Guide and PMI database, internet
3. To create a schedule management plan.	Interviews, meetings with project manager	PMBOK Guide and PMI database, internet
4. To create a cost management plan to define the processes for developing and managing the project budget that ensures the project is completed within the budget constraints.	Interview with project manager and meetings with management team of school	PMBOK Guide and PMI database, internet and historical data and accounting data

5. To develop a quality management plan.	Interview with project manager and meetings with management team of school	PMBOK Guide and PMI database, internet and historical data and Accounting data
6. To create a resource management plan .	Interview with project manager and meetings with management team of school	PMBOK Guide and PMI database, internet
7. To develop a communication management plan.	Meeting with lead project manager and management team of school.	PMBOK Guide and PMI database, internet and historical data and Accounting data
8. To create a risk management plan risks.	Meeting with lead project manager and management team of school and interview the risk disaster personnel on staff	PMBOK Guide and PMI database, internet
9. To develop a procurement management plan	Meeting with lead project manager and principal of school	PMBOK Guide and PMI database, internet
10. To develop a stakeholder management plan engagement.	Meeting with project manager, management of school	PMBOK Guide and PMI database, internet

3.2. Research methods

Research methods are the strategies, processes or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create better understanding of a topic.
(LibGuides: Research Methods: What are research methods?, 2020)

3.2.1 Analytical Method

The analytical research method sometimes referred to as the explanatory method "uses facts or information already available and analyses it to make a critical evaluation" (Sridhar, 2008, slide 20). For this project the analytical method, which seeks to break down a unit into simpler elements, to examine and then re- group them, will be used.

3.2.2 Inductive-Deductive Method

This is a common method of research in which the deductive method is geared at testing an existing theory, thus arriving at a logical conclusion, while the Inductive method is aimed at generating a new theory or theories based on the gathered information or data at hand. (Gabriel, D. D., 2013).

3.2.3 Observation Method

This form of research is non-experimental; in that, the research is carried out through the mere observation and acknowledgement of the ongoing pattern.
(Crossley, M. W., & Preston, R. 1987).

3.2.4 Interview

This method is a widely used method in research as it allows for the collection of data by asking people questions and following up or probing their answers to explore their perspectives on a particular idea, program

or situation. (RWJF - Qualitative Research Guidelines Project Evaluative Criteria, 2020)

Chart 2: Research Methods (S Jennings)

Objectives	Research Methods		
	Analytical method 1	Inductive-deductive method 2	observation
To create a project charter that formally authorizes the project.	The analytical method will be employed by using facts or information from the sources identified in Chart 1 Objective 1 above, to drive decision making when creating the project charter.		
To create a scope management plan to ensure that all works required are included.		This technique will be used to collect project requirements.	Visit various greenhouse site and observe their movements
To create a schedule management plan to support the development and management of a project schedule.	The analytical method will be employed by using information from the sources identified in Chart 1 objective 3 above, to drive decision making when creating the documents that will comprise the time management plan.	Plan meeting with expert judgements to gather qualitative report	
To create a cost management plan to define the processes for developing	Analytical technique will be employed to understand the various fund raising options	Plan meeting with expert judgements to gather qualitative	

and managing the project budget.		report	
To develop a quality management plan to identify the quality requirements for the project.		This method will be employed to identify both qualitative and quantitative data	Visit various customer site and observe the various benchmarks.
To create a plan resource management plan to ensure that all resources are managed effectively.	Analytical tools will be employed such as information from experts and meetings to gain useful insight. This method makes for the critical thinking of the roles and responsibilities to be assigned.		
To develop a communication management plan to ensure timely and effective communication of the project information.	The analytical method will be employed by using information derived from the sources identified in Chart 1 Objective 7 above, to drive decision making when creating the documents that will comprise the communications management plan.	Will be used to review, evaluate and summarize material on the aspects of communications required.	
To create a risk management plan to identify and examine risks to the successful completion of the project.		Both quantitative and qualitative risk assessment with be employed	This technique will be used to help identify risk.

To develop a procurement management plan to obtain products, services or results required by the project		To get important information from suppliers to procure the best options	
To develop a stakeholder management plan to identify stakeholders		Will be used to review the appropriate tools needed to construct a stakeholder management plan	

3.3. Tools

The PMBOK Guide (2017) defines tools as something "tangible, such as a template or software program, used in performing an activity to produce a product or result".

- Data Analysis – used to organize, assess and evaluated data and information; for example, root cause, stakeholder analysis;
- Communication Methods – a systematic procedure, technique or process used to transfer information among projects; for example, feedbacks;
- Decision-making – techniques used to collect data and information from a variety of sources; for example, meetings;
- Interpersonal and team skills- skills used to effectively lead and interact with team members and other stakeholders; for example, observation;
- Data Gathering – used to collect data and information from variety of source; for example, benchmarking, brainstorming

Chart 3: Tools (Source: PMBOK Guide (2017)

Objectives	Tools
1. To create a project charter that formally authorizes the project and provide the project manager with the authority to apply organizational resources.	Expert Judgement Meetings Data gathering; interviews, brainstorming
2. To create a scope management plan to ensure that all works required are included.	Expert judgement, Meetings Decision making, Data gathering

3. To create a schedule management plan to support the development and management of a project schedule.	Meetings Critical path analysis, Gantt chart Expert judgement
4. To create a cost management plan to define the processes for developing and managing the project budget.	Expert judgment Analogous estimating Parametric estimating Bottom-up estimating Three-point estimating
5. To develop a quality management plan to identify the quality requirements for the project.	Benchmarking, Brainstorming Interviews, Cost of quality Cost benefit analysis, Expert judgement
6. To create a resource management plan to ensure that all resources are identified and managed effectively.	Expert judgement Hierarchical charts Responsibility assignment matrix meetings
7. To develop a communication management plan to ensure the effective communication of the project information.	Communication technology Communication models Communication methods meetings
8. To create a risk management plan to identify and examine risks to the successful completion of the project.	Expert judgement Stakeholders analysis Meetings SWOT analysis
9. To develop a procurement management plan to be used to obtain products, services or results required by the project.	Market research Expert judgement meetings
10. To develop a stakeholder management plan to identify and support all the project stakeholders	Brainstorming Expert judgement Stakeholders analysis, meeting

3.4. Assumptions and constraints

An assumption is a "factor in the planning process that is considered to be true, real or certain, without proof or demonstration" (PMBOK® - A Guide to Project Management Body of Knowledge, 2017, p. 699)

Constraint is a "limiting factor that affects the execution of a project, program, portfolio or process" (PMBOK® - A Guide to Project Management Body of Knowledge, 2017, p. 699). The assumptions and constraints considered on the Final Graduation Project for each specific objective are set out in **Chart 4** below.

Chart 4: Assumptions and Constraints (Source: S. Jennings, Author)

Objectives	Assumptions	Constraints
1. To create a project charter that formally authorizes the project. .	The charter will be created before all other subsidiary documents.	Time-Authorization of the project may take a while
2. To create a scope management plan to ensures that all works required are included to successfully complete the project.	All information has been disclosed by all relevant stakeholders, to develop the scope.	The scope may change as the project progresses.
3. To create a schedule management plan to support the development and management of a project schedule that ensures that the project is completed within the allotted time period.	The time allocated for the development of the Project Management Plan is ufficient	Insufficient expert judgment available.
4. To create a cost management plan to define the processes for developing and managing the project budget that ensures the project is completed within the budget constraints.	The budget created during planning will accurately depict the financial resources required to build the greenhouse.	Insufficient time and resources available to complete a detailed budget

Objectives	Assumptions	Constraints
5. To develop a quality management plan to identify the quality requirements for the project to ensure the results meet expectations for approval within the time, cost and scope constraints.	All stakeholder requirements will be collected and analyzed.	Scope – based on the information gathered, certain requirements may change the scope. Resource- the materials used maybe of a substandard grade Time- testing and inspection may take some time
6. To create a planned resource management plan to ensure that all human resources are identified and managed effectively to complete the project within time, cost and scope constraints	The project has sufficient human resources, and Responsibilities and duties are clearly defined.	Resources – unavailability of expert
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information.	The chain of command is clearly stated and the organisation has the requisite technology to communicate.	Communication- unreliable medium of communication, internet and electricity may be unreliable also..
8. To create a risk management plan to identify and examine risks to the successful completion of the project and develop plans to minimize the likelihood of the risks.	There are contingency plans in place and that risk will be fully assess.	Risk may occur, the location is prone to natural disaster such as hurricanes and volcanic eruption, the project maybe destroy
9. To develop a procurement management plan to be used to obtain products, services or results required by the project.	Suppliers are identified and all goods and services will be easily procured	Suppliers may not have the material

Objectives	Assumptions	Constraints
10. To develop a stakeholder management plan to identify and support all the project stakeholders to ensure effective stakeholder engagement	All stakeholder requirements will be identified along with their levels of interest.	Stakeholder requirements and levels of interest may change during the project

3.5. Deliverables

According to the PMBOK Guide 6th ed., a "deliverable is any unique and verifiable product, result or capability to perform a service that is required to be produced to complete a process, phase or project. Deliverables are typically the outcomes of the project and can include components of the project management plan" (PMBOK Guide, 2017, p. 95).

Chart 5: Deliverables (Source: S Jennings, Author)

Objectives	Deliverables
1. To create a project charter that formally authorizes the project and provides the project manager with the authority to apply organizational resources. To the project in order to produce the project management plan.	Project charter
2. To create a scope management plan to ensure that all works required are included to successfully complete the project.	Scope management plan
3. To create a schedule management plan to support the development and management of a project schedule that ensures the project is completed within the time constraints	Schedule management plan
4. To create a cost management plan to define the processes for developing and managing the project budget that ensures the project is completed within the budget constraints.	Cost management plan

5. To develop a quality management plan to identify the quality requirements for the project to ensure the results meet expectations for approval within the time, cost and scope constraints.	Quality management plan
6. To create a Plan resource management plan to ensure that all human resources are identified and managed effectively to complete the project within time, cost and scope constraints.	Plan resource management plan
7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information.	Communication management plan
8. To create a risk management plan to identify and examine risks to the successful completion of the project and develop plans to minimize the likelihood of the risks.	Risk management plan
9. To develop a procurement management plan to be used to obtain products, services or results required by the project.	Procurement management Plan
10. To develop a stakeholder management plan to identify and support all the project stakeholders to ensure effective stakeholder engagement	Stakeholder Management Plan

RESULTS

4.1. To Create a Project Charter

The first specific objective to be developed in the Project Management Plan for the construction of a greenhouse at the Georgetown Secondary School is a Project Charter. The project charter is the first process in the Project Integration Management knowledge area. The project charter was accomplished using minutes of meetings, collecting data from other schools with established greenhouse and the *PMBOK® Guide* as sources. The project charter formally authorizes the project and provides the project manager with the authority to apply organisational resources to the project to produce the project management plan.

According to *PMBOK® Guide,* to develop the Project Charter the following inputs, and tools and techniques were required. See **Figure 8** below. (Project Management Institute, 2017, p. 75).
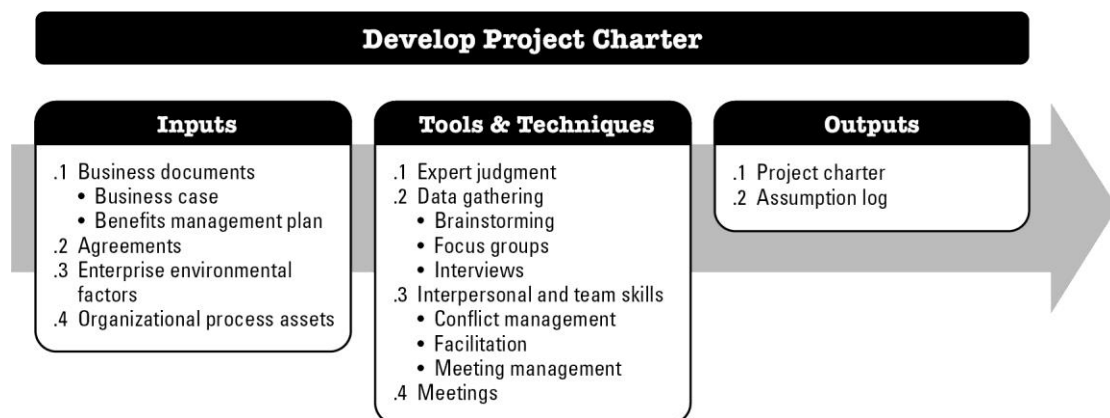
Figure 4-2 (Guide). Develop Project Charter: Inputs, Tools & Techniques, and Outputs

A Guide to the Project Management Body of Knowledge (PMBOK®Guide) – Sixth Edition. ©2017 Project Management Institute, Inc. All rights reserved.

Figure 14: Develop Project Charter (Source: PMBOK Guide, 2017)

The construction of the greenhouse project is an idea formulated and therefore, GSS does not have a developed project management approach to deliver the greenhouse. In the absence of the inputs of this process, a meeting with the potential lead project manager, management of GSS and other data gathering techniques were used to develop the project charter in Figure 7.

PROJECT CHARTER
FOR CONSTRUCTION OF GREENHOUSE
AT
GEORGETOWN SECONDARY SCHOOL

JUNE 2020

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Project Title
Project Purpose/Justification
Project Description
Project Goal
Project Scope
Key Stakeholders
Project Milestones
Project Budget
Constraints, Assumptions and Risk
Project Approval

Project Title

The Georgetown Secondary School Greenhouse Project

Project Purpose/Justification

The development of the project management plan to manage the construction of a greenhouse at the Georgetown Secondary School (GSS) stems from the severe climatic conditions and the low food supply that have been experienced in the Caribbean over the past 25 years. Hence, the idea of a greenhouse was conceptualized as one way to mitigate the issue of climate change, whilst

supplying food and providing the opportunity to impart knowledge to students for them to understand the fragility of their surroundings and for the school to expand its curriculum. The project team will review the project charter. The final approval will be the Principal of GSS and the Ministry of Education.

Project Description

The project includes the construction and use of a 30X60 Solar-Powered greenhouse and irrigation technologies on the ground of the GSS. The greenhouse will rely on solar energy to help power necessary functions, water harvesting and collection using buildings at school of the greenhouse thus making it sustainable.

The greenhouse will allow the GSS to expand the curriculum and opportunities for students in a variety of areas (Science, Food & Nutrition, Business and Visual Art, etc.). The products to be cultivated are sweet peppers, tomatoes, lettuce and chive.

The reason for choosing these crops are that they are short maturity crops; there is a high demand for them and they can be harvested and reaped within with the school term.

Goal

To develop a project management plan to manage the construction of a greenhouse at the Georgetown Secondary School, to address the urgent necessity to reduce the impact of the extreme weather conditions on-farm production output and livelihoods.

The following business objectives have been formulated:

- To construct a greenhouse on the grounds of Georgetown Secondary School (GSS);
- To create a structure that will provide needed space for students to conduct experiments and to enhance learning;
- To ensure that the project is self-sustainable and has growth potential;

- To construct a facility that will be used to grow a variety of nutritional products.

Scope

The following are the result of the project:

- Formation of a sub-committee;
- Acquire funds through grants and other fundraising activities;
- Identified location for the greenhouse on the school property;
- Finalize approval from Principal and Ministry of Education;
- Define the project management resources to oversee the construction;
- Finalize the curriculum that will make use of the greenhouse;
- Develop a maintenance plan for the ongoing support of the greenhouse structure.

The scope will not:

- Solicit bids for the construction of the greenhouse
- Develop design and specification for the greenhouse

Key Stakeholders

Ministry of Education

Ministry of Agriculture, Rural Transformation, Forestry and Fisheries

Principal of GSS

Deputy Principal of GSS

Head of Science Department

Head of Food & Nutrition and other Extra- Curricular activity

Head of Business Department

Head of Math Department

Students

Parents

Community

Project Milestones

- Formation of Sub-committee - 06/2020
- Identify site for greenhouse - 06/2020
- Fund raising initiatives - 6/2020-9/2020
- Present proposal to principal – 09/2020-09/2020
- Procure foundation requirements – 10/2020-11/2020
- Procure irrigation and foundation material – 12/2020-01/2021
- Conduct training workshop for Agriculture teacher – 01/2021
- Conduct training workshop for 30 students – 02/2021
- Procure greenhouse and other material - 03/2021-04/2021
- Installation of irrigation system – 05/2021 -6/2021
- Installation of greenhouse system -07/2021-08/2021
- Installation of other materials -08/2021-09/2021
- Document maintenance procedures – 09/2021
- Transition by project team – 09/2021

- **Project Budget**

Approximately $30,000 USD will be needed for construction of the greenhouse

Constraints, Assumptions and Risks

Constraints	The project may exceed $30,000 USD.
Assumptions	- Beneficiary will accept and use the greenhouse provided - The project will be approved. - The greenhouse would be maintained by the school
Risks	- Funding may not be acquired in the required time. - Vandalism

- Availability of expertise
- Unexpected extreme weather events
- Scheduling delays

Approval Signatures

[Name], Project Client	[Name], Project Sponsor	[Name], Project Manager

Figure 15: GSS Greenhouse Project Charter. Adapted from Simple Project Management Tool. Retrieved June 4, 2020 from https://project-charter-template.casual.pm/

4.2. Scope Management Plan

**SCOPE MANAGEMENT PLAN
FOR CONSTRUCTION OF GREENHOUSE
AT
GEORGETOWN SECONDARY SCHOOL**

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Introduction

The Scope Management Plan provides the scope framework for the project. This plan was created using a modified template taken from an online source.

The plan documents the scope management approach; roles and responsibilities as they pertain to project scope; scope definition; verification and control measures; scope change control and the project's work breakdown structure. Any project communication, which pertains to the project's scope, should adhere to the Scope Management Plan.

To create the scope management plan the project charter was used as an input and meeting with an expert from the Ministry of Agriculture along with other stakeholders within the project decide on the Requirements needed.

Scope Management Approach

This project scope management will be the sole responsibility of the project manager. The Scope Statement, Work Breakdown Structure (WBS) and WBS Dictionary define the scope for this project. The project manager, management team and stakeholders will establish and approve documentation for measuring project scope and work performance measurements. The project manager or any member of the project team may initiate proposed scope changes. All change requests will be submitted to the project manager who will then evaluate the requested scope change. Upon acceptance of the scope change request, the project manager will submit the scope change request to the Change Control Board for acceptance.

Upon approval of scope changes by the Change Control Board, the project manager will update all project documents and communicate the scope change to all stakeholders. Based on feedback and input from the project manager and stakeholders, the principal and Ministry of Education are responsible for the acceptance of the final project deliverables and project scope.

Roles and Responsibilities

The project manager, sponsor and team will all play key roles in managing the scope of this project. As such, the project sponsor, manager, and team members must be aware of their responsibilities in order to ensure that work performed on the project is within the established scope throughout the duration of the project. The table below defines the roles and responsibilities for the scope management of this project.

Chart 6: Scope Management Roles and Responsibilities (Source: compiled by Author)

Name	Roles	Responsibilities
Ministry of Education	Control Board	• Approve or deny scope change requests as appropriate. • Accept final deliverables
Rodwell Williams	Project Manager	• Measure and verify project scope • Facilitate scope change requests • Facilitate impact assessments of scope change requests • Organize and facilitate scheduled change control meetings • Communicate outcomes of scope change requests • Update project document upon approval of all scope.
Assistant Project And Project Team	Team Members	• Participate in defining change resolutions • Evaluate the need for scope changes and communicate them to the project manager as necessary. • Can propose scope changes • Will execute change directives issued by project manager
HOD	Teachers/ Site Workers	• Develop curriculum for their various department to integrate the use of greenhouse. • Monitor and evaluate
Students	Beneficiary	• Participate in the greenhouse, irrigation, and technology training. • Facilitate the operation, maintenance of the greenhouse and the irrigation system.

Scope Definition

This section explains the process that was followed to develop the details description of the project and its deliverables. The project deliverables were generated based on the requirements collection process and input from subject matter experts such as the Agriculture teacher and others from the Ministry of Agriculture. This process of expert judgement provides feedback on the most effective, safe and cost efficient ways to meet the original requirements of constructing a greenhouse.

Project Description

The project includes the construction and use of a solar-powered greenhouse and irrigation technologies on the ground of the GSS. The greenhouse will rely on solar energy to help power necessary functions, water harvesting and collection using buildings at school of the greenhouse; thus, making it sustainable.

The greenhouse will allow the GSS to expand the curriculum and opportunities for students in a variety of areas (Science, Food & Nutrition, Business and Visual Art, etc.). Sweet peppers, tomatoes, lettuce and chive are the products that were identified to be cultivated because these crops are short maturity crops and they can easily planted and harvested within a school term.

Project Requirements

Requirements documentation describes how individual requirements meet the business need for the project. The requirements traceability matrix is a grid that lines product requirements from their origins to the deliverable that satisfies them. It provides a means throughout the project life cycle. (PMI, 2017, p.148). **Figure 10** below shows the traceability matrix for GSS greenhouse project.

Requirements Traceability Matrix								
Project Name:		Georgetown Secondary School Project						
Cost Center:								
Project Description:		Project management plan for the Construction of a 30 X 60 Solar Powered Greenhouse on the school grounds for academic purposes.						
ID	Associate ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Product Design	Priority	Test Cases
001	1.0	Experts in Greenhouse, Agriculture Botany, Education, Project Management	Manage, maintain, and expand the vegetable and plant collections	Establish the Greenhouse garden to contribute to food security and conservation of vegetable species	Establishment of Sub Committee Group		High	
		Preparation documents for approval			Project Charter		High	
	1.1	Work Breakdown Structure complete	Breakdown work into manageable parts	Defining the GSS Greenhouse Purpose - Vision and Mission Statements	Project Management Structure		High	
	1.2	Scope Management			Scope Management plan		High	
002	2.0	General instructions on specification of irrigation and greenhouse material	Selection of Greenhouse and other materials	To establish the required material needed to withstand the climatic condition	Scope Management plan		High	
	2.1	Project Charter and sufficient and technical information			Project charter			
		Determine Initial Budget and perform cost Analysis	To develop time phase and spending plan	Establish the financial commitment needed to complete the project	Cost baseline		High	

Requirements Traceability Matrix								
Project Name:		Georgetown Secondary School Project						
Cost Center:								
Project Description:		Project management plan for the Construction of a 30 X 60 Solar Powered Greenhouse on the school grounds for academic purposes.						
ID	Associate ID	Requirements Description	Business Needs, Opportunities, Goals, Objectives	Project Objectives	WBS Deliverables	Product Design	Priority	Test Cases
003	3.	Enlist the service of expert.	Quality detailed of interior and exterior layout with material	To establish the specification requirements needed for the greenhouse to be functional	Request for Proposals/Scope of Work		Medium	
					Design Brief		high	
	3.1	Drainage and irrigation system and infrastructure in place			Drainage and storm water management		high	
	3.2	Spacing requirements; grouped plantings; species selection			Bed and tray preparation		high	
004	4	Educational curriculum			Education Department			
	4.1	Good communication between management and teachers			Develop Strategic Plan for 3-5 years			

Figure 16: GSS Greenhouse Project Requirement Traceability Matrix (Adapted from PMI Guide, 2017. p. 149).

Functional requirements:

- Polycarbonate structure approximately 30 x 60

- Site preparation and foundation with pipes, aluminum poles

- Flooring

- Irrigation system

- Benches/tables

- Shelving and bins

- Fencing

- Storage area

- Preparation area

- Equipment – trays, stakes, pots, trowels etc.

Work Breakdown Structure

The work required to complete this project will be sub-divided into individual work packages in order for it to be effectively managed. The project is broken down into five phases: the preliminary phase, the procurement phase, construction phase, curriculum phase and the transition. Elements at different levels are not necessarily the order in which work would be done. Sequencing will be done at a later stage. Each of these phases is then sub-divided further down to work packages (see WBS below).
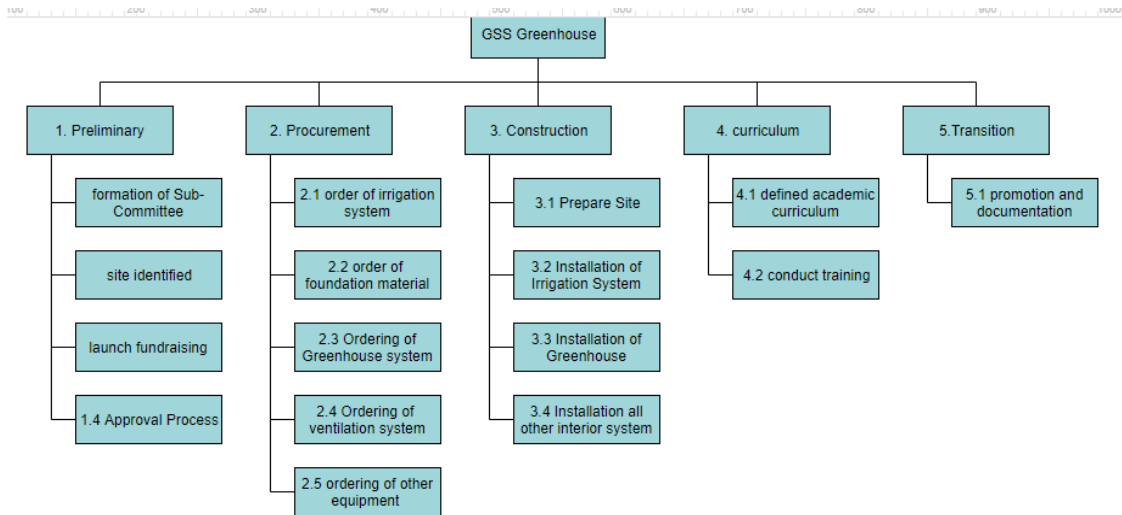
Figure 17: Work Breakdown Structure (compiled by Author)

Work Breakdown Structure Dictionary

The Work Breakdown Structure Dictionary is a document that provides detailed information about a work package (work at the lowest level in a work breakdown structure). Such information includes a unique number or WBS code of account, cost, duration, quality requirements, and the person responsible for carrying out the work. Below is the template that will be used for assigning work packages to resources management.

Chart 7: GSS Greenhouse Project Work Breakdown Dictionary (compiled by Author)

Activity ID Number	Element Name	Description of work	Responsibility
1.1	Formation Sub-committee	Determines the scope of work	Project Manager, Asst. Project Manager, Ministry of Agriculture
1.2	Site Identification	Solicits inputs on potential location	Project Manager, Asst. Project Manager Ministry of Agriculture.
1.3	Greenhouse Specification	Determines the requirements and design	Ministry of Agriculture, Project Manager and Asst. Project Manager
1.4	Fundraising	Determines initial budget and perform cost analysis and states how funds will be secured for project	Deputy Principal and other teachers, project manager and Asst. project manager
1.5	Present Proposal	Request approval	Ministry of Agriculture, Project Manager and Asst. Project Manager.
2.	Procurement	Ordering of Materials	Asst. Project Manager
3.	Construct	Preparation and installation of systems	Project Manager, Ministry of Agriculture
4.1	Greenhouse Curriculum	Defines the academic curriculum	Heads of Department, Principal, Deputy Principal
4.2	Training	Conducts training	Ministry of Agriculture
5.	Transition	Requirement and procedures to be transition	Project team

Scope Verification

As the project progresses, the project manager will verify interim project deliverables against the original scope as defined in the scope statement, WBS and WBS Dictionary. Once the project manager verifies that the scope meets the requirements defined in the project plan, the project manager and principal will meet for the formal acceptance of the deliverable. During this meeting, the project manager will present the deliverable to the principal for formal

acceptance. The principal will accept the deliverable by signing a project deliverable acceptance document. This will ensure that project work remains within the scope of the project on a consistent basis throughout the life of the project.

Scope Control

The project manager and the project team will work together to control the scope of the project. The project team will leverage the WBS Dictionary by using it as a statement of work for each WBS element. The project team will ensure that they perform only the work described in the WBS dictionary and generate the defined deliverables for each WBS element. The project manager will oversee the project team and the progression of the project to ensure that the scope control process is followed.

If the project scope needs to be changed, the process for recommending changes to the scope of the project must be carried out. Any project team member or sponsor can request changes to the project scope. All change requests must be submitted to the project manager in the form of a project change order. The project manager will then review the suggested change to the scope of the project. He will either deny the change request if it does not apply to the intent of the project or convene a change control meeting between the project team and sponsor to review the change request further and perform an impact assessment of the change. If the change request receives approval by the project manager and sponsor, the project manager will then formally submit the change request to the project sponsor who will then formally accept the change by signing the change order. Upon acceptance of the scope change by the project manager and project sponsor, the project manager will update all project documents and communicate the scope directive to all project team members and stakeholders. **Figure 12** below shows a template of change request form.

Scope Change Request Form
Customer:
Project:
Requested by:
Description of the Change:
Justification for the Change:
Project Impacts   **(Project Manager Use Only)**
Budget and Schedule Impacts:
New Project Completion Date: **Additional Project Costs:**
Date: **Resolution Required by:**
Signed (Project Manager):
Resolution:
Approved o   **Rejected** o   **Date:**
Signed:
Name and Title:

Figure 18: GSS Greenhouse Project Change Request Form. Adapted from Dexform Retrieved July 6, 2020 from http://www.dexform.com/change-request-template

4.3. Project Schedule Management

**SCHEDULE MANAGEMENT PLAN
FOR
CONSTRUCTION OF GREENHOUSE
AT
GEORGETOWN SECONDARY SCHOOL
JUNE 2020**

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Introduction

Project Schedule Management includes the processes required to manage the timely completion of the project. The project schedule management processes and their associated tools and techniques are documented in the schedule management plan. The Project Charter and the Scope Management Plan were used as inputs to this process to gather information regarding the Scope Baseline and the Summary Milestone Schedule. To create the Schedule Management Plan, the tools and techniques used were expert judgement, analytical techniques, and meetings. Since there were no OPA's, a Schedule Management Plan template was derived from another source and modified for this purpose.

Schedule Management Approach

The Schedule Management plan establishes the criteria and the activities for developing, monitoring and controlling the project schedule. Project schedules will be made using Microsoft Project 2013. Activity definition will identify the

specific work packages that must be performed to complete each deliverable. Activity sequencing will be used to determine the order of work packages and assign relationships between project activities. Activity duration estimating will be used to calculate the number of work periods required to complete work packages. Resource estimating will be used to assign resources to work packages to complete schedule development.

Once an initial schedule has been developed, the project manager and assistant project manager will assess it carefully to review assigned project tasks. The project team and resources must agree to the proposed work package assignments, durations, and schedule. Once this is achieved, the principal and expert from Ministry of Agriculture will review and approve the schedule and it will be baseline. The table below shows the schedule management roles and responsibilities.

Chart 8: Roles & Responsibilities (Source: S Jennings, Author)

Roles	Responsibilities
Project Manager	• Facilitate the breakdown of work packages into activities; • Create project schedule using MS Project 2013; • Validate the schedule with team
Project Team	• Participate in work, duration and resource estimating; • Review and validate the proposed assigned activities once approved.
Stakeholders	• Review of proposed schedule; • Assist validation and approve the final schedule before it is baseline.

Define Activities

According to PMI, Define Activities is the process of identifying and documenting the specific actions to be performed to produce the project deliverables (PMI, 2017 P.183). Of the techniques identified in the *PMBOK® Guide*, decomposition and expert judgement were the ones used during this process. The tool used to capture the information for this and the remaining processes required to develop the schedule was Microsoft Office Project 2013, identified as a scheduling software in the *PMBOK® Guide*. The Activity List seen in **Chart 9** below is an output developed from this process. It was compiled from the information in the schedule.

Milestone for project schedule
- Formation of Sub- Committee

- Identify site for greenhouse

- Fundraising initiatives

- Present proposal to principal

- Procure Solar -powered requirements

- Procure irrigation and foundation material

- Conduct training workshop for Agriculture teacher

- Conduct training workshop for 30 students

- Procure greenhouse and other materials

- Installation of irrigation system

- Installation of greenhouse system

- Installation of other materials

- Document maintenance procedures

- Transition by project team

Chart 9: Activity List (Source: Compiled by Author, S. Jennings)

GSS Greenhouse (Level 1)		
WBS ID	Activity Level 2)	Activity (Level 3)
1	Preliminary	1.1 formation of Greenhouse sub-committee. 1.2 Site identified 1.3 Launch fundraising 1.4 Greenhouse specification 1.5 Approval process
2	Procurement	2.1 Order of irrigation materials 2.2 Order of foundation materials 2.3 Procurement of greenhouse material 2.4 Procurement of equipment for farm use and other material needed.
3	Construction	3.1 prepare site 3.2 Installation of irrigation systems. 3.3 installation greenhouse system. 3.4 installation all other material and equipment
4	Greenhouse curriculum	4.1 Define Academic Curriculum 4.2 conduct training workshops
5.	Transition of Greenhouse	5.1 promotion and documentation of project

Activity Duration

Duration estimating is the process of estimating the number of work periods needed to complete individual activities with the estimated resources. Duration estimates must be realistic to ensure that the project schedule runs smoothly and there is no hidden padding of time that can lead to the project extending beyond acceptable timelines.

For this project, the estimation of project duration will be derived using expert judgement and historical data. The team and the Principal will be briefed to ensure that the established duration estimates for project activities are indeed achievable. Duration will be measured in days.

Chart 10: Activity Duration (Source: Compiled by S. Jennings)

Task Name	Duration	Resource Names
GSS Greenhouse Project	224days	
1. Preliminary	**97 days**	
1.1 Formation of Greenhouse Sub-Committee	2 days	Project Manager, heads of Department, Ministry of Agriculture, Principal, Deputy Principal, Asst. Project manager
1.2 Site Identification	1 day	Project Manager, Asst. Project Manager, Ministry of Agriculture
1.3 Greenhouse Specification	2 days	Project Manager , Ministry of Agriculture
1.4 Approval Process	2 days	Project Manager
1.5 Launch Fundraising	90 days	Principal , Heads of Departments
Procurement	**90 days**	
2.1 Order of irrigation Materials	30 days	Asst.Project Manager
2,2 Order of Foundation Materials	15 days	Asst.Project Manager

2.3 Order of Greenhouse	30 days	Asst.Project Manager
2.4 Order of equipment for farm use and other material needed	15 days	Asst.Project Manager
Construction	**22 days**	
3.1 Site Preparation (clearing of debris and leveling of land)	3 days	Site worker, Asst. Project manager
3.2 Installation of Irrigation system	7 days	Site worker, Ministry of Agriculture, Project manager
3.3 Installation Greenhouse	7 days	Site workers, Ministry of Agriculture, Project Manager, Asst. Project Manager
3.4 Installation of all other material and equipment (benches, trays etc.)	7 days	Site workers, Ministry of Agriculture, Project Manager, Asst. Project Manager
Greenhouse Curriculum	**19 days?**	
4.1 Define Academic Curriculum	14 days	Heads of Department, Principal, Deputy Principal
4.2 Conduct training workshop	5 days	Ministry of Agriculture
5. Transition of Greenhouse	**5 days**	Project Manager
5.1 Promotion and documentation of project	5 days	Project Manager

Develop Schedule

The creation or development of a project schedule is the process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model for project execution and monitoring and controlling. The importance of this process allows for the generation of a project schedule with planned dates for completing project activities. The progress of the project can also be accurately measured and to highlight any delays in the completion of project activities.

This project will seek to establish the critical path which is determined by identifying the longest stretch of dependent activities and measuring the time required to complete them from start to finish. In identifying the critical path there are some key elements will be used such as the list of all the acquires that are required to complete the project, the duration for each activity to be completed, the dependencies between activities and established endpoints such as milestones and deliverable items.

Chart 11: GSS Schedule (Source: Compiled by S. Jennings)

Activity Description	Duration	Start	Finish	Predecessors
GSS Greenhouse Project				
1. Preliminary	**97 days**	**Mon 25/05/20**	**Tue 06/10/20**	
1.1 Formation of Greenhouse Sub-Committee	2 days	Mon 25/05/20	Tue 26/05/20	
1.2 Site Identification	1 day	Wed 27/05/20	Wed 27/05/20	3
1.3 Greenhouse Specification	2 days	Thu 28/05/20	Fri 29/05/20	3,4
1.4 Approval Process	2 days	Mon 01/06/20	Tue 02/06/20	3,5
1.5 Launch Fundraising	90 days	Wed 03/06/20	Tue 06/10/20	3,6

Procurement	**90 days**	**Wed 07/10/20**	**Tue 09/02/21**	**2**
2.1 Order of irrigation Materials	30 days	Wed 07/10/20	Tue 17/11/20	7
2,2 Order of Foundation Materials	15 days	Wed 18/11/20	Tue 08/12/20	7,9
2.3 Order of Greenhouse	30 days	Wed 09/12/20	Tue 19/01/21	10
2.4 Order of equipment for farm use and other material needed	15 days	Wed 20/01/21	Tue 09/02/21	7,11
Construction	**22 days**	**Wed 10/02/21**	**Thu 11/03/21**	**8**
3.1 Site Preparation (clearing of debris and leveling of land)	3 days	Wed 10/02/21	Fri 12/02/21	9
3.2 Installation of Irrigation system	7 days	Sat 13/02/21	Mon 22/02/21	9
3.3 Installation Greenhouse	7 days	Tue 23/02/21	Wed 03/03/21	11
3.4 Installation of all other material and equipment (benches, trays etc.)	7 days	Thu 04/03/21	Fri 12/03/21	16
Greenhouse Curriculum	**19 days?**	**Fri 12/03/21**	**Wed 07/04/21**	
4.1 Define Academic Curriculum	14 days	Fri 12/03/21	Wed 31/03/21	7
4.2 Conduct training workshop	5 days	Thu 01/04/21	Wed 07/04/21	19
5. Transition of Greenhouse	**5 days**	**Fri 26/03/21**	**Thu 01/04/21**	
5.1 Promotion and documentation of project	5 days	Fri 26/03/21	Thu 01/04/21	7

Critical path shown on the project schedule was created in MS project 2010. See Figure 13 for the activities, which make up the project's critical path (highlighted in red)
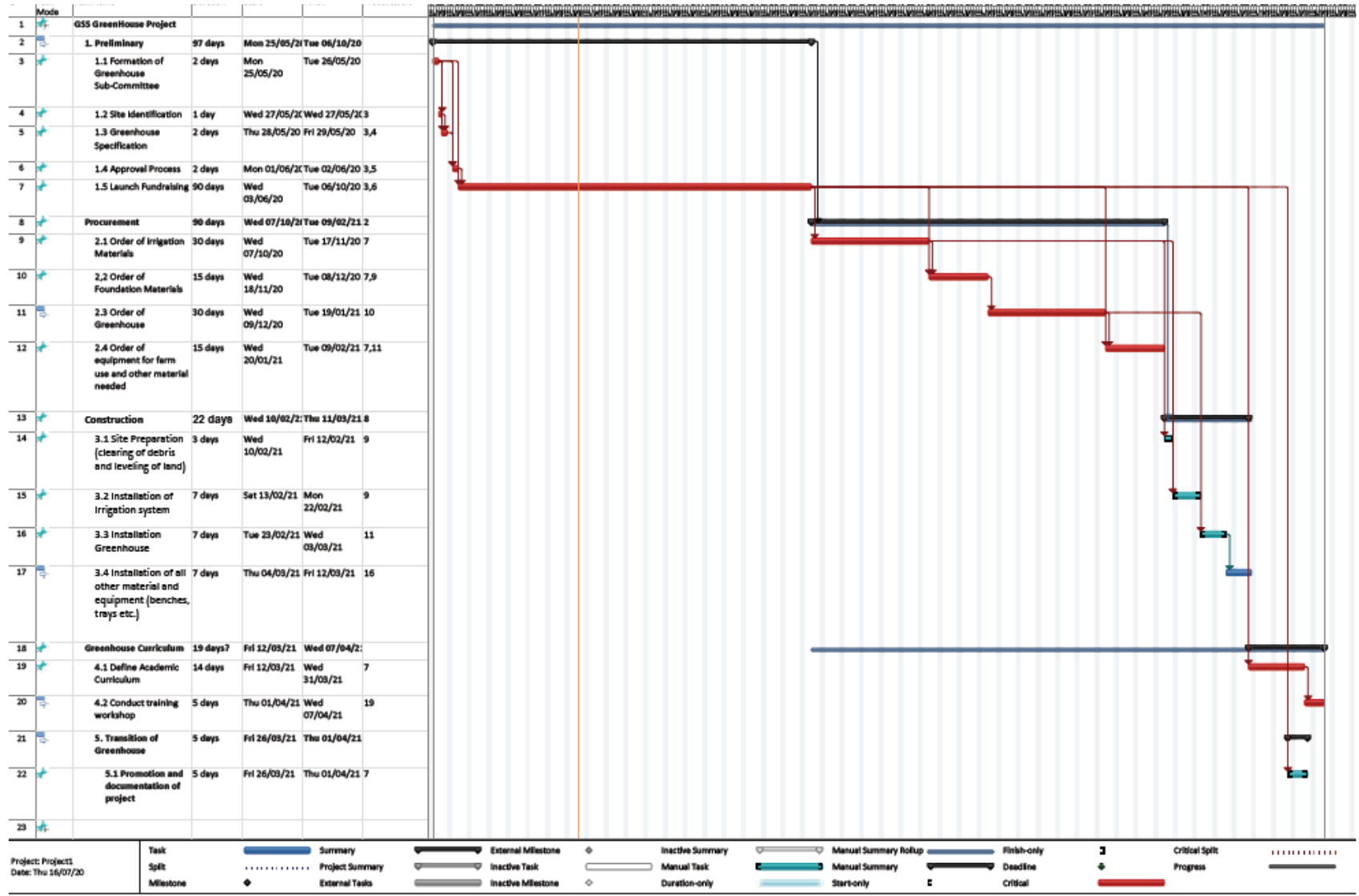
Figure 19: GSS Greenhouse Project Gantt chart (MS Project 2010, July 2020)

4.4. Project Cost Management

The tools and techniques used to develop the Cost Management Plan were expert judgement, analytical techniques, and meetings. Following this process, documents such as the Project Charter, Scope Management Plan, and Schedule Management Plan were updated in accordance with the *PMBOK® Guide.*

COST MANAGEMENT PLAN
FOR CONSTRUCTION OF GREENHOUSE
AT
GEORGETOWN SECONDARY SCHOOL
JULY 2020

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The project manager will be responsible for managing and reporting on the projects' cost throughout the duration of the project. He will send out a weekly financial report by e-mail to the project sponsor once we get funding, Ministry of Education, Ministry of Agriculture and the principal of the school.

During the bi-monthly project progress meeting, the project manager and assistant project manager will meet with the principal and Ministry of Agriculture to present and review the projects' cost performance for the preceding month. Performance will be measured using earned value management or metrics. The project manager is responsible for preparing the Cost Management Plan and the Cost Baseline. The project manager is responsible for accounting for cost deviations and presenting.

Cost Management Approach

Costs for this project will be managed at the second level of the Work Breakdown Structure (WBS). Control Accounts (CA) will be created at this level to track costs. Earned Value calculations for the CAs will measure and manage the financial performance of the project. Credit for work will be assigned at the work package level. The percentage of credit granted to each work package will be calculated based on the amount of work completed at a point in time compared to the total costs required to complete the work package. Costs may be rounded to the nearest dollar and work hours rounded to the nearest whole hour.

Cost variances of +/- 0.1 in the cost and schedule performance indexes will change the status of the cost to cautionary; as such, those values will be changed to yellow in the project status reports. Cost variances of +/- 0.2 in the cost and schedule performance indexes will change the status of the cost to an alert stage; therefore, those values will be highlighted in red in the project status reports. This will require corrective action from the project manager in order to bring the cost and/or schedule performance indexes below the alert level. Corrective actions will require a project change order and the project sponsor must approve it before it can be included within the scope of the project.

Measuring Project Costs

Earned Value Management will be used to measure the performance of the project. The following four Earned Value metrics will be employed to measure the project's cost performance:

1. Schedule Variance (SV)

2. Cost Variance (CV)

3. Schedule Performance Index (SPI)

4. Cost Performance Index (CPI)

If the Schedule Performance Index or Cost Performance Index has a variance of between 0.1 and 0.2, the project manager must report the reason for the exception. He must provide management with a detailed corrective plan to bring the project's performance back to acceptable levels.

Performance Measure	Yellow	Red
Schedule Performance Index (SPI)	Between 0.9 and 0.8 or Between 1.1 and 1.2	Less than 0.8 or Greater than 1.2
Cost performance index (CPI)	Between 0.9 and 0.8 or Between 1.1 and 1.2	Less than 0.8 or Greater than 1.2

Reporting Format

Reporting for cost management will be included in the bi-monthly project progress report. The Monthly Project Progress Report will include a section labelled, "Cost Management". This section will contain the Earned Value Metrics identified in the previous section. All cost variances outside of the thresholds identified in this Cost Management Plan will be reported on, including any corrective actions, which are planned. Change orders that are triggered based upon project cost overruns will be identified and tracked in this report.

Cost Variance Response Process

The Control Threshold for this project is a CPI or SPI of less than 0.95 or greater than 1.15. If the project reaches one of these Control Thresholds, a Cost Variance Corrective Action Plan is required. The project manager will present the project sponsor with options for corrective actions within five business days from when the cost variance is first reported. Within three business days from when the project sponsor selects a corrective action option, the project manager will present the project sponsor with a formal Cost Variance Corrective Action Plan. The Cost Variance Corrective Action Plan will detail the actions necessary to bring the project back within budget and the

means by which the effectiveness of the actions in the plan will be measured. Upon acceptance of the Cost Variance Corrective Action Plan, it will become a part of the project plan and the project will be updated to reflect the corrective actions. **Chart 12** below shows the cost baseline for the project and **figures 20 and 21** outlined the cash flow and the corresponding S-curve.

Georgetown Secondary School Greenhouse Project Cost Baseline

Project Manager: Rodwell Williams

Date Prepared 17 July 2020

Chart 12: GSS Cost Baseline (Source: Compiled by S. Jennings)

Item	Activity name	Duration	Unit	Unit cost	Total project cost
1	Formation of Sub-committee	2days	1	0	$0.00
2	Site Identification	1day	1	0	$0.00
3	Greenhouse Specification	2days	1	$500.00	$500.00
4	Approval Process	2 days	1	0	$0.00
5	Launch Fundraising Activity	90 days			$500.00
6	Order of Irrigation Materials	30 days	1	$3,319.67	$3,319.67
7	Order of Foundation Materials	15 days		$400.00	$400.00
8	Order of Greenhouse (30x60)	30 days	1	$8241.00	$8,241.00
9	Order of Equipment for Farm Use and Other Materiasl Needed	15days		$600.00	$600.00
10	Site Preparation(clearing of Debris and Leveling Land)	3 days	3	$250.00	$750.00
11	Installation of Irrigation System	7 days	3	$560.00	$1680.00
12	Installation of Greenhouse	7 days	3	$733.33	$2200.00
13	Installation of all other Materials and Equipment	7 days	3	$733.33	$2200.00
14	Define Academic Curriculum	14 days	9	$10.00	$90.00
15	Conduct Training Workshop	5 days	2	$438.34	$876.67
16	Promotion and Dcumentation of Project	5 days		$1642.00	$1642.00
	Cost Baseline				**$22999.32**
	Contingency Reserve 3%				**$690.00**
	TOTAL				**$23689.32**

Approvals

Printed Name:	Printed Name:
Title:	Title:

Cash Flow GSS Greenhouse Project

		May	June	July	August	September	October	November	December
GSS Greenhouse Project									
1. Preliminary									
1.1	Formation of Greenhouse Sub-Committee								
1.2	Site Identification								
1.3	Greenhouse Specification	$500							
1.4	Approval Process								
1.5	Launch Fundraising		$111.11	$127.78	$116.67	$122.22	$22.22		
Procurement									
2.1	Order of irrigation Materials						$1,991.80	$1,327.87	
2,2	Order of Foundation Materials							$240.00	$160.00
2.3	Order of Greenhouse								$4,669.90
2.4	Order of equipment for farm use and other material needed								
Construction									
3.1	Site Preparation (clearing of debris and leveling of land)								
3.2	Installation of Irrigation system								
3.3	Installation Greenhouse								
3.4	Installation of all other material and equipment (benches, trays etc.)								
Greenhouse Curriculum									
4.1	Define Academic Curriculum								
4.2	Conduct training workshop								
5. Transition of Greenhouse									
5.1	Promotion and documentation of project								
Total			$111.11	$127.78	$116.67	$122.22	$2,014.02	$1,567.87	$4,829.90

	January	February	March	April	Total
GSS Greenhouse Project					
1. Preliminary					
1.1 Formation of Greenhouse Sub-Committee					
1.2 Site Identification					
1.3 Greenhouse Specification					$500.00
1.4 Approval Process					
1.5 Launch Fundraising					$500.00
Procurement					
2.1 Order of irrigation Materials					$3,319.67
2,2 Order of Foundation Materials					$400.00
2.3 Order of Greenhouse	$3,571.10				$8,241.00
2.4 Order of equipment for farm use and other material needed	$320.00	$280.00			$600.00
Construction					
3.1 Site Preparation (clearing of debris and levelling of land)		$750.00			$750.00
3.2 Installation of Irrigation system		$1,680.00			$1,680.00
3.3 Installation Greenhouse		$1,257.14	$942.86		$2,200.00
3.4 Installation of all other material and equipment (benches, trays etc.)		$1,885.71	$314.29		$2,200.00
Greenhouse Curriculum					
4.1 Define Academic Curriculum			$90.00		$90.00
4.2 Conduct training workshop					
Transition of Greenhouse			$701.34	$175.33	$876.67
5.1 Promotion and documentation of project			$1,313.60	$328.40	$1,642.00
Total	$3,891.10	$5,852.85	$3,362.09	$503.73	$22,999.34

Figure 20 the cash flow of GSS Greenhouse project developed in (Ms Project 2010)
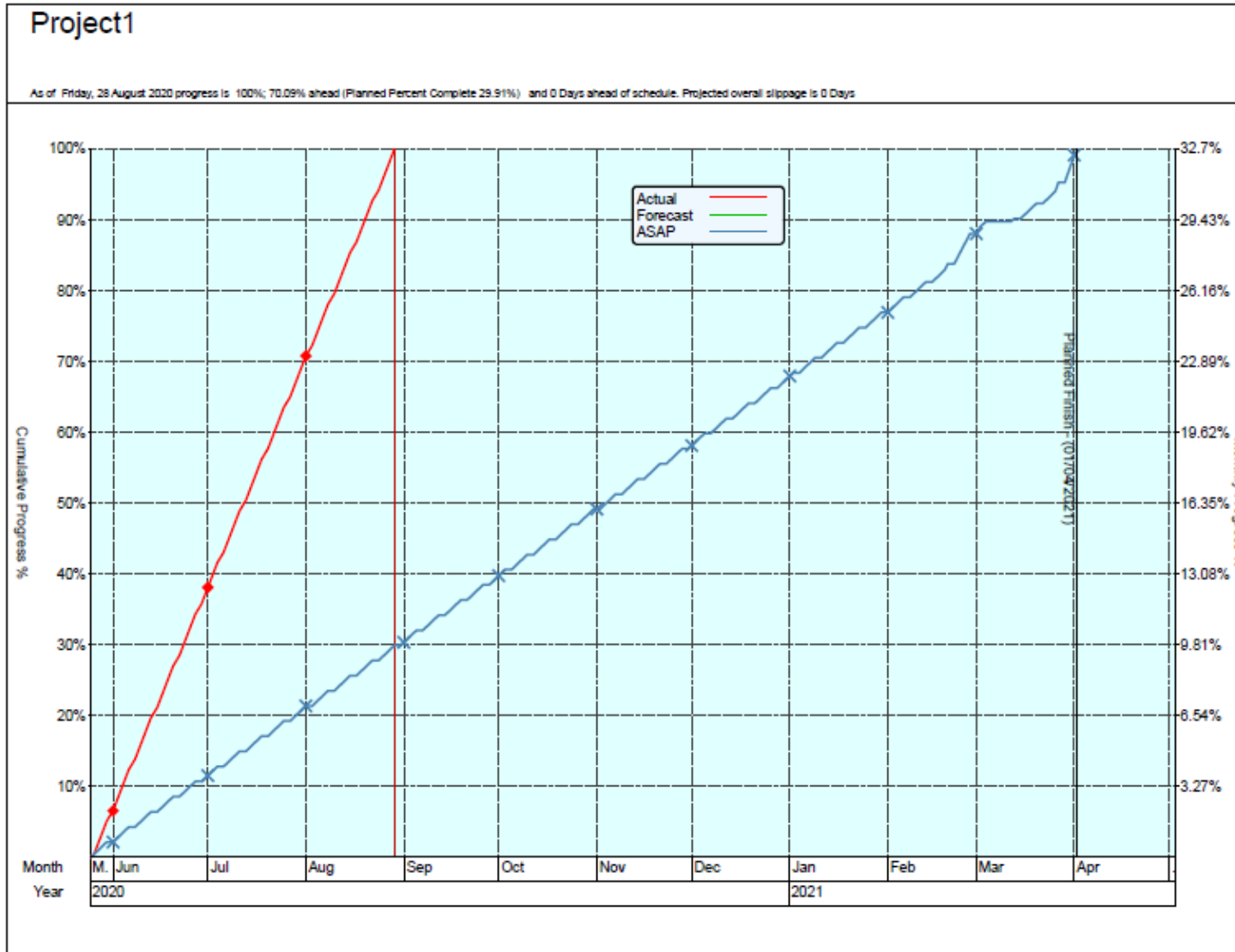
Figure 21 the S-Curve of GSS Greenhouse project developed in (Ms Project 2010)

Project Budget

Project Budgeting is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline. Using the information from the Activity Costs Estimates, Scope Baseline, Cost Management Plan, Project Schedule, Risk Register and Agreements, the budget was determined by aggregating the costs of each work package. After developing the schedule, the costs were estimated for the project. The Cost Management Plan was used as an input to this process. The tools and techniques used were expert judgement, bottom-up, analogous, and parametric estimating. In order to determine the cost of each work package, costs were estimated for each related task required to complete the components of work identified during Activity Definition. To do this, analogous estimating and parametric estimating were utilized.

In addition, the contingency reserved is used to manage identified risk, so the number is estimated at 3%. Expert judgement was used to identify the percentage allocated for the contingency reserve. Because of the number of known-unknowns identified in the Project Charter and Risk Management Plan and past experiences, the decision was made to calculate the contingency at the low end of the range.

Cost Change Control Process

The cost change control process will follow the established project change order, the principal must approve all approval for project budget/cost changes. Monitoring and controlling the project budget ensures that only the appropriate project changes are included in the budget baseline, that information about authorized changes are communicated and corrective actions are taken by those in charge.

Purchase order forms are completed for each set of related project expenses such as equipment and material costs. The project manager and principal must give their approval. The principal is to record, track and monitor the budget.

4.5 Project Quality Management

The Quality Management Plan is a component of the project management plan. It describes how the organization's quality policies are to be implemented. A modified template from online source the quality management plan for the construction of the Greenhouse Project for the GSS would be used. Plan Quality Management is the only Quality Management process used during project planning. The inputs for this process identified in the *PMBOK® Guide* were used to develop the Quality Management Plan. These inputs included the stakeholder register, risk register, and the requirements documentation previously developed by the assistant project manager. In addition, the Requirements Management Plan was used as an input, because it identified the requirements of good quality previously outlined by the project team.

QUALITY MANAGEMENT PLAN
FOR
CONSTRUCTION OF THE GREENHOUSE PROJECT
AT
THE GEORGETOWN SECONDARY SCHOOL
JUNE 2020

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PLAN QUALITY
MANAGE QUALITY
CONTROL QUALITY

Introduction

The primary purpose of the plan is to define how quality will be managed throughout the lifecycle of the GSS greenhouse project. The project team and the expert from the Ministry of Agriculture will establish the activities, processes, and procedures such as:

Ensure quality is planned

- Define how quality will be managed
- Define manage quality activities
- Define quality control activities
- Define acceptable quality standards

The intended audience is the project team and any senior leaders whose support is needed to carry out the plan.

Plan Quality

The GSS greenhouse shall be constructed to the highest standards of quality to withstand the climatic conditions that the Caribbean encounters annually. To achieve this standard, all persons must develop a culture of quality and strive to achieve the highest standard and approval form the inception of this project. Quality is the responsibility of all. The following are the processes and procedures to be followed:

a. Construct a greenhouse with materials procured from companies and manufacturers that show a record of sustainable practices;
b. The project team shall meet to discuss individual method to ensure proper understanding of what to be done;
c. All materials are to be thoroughly inspected by the project manager and signed off and dated;
d. The project manager or Ministry of Agriculture will determine the product quality standards and requirements;
e. The project manager will determine the process quality standard and requirement. Many of these standards will be based on existing greenhouse process standards;

f. Upon reaching a milestone, the project manager shall notify the expert at Ministry of Agriculture. Then quality inspection will be carried out. Upon approval the work may proceed.

g. If a defect is found and corrective actions require a change in the project scope, a written request shall be presented with clear justification and potential impact on project time and cost. The principal and project manager must sign the approval for such change before any change is made.

h. All training must be done before the project is closed.

Manage Quality

The quality assurance of the GSS greenhouse focuses on the processes used in the construction of the building. In order to ensure quality, an iterative quality process will be used throughout the project life cycle. This iterative process includes measuring process metrics, analysing process data, and continuously improving the processes.

The project manager, technician from Ministry of Agriculture and the project team will perform assessments at planned intervals throughout the project to ensure all processes are being correctly implemented and executed. The key quality control metrics are:

- Economic – design, construction and operational cost and productivity.
- Environmental- use of resources, waste generation
- Social – user's health and comfort and community impact.

Quality Metrics are an objective measure of the quality of a product or process. Quality metrics use common language to assess progress about quality and will be used as the method to quantitatively assess the GSS Greenhouse project. The table below provides the key quality metrics for the project.

Metrics	measurement	tolerance	Reported By
Number of opened change request	Total new change request created in the report period.	No tolerance, report on a weekly to subcommittee.	PMO
Baseline finish versus Actual finish	Number of planned tasks that should have finished/total number of tasks in 30 days look ahead.	No more than 10% of planned tasks are late as per the baseline finish date.	PMO

The project manager and the project team will provide day-to-day quality management and conduct process audits on a weekly basis, monitor process performance metrics, and assure all processes comply with project standards. If discrepancies are found, the project manager or assistant project manager will meet with the technical personnel and review the identified discrepancies.

The assistant project manager will schedule regularly occurring project, management, and document reviews. In these reviews, an agenda item will include a review of project processes, any discrepancies and/or audit findings, and a discussion on process improvement initiatives.

Process improvement is another aspect of quality assurance. Quality assurance reviews, findings, and assessments should always result in some form of process improvement and, as a result, product improvement. All process improvement efforts must be documented, implemented, and communicated to all stakeholders as changes are made.

Quality Control

The quality control of the construction of the GSS Greenhouse project focuses primarily on the construction and transition of the building. The quality performance standards for the building of the Greenhouse Project are in accordance with the organizational standards. Additionally, all physical measurements will be conducted to ensure compliance with established quality standards.

The project team will perform all physical measurements on site and will ensure all physical and performance standards are met. The project manager will schedule regularly occurring project, management, and document reviews. In these reviews, an agenda item will include a review of products, any discrepancies and/or audit findings from the assistant project manager, and a discussion on product improvement initiatives.

It is imperative to the success of the project that all of the established physical and performance standards are reached.

Quality Control Measurements

All GSS Greenhouse Project products and processes must be measured and fall within the established standards and tolerances. The logs below will be used by the project and quality teams in conducting these measurements and will be maintained for use as supporting documentation for the project's acceptance.

Quality Assurance Log

Process inspection #1	Date	Process Measured	Required Value	Actual Measured	Acceptable? (Y/N)	Recommendation	Date Resolved.

Quality control log

Deliverable	Date	Item Measured	Required Value	Actual Measured	Acceptable? (Y/N)	Recommendation	Date Resolved

Template for the GSS Greenhouse project Quality Management Plan. **Adapted from *Project Management Docs.* Retrieved June 27, 2017 from http://www.projectmanagementdocs.com/template/Quality-Management-Plan.doc**

4.6. Plan Resource Management

**PLAN RESOURCE MANAGEMENT PLAN
FOR CONSTRUCTION OF GREENHOUSE PROJECT
AT
GEORGETOWN SECONDARY SCHOOL
JULY 2020**

Introduction

Plan Resource Management is the process of defining how to estimate, acquire, manage, and use team and physical resources. The key benefit of this process is that it establishes the approach and level of management effort needed for managing project resources based on the type and complexity of the project.

The plan resource management is the only process from the Resource Management knowledge area that will be used during the planning process on the GSS Greenhouse Project. It will utilize the following tools and techniques. Expert judgment and data representation techniques like hierarchical charts and the RACI chart are useful tool to use to ensure clear assignment of roles and responsibilities when the team consists of internal and external resources. Below depicts the GSS Greenhouse Project Organisational Chart.
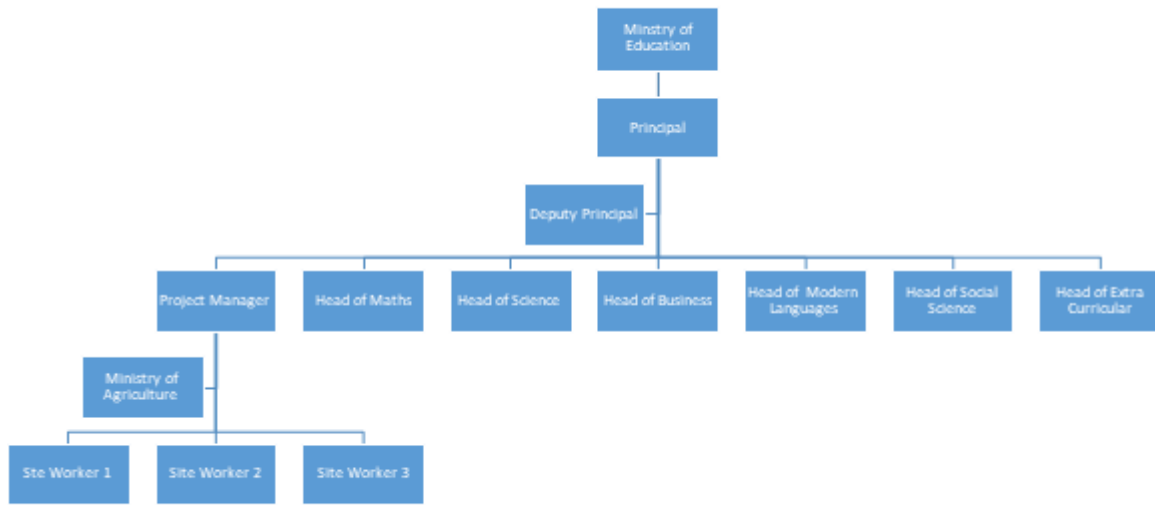
Figure 22: GSS Greenhouse Project Organisational Chart (Source: Author Sybil Jennings)

Roles and Responsibilities

The roles and responsibilities for the project team of the Building of the Greenhouse Project are essential to project success. All team members must clearly understand their roles and responsibilities in order to successfully perform their portion of the project. Table below outlined the following project team roles and responsibilities that have been established:

Name	Roles	Responsibilities
Ministry of Education	Control Board	• Approve or deny scope change requests as appropriate. • Accept final deliverables
Rodwell Williams	Project Manager	• Measure and verify project scope • Facilitate scope change requests • Facilitate impact assessments of scope change requests • Organize and facilitate scheduled change control meetings • Communicate outcomes of scope change requests • Update project document upon approval of all scope.
Assistant Project And Project Team	Team Members	• Participate in defining change resolutions • Evaluate the need for scope changes and communicate them to the project manager as necessary. • Can propose scope changes • Will execute change directives issued by project manager
HOD	Teachers/ Site Workers	• Develop curriculum for their various department to integrate the use of greenhouse. • Monitor and evaluate
Students	Beneficiary	• Participate in the greenhouse, irrigation, and technology training. • Facilitate the operation, maintenance of the greenhouse and the irrigation system.

A RACI chart is a useful tool to use to ensure clear assignment of roles and responsibilities when the team consists of internal and external resources.

Chart 13: RACI for GSS Greenhouse Project (Source: S. Jennings)

Greenhouse Project	Roles				
	Min Of Education	Principal	Min of Agriculture (Technical)	Project Manager	Head of Dept.
Requirements & Specifications	I	I	C	A	I
Fundraising Activities	I	A		C	R
Project Approval	C	A	I	R	I
Change Request	I	A	C	R	I
Procure Material	I	A	C	R	I
Project Scope	I	A	C	R	I
Manage Site Workers	I	I	C	R	I
Curriculum Develop	I	A		C	R

KEY:
R - RESPONSIBLE
A - ACCOUNTABLE
C- CONSULTED
I – INFORMED

Estimate Activity Resources

Activity Resources is the process of estimating team resources and the type and quantities of materials, equipment, and supplies necessary to perform project work. The key benefit of this process is that it identifies the type, quantity, and characteristics of resources required to complete the project. The inputs will be used in the process of activity resource estimating. Those inputs are the activity list, project management plan, and the resource availability. The GSS Greenhouse Project will utilize three (3) main estimations:

- Effort estimation

- Cost estimation

- Resource estimation

Effort Estimation:

Effort estimation will allow the GSS Greenhouse Project to know beforehand and before implementing an application, the amount of effort required to develop this application on time and within budget. To estimate effort, it is necessary to have knowledge of previous similar projects that have already been developed by various schools and Ministry of Agriculture and to understand the project variables that may affect effort prediction.

Meetings as a key expert-based method that we will use due to the previous project knowledge and expertise of the project team augmented with process guidelines, checklists, and data) to generate sound predictions.

Cost Estimation:

The currency that will be used to quote monetary figures is USD. The chart below gives an example of the main budget items on the project will be.

The following budget will be used to estimate the cost of the project activities.

GSS Greenhouse Project Budget	
Project Deliverable	Cost Estimated
Preliminary	$1000.00
Procurement	$12560.67
Construction	$6830.00
Define Curriculum	$966.67
Transition	$1642.00
Subtotal	$22999.34
Contingency Reserve	$690.00
Total Project Budget	**$23689.34**

Resource Estimate

As the project team for the GSS Greenhouse Project has done several projects of a similar nature before, Analogous Estimating has been chosen as the most suitable estimation method. This technique is used when there is a reference to a similar project executed and it is easy to correlate with other projects. Expert judgment and historical information of similar activities in a referenced project are gathered to arrive at an estimate of the project.

Acquire Resources:

Acquire Resources is the process of obtaining team members, facilities, equipment, materials, supplies, and other resources necessary to complete project work. The key benefit of this process is that it outlines and guides the selection of resources and assigns them to their respective activities.

The Acquire Resources process is repeated at several stages throughout the project as the need arises. In the early stages of the project, a high-level requirement of resources will be available, but as the plan is refined, further detail is added. This leads to more accurate specifications for the resources.

Material acquisition for the GSS Greenhouse Project will be standardized to ensure that only high-quality durable materials are used to construct the greenhouse. Before any material is procured, it must meet the rating requirements and approved by the Ministry of Agriculture expert and project manager.

Develop Team

Develop Team is the process of improving competencies, team member interaction, and the overall team environment to enhance project performance. To develop the soft skills in the project team a systematic methodological approach will be used to change undesirable habits.

Training Needs Assessment

The GSS Greenhouse Project comprises of project personnel who are technically skilled, unskilled and expert. It is critical to first identity the requisite individual skills that are needed by the project team. As such, soft skills will be the very first skill to develop in the team.

For soft skills training needs assessment, each team member must do an objective self-assessment along with assessing others (anonymously) to allow truthful critical and feedback from peers. Through this process, it will also be important to highlight the benefits of self-reflection so that each person can see it as a tool to develop and grow in their professional life and career within and outside of the project. When each project member aligns their goals with the needs of the company, it engages employees and gets them personally invested in the training.

Managing Team Formation

Manage Team is the process of tracking team member performance, providing feedback, resolving issues, and managing team changes to optimize project performance. In order to manage a team understanding, team development is critical to create plans to address issues that arise during each stage. According to psychologist named Bruce Tuckman, a team goes through five (5) stages of development: forming, storming, norming, performing and adjourning. Each stage of development has its own dynamics that the project manager will need to fully understand in order to lead a productive team and a successful project.

The first stage of team development is the Forming Stage. During this stage, the team is introduced and everyone starts to familiarize themselves with each as well as their roles and responsibilities. In the forming stage, there often exists high uncertainty and low conflict among team members and a usual tendency for members to behave independently. In this regard, the project manager will need to build a strong foundation for teamwork. He or she should

also be on the lookout for the formation of cliques or subgroups within the team that may act counterproductive to the established objectives of the project and have a negative impact on the project. To avoid initial misunderstandings among team members and encourage cohesive behavior, the project manager will be responsible for managing the team during the formation stage and implementing some or all of the activities below to ensure that the Blue Spider Project team remains cohesive during the formation stage.

To manage the formation stage of the GSS Greenhouse Project, the project manager will:

- Define roles and responsibilities of team members;
- Explain the lines of authority within the project;
- Share relevant policies and procedures that the team must adhere to while engaged on the project;
- Establish goals for the team;
- Discuss with the team and acquire consensus on ways to build trust within the team;
- Establish expectations for the team and its members;
- Create and agree to a team charter;
- Arrange team-building activities and occasionally meet to work on common tasks.

Control Resources

Control Resources is the process of ensuring that the physical resources assigned and allocated to the project are available as planned, as well as monitoring the planned versus actual utilization of resources and taking corrective action as necessary. The key benefit of this process is ensuring that the assigned resources are available to the project at the right time and in the right place and are released when no longer needed.

For the Control Resources process of the GSS Greenhouse, the techniques below will be used:

- **Brainstorming** - Brainstorming will be conducted with the sub-committee team who focus on identification of risk for the project.

- **Root Cause Analysis** - Root causes are determined for the identified risks. These root causes are further used to identify additional risks.

- **Checklist Analysis** - The checklist of risk categories is used to come up with additional risks for the project.

4.7 Communication Plan Management

To ensure that information communicated about the project during the project lifecycle will be disseminated to the appropriate parties at the correct time, the Communications Management Plan, seen below, was developed using the *PMBOK® Guide*. The plan details how each stakeholder would receive information from members of the project team, the frequency of communication, the information that would be communicated to them and the person responsible for ensuring that the correct information was received by the communication sent.

COMMUNICATION PLAN MANAGEMENT

FOR CONSTRUCTION OF GREENHOUSE PROJECT

AT

GEORGETOWN SECONDARY SCHOOL

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Introduction

Plan Communication

Manage Communication

Monitor Communication

Introduction

The Communications Plan will serve as a guide to assist in communication between the stakeholders of the construction of the Greenhouse Project. The project manager and assistant project manager will take the primary role in ensuring effective communications on this project. The communications matrix is a major section of this plan. It documents the communication requirements, the information being communicated, and audience for each communication, the frequency of communication, and the individual responsible for the communication or dissemination of the information to the appropriate audience.

Audiences

The major audience for this project is the entire project team.

Plan Communication

Plan communication is the process of developing an appropriate approach and plan for communications based on stakeholder's information needs and requirements. This process will be performed periodically throughout the project as needed. The input tools and techniques that were used are meetings, communication models and techniques.

The first step in the Plan Communication Management for the GSS Greenhouse Project is to identify and assess each stakeholder. This step will guide the appropriate channels, methods and frequency of the entire communication process. Chart 14 shows an example of the identification and assessment of stakeholders using the Stakeholder Impact, Power, Interest and Influence Matrix.

Chart 14: GSS Greenhouse Project- Stakeholder Impact -Power-Interest-Influence Matrix (Source: S. Jennings)

Stakeholder	Impact (low, medium, high)	Interest (low, medium, high)	Power (low, medium, high)	Influence (low, medium, high)
Ministry of Education	medium	medium	high	medium
Ministry of Agriculture	high	high	medium	high
Principal	high	high	high	high
Project Manager	high	high	low	low
Head of Departments	low	high	medium	medium
Students	low	high	low	low

Communication Method

It is crucial that the project manager work closely with stakeholders. Establishing ground rules for effective stakeholder's communication will save time, remove obstacles and ultimately, finish the project on time and within budget. Several communication methods will be utilized on the GSS Greenhouse Project when communicating with stakeholders. **Chart 15** shows the communication matrix.

Communication Technology

The following methods will be used within the project to disseminate information among project stakeholders: emails, social media and websites.

Chart 15: GSS Greenhouse Project Communication Matrix (Source: Author S. Jennings)

Communication	Format	Objective	Frequency	Owner	Distribution	Escalation
Formation of sub-committee	Face-to-face	Introduce Project Team, Review project objectives and management approach	One-time	PM	All project team members and major stakeholders	PMO
Weekly Status Update	Email	Review status with project team	Once a week	PM	PM, PMO	PM
Action Item Follow up	Conference Call and Email	Ensure deliverables are on track	Once every two work days (M,W,F)	PMO	Everyone with an assigned action item	PM
Budget Usage	Face-to-face, presentations and email	Report status of budget	Fortnightly	CFO	PM	Program Manager
Risk Review and Update	Face-to-face, presentations and email	Report status and risks to project management, issues, costs and activities.	Fortnightly	PM	Project Engineer, PM	PM

Manage Communication

The Manage Communications is the process of ensuring timely and appropriate collection, creation, distribution, storage, retrieval, management, monitoring and the ultimate disposition of project information. The key benefit of this process is that it enables an efficient and effective information flow between the project team and the stakeholders. This process is performed throughout the GSS Greenhouse Project.

The Manage Communications process identifies all aspects of effective communication, including choice of appropriate technologies, methods, and techniques. In addition, it should allow for flexibility in the communications activities, allowing adjustments in the methods and techniques to accommodate the changing needs of stakeholders and the project. GSS Greenhouse Project will utilize the following tools and techniques to effectively manage communications.

Communication Technology:

Communication technology refers to the tools, systems, and equipment that are used to transfer different information to the stakeholders of the project. The methods used to transfer information among project stakeholders throughout the GSS Greenhouse project will vary based one the situational needs. Common methods that will be used for information exchange and collaboration include conversations, meetings, written documents, database, social media and websites.

In using these methods, the project manager along with the project team will consider the following factors that can affect the choice of communication technology used:

Urgent need for information - urgency, frequency, and the format of the information to be communicated may vary from time to time during the different phases of the GSS Greenhouse Project

Ease of use – The choice of communication technologies must be suitable for project participants and at training events that will be planned.

Project environment – The team can meet and operate on a face-to-face basis or in a virtual environment or it can use a combination of both.

Monitor Communication

Monitor Communications is the process of ensuring the information needs of the project and its stakeholders are met. The key benefit of this process is the optimal information flow as defined in the communications management plan.

A key feature in the monitoring process is the establishment of checkpoints to make sure that the project is on the right track. Monitoring therefore requires a system for recording, on a regular basis, useful information and keeping track of the activities and progress being made towards the set objectives. Monitoring identifies when something is going wrong on the project and it assists in establishing the correct course of action to remedy the situation. Chart 16 clearly outlines how the project progress will be tracked and the scheduled periods for collecting information.

Chart 16: GSS Greenhouse Project Monitoring, Reporting and Evaluation (Source: Author S. Jennings)

Method of Monitoring and Evaluation	Frequency	Responsible Party
Inception report on the initial activities undertaken at the start of the project.	Within the first month of the project start.	Ministry of Agriculture, project manager
Monthly reporting activities on the number of adaptation and mitigation measures in irrigation and greenhouse technologies.	Monthly	Expert/ Consultant from Ministry of Agriculture
Financial summary of the expenditure incurred during the reporting period.	Monthly	Teacher (Accounts) at GSS
Final Project report	Two weeks before the end of the project	Project team.

4.8. Project Risk Management

Plan Risk Management is the process of defining how to conduct risk management activities for a project risk. PMI defines it as, "an uncertain event or condition that, if it occurs, that has a positive or negative effect on a project's objectives." (PMI, 2017, p. 410).

The Project Charter and Stakeholder Register were used as inputs to the process. The tools and techniques used were expert judgment, meetings, stakeholders' analysis and SWOT analysis. The Risk Management Plan below states how risks will be identified, analysed, planned for, and monitored and controlled throughout the project lifecycle (Project Management Institute, 2017, p. 414).

RISK MANAGEMENT PLAN

FOR CONSTRUCTION OF GREENHOUSE PROJECT

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Purpose
Plan Risk Management
Risk Identification
Risk Assessment
Classifying and Prioritizing Risk
Risk Response Planning
Risk Monitoring, Controlling and Reporting

PURPOSE

This plan documents the processes, tools and procedures that will be used to manage and control those events that could have a negative impact on the GSS Greenhouse Project. It is the controlling document for managing and controlling all project risks.

Plan Risk Management

The project manager working with the project team will ensure that risks are actively identified, analyzed and managed throughout the life of the project. Risks are identified as early as possible in the project to minimize their impact. The subsequent section outlines the steps for accomplishing this. The project manager will serve as the risk manager for this project.

Risk Identification

A risk is any event that could prevent the project from progressing as planned, or from successful completion. Risks can be identified from a number of different sources. Some may be obvious and will be identified prior to project kickoff. Others will be identified during the project lifecycle, and can be identified by anyone associated with the project. Some risk will be inherent to the project itself, while others will be the result of external influences that are completely outside the control of the project team.

The GSS Greenhouse Project Manager has overall responsibility for managing project risk. Project team members may be assigned specific areas of responsibility for reporting to the project manager. Throughout all phases of the project, a specific topic of discussion will be risk identification. The intent is to instruct the project team the need for risk awareness, identification, documentation and communication.

Risk Assessment

The impact and probability of risks will be evaluated using a probability impact matrix during qualitative risk analysis. There will be a response plan developed for all risks identified as having any impact on the project, positive or negative.

Classifying and Prioritizing Risk

In order to determine the severity of the risks identified by the team, a probability and impact factor was assigned to each risk. This process allowed

the project manager to prioritize risks based upon the effect they may have on the project.

Qualitative Risk Analysis

The project manager, with input from the project team using the following approach, will assess the probability and impact of occurrence for each identified risk.

Probability

- High - Greater than <70%> probability of occurrence – these risks have the potential to affect project cost, schedule or performance.

- Medium- between <30%> and <70%> - these risks have the potential to slightly impact project cost, schedule or performance.

- Low- below <30%> - these risks have relatively little impact on cost, schedule or performance.

Based on the probability of each risk occurring and its possible impact on the project, risks that fall within the red zone represents high risks, the yellow zone moderate risks and the green zone low risks.

To identify the project risks, the Risk Management Plan, Cost Management Plan, Schedule Management Plan, Quality Management Plan, Human Resource Management Plan, Scope baseline, Activity Cost and Duration Estimates, Stakeholder Register and Procurement documents were used as inputs to the process. The tools and techniques employed were documentation reviews, and expert judgment. The risk register below is the output from this process. Below are the probability and impact scales, probability matrix and risk register in chart is the Risk Register for GSS Greenhouse Project.

Probability and impact scales.

Probability and Impact scales.						
Scale	Probability	Probability Score	Impact on Project			
			Schedule	Cost	Scope	Impact Score
Low	< 30%	0.3	< 1month	1% to < 2%	Product performance s hortfall in area of tertiary (minor) importance	0.2
Medium	30% to < 60%	0.6	1 month to < 4 months	2% to < 4%	Product performance shortfall in area of secondary importance	0.4
Very High	> 70%	0.9	> 4 months	> 8%	Significant failure of product to meet one of its primary (critical) purposes	0.8

Figure 23 GSS Greenhouse project probability and impact scale adapted from PMBOK guide (2017): table 11-1 Example of definitions for probability and impact (p.407)

Probability and Impact Matrix

			Threats			Opportunities		
Probability		0.9	0.18	0.36	0.72	0.72	0.36	0.18
		0.6	0.12	0.24	0.48	0.48	0.24	0.12
		0.3	0.06	0.12	0.24	0.24	0.12	0.06
			0.2	0.4	0.8	0.8	0.4	0.2
			Impact					

Figure 24 GSS Greenhous project probability and impact scale adapted from PMBOK guide (2017): table 11-5 Example probability and impact matrix with scoring scheme (p.407)
Scale

Chart 17: Risk Register (Source: S Jennings, Author)

RBS Code	Cause	Risk	Consequences	Probability	Impact	Classification	Trigger	Owner	Strategy	Cost
1	Poor research on technology	The technology implemented failed to work as expected.	The expected schedules are delayed.	0.3	0.2		Missed installation deadline	Ministry of Agriculture	Extensive research on the required technology undertaken prior to purchase and installation	Cost of technical advice.
2	Vandalism	Intrusion and damage to crops by livestock.	Failure to meet quality standard	0.3	0.2		Lack of funding for fencing	Project manager	Fencing cost will be calculated in materials needed and will be installed	No extra cost
3	Poor estimate of human resources	Availability of technical expertise	Inability to have a technical advisor cause schedule delay	0.3	0.2			Sub-committee	Ensure that expert is available in country within the Ministry of Agriculture's Technical team	
4	Project delayed	Lack of funding	Project can be cancelled	0.9	0.8		Project cannot meet its objectives	Principal, head of departments	Start project when sufficient capital is achieved	
5	Mother nature	Extreme weather conditions	Delay in project schedule as well as destruction of materials and project progress.	0.6	0.4		**Natural disaster**	**Project manager**	Add extra days to the project schedule to allow for bad weather delays and pay attention	

									to weather forecast.	
6	Delay in shipment from supplier	Late arrival of materials	Late start of construction phase of project and delaying project schedule.	0.6	0.4		Insufficient quantity	Project manager	Have material ordered early enough to account for any delays in the shipping process	

Risk Response Planning

Each major risk (those falling in the Red & Yellow Zones) will be assigned to a project team member for monitoring purposes to ensure that the risk will not fall through the cracks. For each major risk, one of the following approaches will be selected to address it:

- Avoid – make changes to the project plan to eliminate the risk.
- Mitigate- incorporate the ongoing monitoring and handling risks throughout the life of the project to reduce the impact or probability of the risks.
- Accept – acknowledge the existence of the risk and accept its consequences if it occurs.
- Transfer- transfer responsibility and ownership of the risk to an outside resources or organisation.

Risk Monitoring, Controlling and Reporting

The assistant project manager will monitor the status of risks by comparing the data collected during project execution with the risk register and risk analysis summary. The risk register will be updated weekly and communicated to the principal and project management team during project status meetings. The project manager is responsible for deciding when to execute a risk response.

4.9. Procurement Plan Management

Project Procurement Management was conducted after Project Cost, Time and Resource Management. To develop a Procurement Management Plan, a template was modified. As documented in the *PMBOK® Guide,* the Requirements Documentation, Risk Register, Stakeholder Register and Project Charter were the inputs used in the process. The tools and techniques were expert judgement meetings, and market research manager.

The plan below detailed how the project team will address procurement throughout the lifecycle of the project.

PROCUREMENT MANAGEMENT PLAN

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Introduction
Procurement Management Approach
Procurement Definition
Type of Contract to be Used
Procurement Risk

Introduction

The Procurement Management Plan sets the procurement framework for a project. This plan however, serves as a guide for the Management of the Georgetown Secondary School Greenhouse Project in St. Vincent and the Grenadines. The plan identifies and defines the products and/or services to be acquired; the types of contracts to be used to support the project; the contract approval process, and decision criteria. Included in this Procurement Management Plan are the established criteria of how the project will deal with procurement and a comparison chart, which will include the plan procurement process. The Procurement Management Plan is created during the Planning Process Phase of the project. The intended audience is the project manager,

project team, and any key stakeholders whose support is needed to carry out the plan.

Procurement Management Approach

The project manager will provide oversight and management for all procurement activities under this project. He/she will work with the project team to identify all items to be procured for the successful completion of the project. The project manager will then review the procurement list and determine whether it is advantageous to make or buy the items, and begin the vendor selection, purchasing and the contracting process.

Procurement Definition

The following procurement items and/or services have been determined to be essential for project completion and success. The following list of items, justification, and timeline are pending project manager review for submission to the assistant project manager for purchasing to commence.

Items/service	Justification	Needed by
Solar Photovoltaic Pumps	To pump the water through pipes	12/02/2021
800 Gallon Water tanks	Used for rainwater harvesting	12/02/2021
Drip line	To water the crops in the greenhouse	12/02/2021
Plastic covering and aluminum poles	Will be used as the protective gear for vegetables	22/02/2021
Fencing	To prevent intrusion and damage to crops	22/02/2021
Farm use equipment	For cultivation activities within the greenhouse	03/03/2021
Benches	For students to sit on	12/03/2021
Trays	For cultivation	12/03/2021
Seedlings	The vegetables to be cultivated	12/03/2021
Curriculum	Guide for how the greenhouse will be integrated into various subject areas.	01/04/2021

Type of Contract to be used

All items and services to be procured for this project will be solicited under firm-fixed price contracts. The project team will work to define the item types, quantities, services and required delivery dates. The project manager will research and select the best options in order to procure the items within the required period and at a reasonable cost under the firm-fixed price contract once the vendor is selected.

Procurement Risks

All procurement activities carry some potential for risk, which must be managed to ensure project success. While all risks will be managed in accordance to the project's risk management plan, there are specific risks that pertain specifically to procurement that must be considered:

- Unrealistic schedule and cost expectations for vendors;
- Manufacturing capacity capabilities of vendors;
- Conflicts with current contracts and vendor relationships;
- Configuration management for upgrades and improvements of purchased technology;
- Potential delays in shipping and impacts on cost and schedule;
- Questionable past performance for vendors;
- Potential that final product does not meet required specifications.

These risks are not all-inclusive and the standard risk management process of identifying, documenting, analysing, mitigating, and managing risks will be used.

4.10. Stakeholders Management

According to PMBOK Guide 6th ed., project stakeholder management includes the processes required to identify the people, groups or organisation that could affect or be impacted by the project, to analyze stakeholder expectations and their impact on the project and to develop appropriate management strategies for effectively engaging stakeholders in project decision and execution (PMI, 2017, p 503).

STAKEHOLDERS MANAGEMENT PLAN

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Identify Stakeholders
Plan Stakeholder Engagement
Manage Stakeholder Engagement
Monitor Stakeholder Engagement

Purpose

Project Stakeholders Management includes the processes required to identify the people, groups, or organizations that could affect or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution. The stakeholder's management plan includes various sections.

• **Identify Stakeholders**

• **Plan Stakeholder Engagement**

• **Manage Stakeholder Engagement**

• **Monitor Stakeholder Engagement**

Identify Stakeholders

The process of identifying all people or organizations could impact or be impacted by a decision, activity, or outcome of the project; and analyzing and documenting relevant information regarding their interests, involvement, influence and impact on project success. The project charter and communication management plan were used as an input for this process. The tools and techniques that will be used to identify stakeholders are data gathering, representation and data gathering. **Chart 18** below shows the stakeholder register for GSS Greenhouse Project. The stakeholder register is a living document and serves the project manager and team for the life of the project.

Chart 18: Stakeholder Register (Source: S Jennings, Author)

Project Name	GSS Greenhouse Project	GSS Greenhouse - Stakeholder Register				
ID	Stakeholders	Functional Area	Roles - Responsibilities	Main Expectations	Major Requirements	Influence
1	**Ministry of Education**	Beneficiaries	Ensure the project adheres to the local legal requirements governing construction of greenhouses and that the students' safety is paramount.	Observe all local building requirements.	All construction submissions for approvals adhere to local environmental stipulations.	medium
2	**Ministry of Agriculture**	Project Execution	Provides technical expertise	Undertaking this project will be good to promote climate change and food security to the youth of the nation.	Employ relevant tools and techniques to identify and manage project	High
3	**Principal of GSS**	Project Implementer	Project Management, stakeholder engagement and management	Undertaking this project will be good for the school's reputation and income	Implement proper monitoring and control techniques to ensure all project stakeholders actively adhere to their responsibilities to make the project a success. There is adequate budgetary allocation for project activities. There is positive support from all project stakeholders to ensure timely project completion.	High

4	**Deputy Principal of GSS**	Project Execution	provide assistant to principal	There will be sufficient space in the completed greenhouse for a variety of produce to establish service there, and that providing service from this greenhouse will be lucrative.	Implement proper monitoring and control techniques to ensure all project stakeholders actively adhere to their responsibilities to make the project a success..	Medium
5	**Head of Departments**	Project Execution	Academic Curriculum	Undertaking this project will be good for the student's education	Develop a curriculum that will promote food security and climate change	Medium
6	**Project team (site workers, etc.)**	Project Execution	Perform job tasks as outlined in the project document.	Provision of required work tools to ensure work productivity and personal safety. Also fair compensation for work done and clear job tasks. Guidance and support from managers when executing job tasks.	Proper Resource Management is in place to address the welfare of employees. OSHA (Occupational Safety and Health Administration) Standards are in place to protect workers safety.	Low
7	**Project Manager**	Project Implementer	Project Management, contract management, stakeholder engagement and management	All project stakeholders actively adhere to their responsibilities to make the project a success. There is adequate budgetary allocation for project activities, positive support from all project stakeholders to ensure timely project completion.	Employ experienced project managers that can lead highly complex projects. Employ relevant Tools and Techniques to identify, engage and manage project stakeholders. Employ Project Management Information System to manage project activities.	High

8	**Parents**	Beneficiaries	Provide feedback on the benefits of project outputs that will directly impact students	They are invited to all focus group meetings and their concerns and suggestions are incorporated in the project.	Establishment of a Stakeholders Management Plan by the GSS Greenhouse	Low
9	**Community**	Beneficiaries	To provide support.	.	There is a robust promotional strategy to promote the use of the greenhouse.	Low
10	**Students**	End-User	Students	The greenhouse facility has ample space and ventilation to conduct research.	Greenhouse layout allows for ease of movement of students	Low

Power Interest Classification

One purpose of this activity is to help identify and categorize groups so that appropriate attention can be given to each group according to the level of engagement needed. To help in this process, the project will use the PMBOK Power/Interest Grid to categorize each stakeholder group. The Power/Interest Grid analyses stakeholder groups in a visual manner to further establish stakeholders' level of interest or concern and their ability to influence the project outcomes.

An important outcome of the stakeholder identification and analysis work, including the Power/Interest Grid, is to identify the most influential and most impacted stakeholder groups so that a focused stakeholder management strategy and plan can be developed and executed.

Provided below is the Power/Interest Grid with the major stakeholders and stakeholder groups for the project.

Stakeholder	Impact (low, medium, high)	Interest (low, medium, high)	Power (low, medium, high)	Influence (low, medium, high)
Ministry of Education	medium	mediun	high	medium
Ministry of Agriculture	high	high	medium	high
Principal	high	high	high	high
Project Manager	high	high	low	low
Head of Departments	low	high	mediun	mediun
Students	low	high	low	low
Parents	low	low	low	low
Community	low	low	low	low

Plan Stakeholder Engagement

This is the process of developing appropriate approaches to effectively engage stakeholders throughout the project life cycle based on their roles, expectations and influence. The key benefit of this process is that it provides a clear, actionable plan to interact with project stakeholders to support the project's interests (PMBOK 6th Ed.).

Based on the information gathered in the project charter of the key stakeholders and communication plan, the project manager will be responsible for engaging stakeholders throughout the lifecycle of the project. The level of engagement required for each stakeholder may vary over the course of the project. For example, during the beginning stages of the project, it might be necessary for the project manager to engage more highly with key stakeholders. Highly engaged key stakeholders in the early stages of the project are pivotal for project kick-off, achieving staff buy-in and clearing obstacles. As the project progresses, the level of engagement will shift from key stakeholders to the broader project team and end-users.

Manage Stakeholder Engagement

This is the process of communicating and working with stakeholders to meet their needs/expectations. The project manager will analyse current levels of engagement by using the PMBOK Stakeholders Engagement Assessment and Stakeholder Power Interest Matrix. The engagement level of stakeholders in **Figure 17** can be classified as follows:

- Unaware – Unaware of the project and potential impacts.
- Resistant – Aware of the project and potential impacts but resistant to any changes that may occur because of the work or outcomes of the project. These stakeholders will be unsupportive of the work or outcomes of the project.
- Neutral – Aware of the project, but neither supportive nor unsupportive.
- Supportive – Aware of the project and potential impacts and supportive of the work and its outcome.

- Leading – Aware of the project and the potential impacts and actively engaged in ensuring that the project is a success.

'C" for their current level of engagement and "D" in the column of their desired level of engagement.

Stakeholders	Unaware	Resistant	Neutral	Supportive	Leading
Ministry of Education				C D	
Ministry of Agriculture					C D
Principal					C D
Project Manager					C D
Head of Departments				C	
Students				C	
Parents			D		
Community			D		

Figure 25: GSS Stakeholder Engagement Assessment Matrix (Adapted from the PMI, 6th Ed., 2017, p 522).

Stakeholder Power Interest Matrix.

In Figure 18 below, stakeholder project employees must be monitor by management as they reside in the lower left quadrant of the matrix. Stakeholder, Ministry of Education, in the upper left quadrant, must be kept satisfied by ensuring concerns and questions are addressed adequately. Ministry of Agriculture, heads of department and principal must be managed closely as they can make highly relevant decision that may affect the project success.

High

Power

Ministry of Education	Ministry of Agriculture, Heads of Departments, Principal
Project Employees	Students, Community, Parents

Low   **Interest**   High
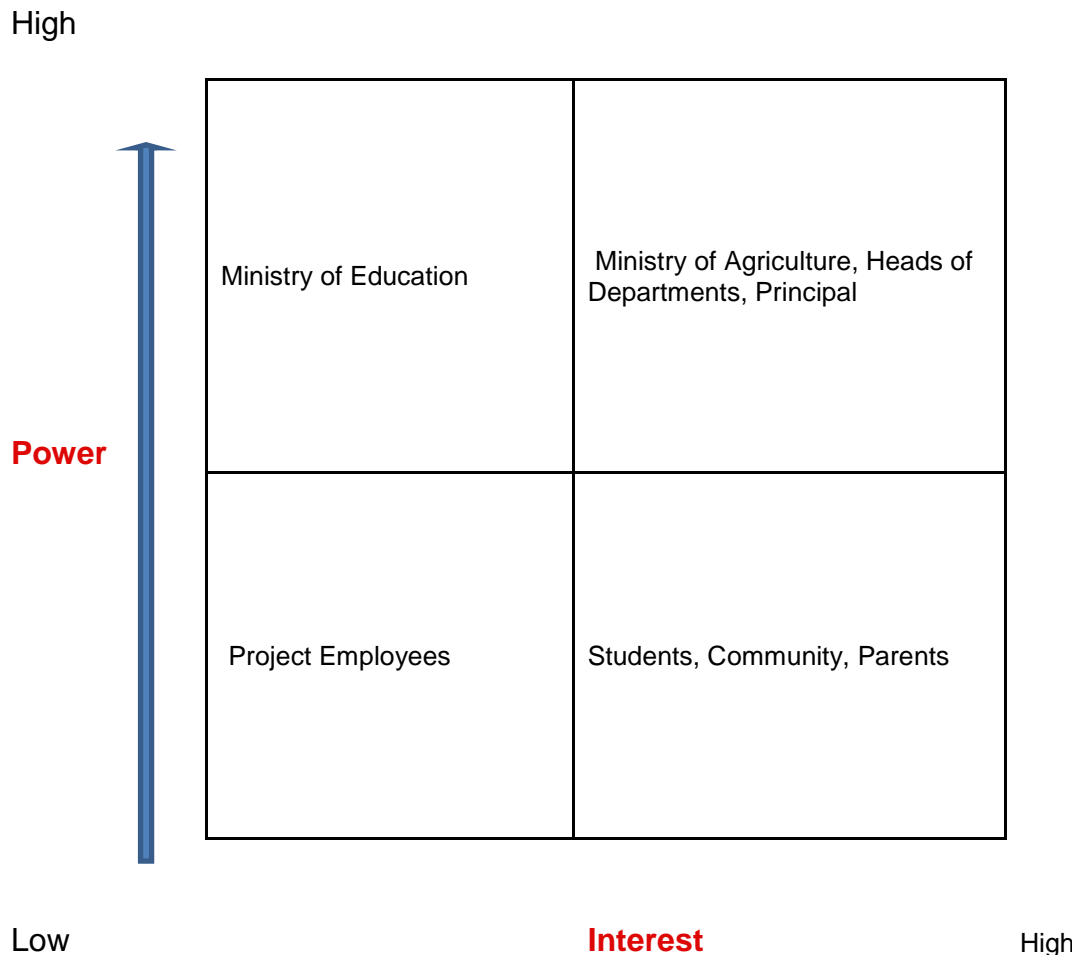
Figure 26: GSS Stakeholder Power Interest Matrix Reprinted from UCI Stakeholder Management Course by Gomez, Osvaldo Martinez

Monitor Stakeholder Engagement

This is the process of monitoring overall project stakeholder relationships and adjusting strategies and plans for engaging stakeholders. Monitor stakeholder engagement involves collecting data, assessing the level of engagement and using insights from the data collection to adjust strategies and tactics for engaging effectively with stakeholders.

As mentioned in the Communications Plan and the Risk Management Plan, the construction of the Greenhouse Project will have mechanisms to receive ongoing direct feedback from key stakeholders, including email, personal communication, site meetings, and status meeting. Individual stakeholder will

be encouraged to participate and to voice questions and concerns, with the most serious issues and concerns that are raised being addressed in a formal, rigorous process through the Issues and Risk Logs.

As described in the Scope Management Plan, the project will solicit broad participation in the collection and validation of requirements, which will uncover issues and concerns early on, so they can be addressed.

Stakeholders are critical to the project's success. The project team will work to involve, engage and listen to all key stakeholders throughout the project lifecycle.

Stakeholder Plan Updates

Note that the Stakeholder Management Plan and associated documents are not static and will be reviewed at least monthly to ensure the plan is meeting project expectations and to make modifications if required.

5. CONCLUSION

1. The Project Management Plan was created using the analytical research method and the 6th Ed. of the *PMBOK® Guide,* to be used as a developmental tool for the Georgetown Secondary School Greenhouse Project Management team.

2. The Project Charter was the first specific objective of the Project Management Plan. A template was used as a guide, to capture and organize the business needs and objectives, project description, preliminary scope statement, initial project risks, project deliverables, summary milestones, and project budget, the Project Charter also included the main stakeholders such as the project manager and the sub-committee for the project to commence.

3. The second element that was developed and defined was the scope of the project, the Scope Management Plan. Within this plan, the WBS, WBS dictionary, and Requirements Traceability Matrix, were developed from a table or template, capturing the information gathered during meetings with project stakeholder and from project document reviews.

4. The e Management Plan was created to identify the project's activities and duration. This element of the plan captures the Activity List, Resource Assignments Table and Project Gantt chart which shows the critical path of the project.

5. To create the Cost Management Plan, a template in Microsoft Excel was used to adequately develop the project budget, and a template was used to capture the Cost ManagemPlan which will guide the development of cost management performance measures and documents such as the Cost Baseline and the Project Funding Requirements.

6. The Quality Management Plan was the fifth specific objective that was created to identify the project's quality management approach, Plan, manage and control quality measures that will be used throughout the

project, in order to ensure that quality was built into the project's processes and product.

7. To address specific objective Resource Management Plan idea, all resources required to complete the project were identified and classified. In addition, the project organization chart, and details of how the human resources will be managed throughout the project.

8. The Project Communications Plan, was the seventh specific objective to be fulfilled. A template was used along with a list of all stakeholders and their roles and responsibilities. In addition, a Communications Matrix was developed, detailing all project stakeholders (names/titles, information, format) throughout the project lifecycle, and ensuring that the information disseminated during the project is done so at the right time, in the right format, to the right people and by the right person.

9. To capture and classify project risk the specific objective number eight, the Risk Management Plan, was created. This plan classify project risks, so that effective risk responses could be planned, a Risk Register was developed along with a qualitative risk analysis. Quantitative Risk Analysis was not performed during this process as the tools were not available for use.

10. The Procurement Management Plan deliverable, created for specific objective nine, was developed using a template to identify the project's procurement management approach, types of contracts used and contract approval process. The plan is comprehensive it detail procurement risks and constraints and ways it will be managed effectively.

11. The Stakeholder Management Plan, developed for specific objective ten, was also developed using a template. In addition to the plan, which details how stakeholders will be identified, classified, managed and engaged throughout the project, the Stakeholder Register and

Stakeholder Analysis and Level of Engagement were also developed to provide more information for effective stakeholder engagement.

6. RECOMMENDATION

Having completed the exercise the student makes the following recommendations to the principal and heads of departments of Georgetown Secondary School. The following recommendations are related to the above captioned GSS Greenhouse Project Management Plan and are meant to further augment the current project objectives.

1. GSS should employ formal project management methods to increase the likelihood of project success in the completion of building projects.

2. GSS should develop standard project management initiation and planning documents prior to the execution of projects.

3. GSS should implement a project management team, using developed standard project planning documents tailored for the project.

4. GSS should invest in the tools required to complete quantitative risk analyses for all projects.

5. GSS should use a Project Management Guide or Framework to direct the development of all project management tools.

6. GSS project management team should exercise care and caution during the development of each subsidiary plan of the Project Management Plan to ensure that all planning subsets for each knowledge area or respective application area are thorough and accurate.

7. GSS project management team should utilize a document management and storage system, to organize and store all documents created for future use and review.

8. Development of training modules are recommended for project team in the efficient use of project management tools, techniques and materials.

9. Develop operational manuals to ensure ongoing preventative maintenance of irrigation and greenhouse technologies.

10. Document lesson learnt of the project issues and best farming practices for beneficiaries.

7. BIBLIOGRAPHY

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8. Appendix 1: FGP Charter

PROJECT CHARTER	
Formalizes the project start and confers the project manager with the authority to assign company resources to the project activities. Benefits: it provides a clear start and well defined project boundaries.	
Date	**Project Name:**
February 25, 2020	Project Management Plan for the construction of a Greenhouse at the Georgetown Secondary school.
Knowledge Areas / Processes	**Application Area (Sector / Activity)**
Knowledge areas: Integration, Scope, Schedule, Cost, Quality, Resources, Communication, Risks, Procurement and stakeholders **Process groups: Initiation, Planning**	**Construction**
Start date	**Finish date**
February 25, 2020	Corresponds to the date when the project is scheduled to be finished

Project Objectives (general and specific)

General objective: To develop a project management plan to manage the construction of a Greenhouse at the Georgetown Secondary School.

1. To create a project charter that formally authorizes the project and provide the project manager with the authority to apply organizational resources to the project in order to produce the project management plan.

2. To create a scope management plan to ensures that all works required are included to successfully complete the project.

3. To create a schedule management plan to support the development and management of a project schedule that ensures the project is completed within the time constraints.

4. To create a cost management plan to define the processes for developing and managing the project budget that ensures the project is completed within the budget constraints.

5. To develop a quality management plan to identify the quality requirements for the project to ensure the results meet expectations for approval within the time, cost and scope constraints.

6. To create a human resource management plan to ensure that all human resources are identified and managed effectively to complete the project within time, cost and scope constraints.

7. To develop a communication management plan to ensure the timely and effective communication of the project status and other key information.

8. To create a risk management plan to identify and examine risks to the successful completion of the project and develop plans to minimize the likelihood of the risks.

9. To develop a procurement management plan to be used to obtain products, services or results required by the project.

10. To develop a stakeholder management plan to identify and support all the project stakeholders to ensure effective stakeholder engagement.

Project purpose or justification (merit and expected results)

The aim of this Final Graduation Project (FGP) is to create a project management plan that will eventually guide the project execution to maximise its success chances. Given that the company have had unsuccessful project experience in the past, the creation and use of the project management plan will help to better define project objectives, success criteria, resources allocation and in general plan everything that is needed for the project success. In addition, this project management plan will become the school's asset that might be used as the basis for future project plans. The project for the construction of a greenhouse is important for the Georgetown Secondary School and thus it must be professional managed to fulfill the social, economical, scientific and cultural needs of the area where it will be located.

Description of Product or Service to be generated by the Project – Project final deliverables

This project describes the construction and sustainability of an academic greenhouse at the Georgetown Secondary School (GSS). The greenhouse will rely on renewable energy, the idea is to use phot-voltaic pumps as an intevention to mitigate against greenhouse gas emissions. This plan will consist of all the subsidary documents of a project management plan

Assumptions

1. It is assumed that all the required information to execute this FGP will be readily available.
2. It is assumed that the company will provide all the project specific information on a timely manner and without any significant restrition to create the project management plan.

Constraints

1. Materials and equipment may not be on site in time to begin construction and planting seeds.
2. Resources may not be available.

Preliminary risks

CAUSE	EFFECT	IMPACT
The technology Implemented failed To work as expected.	The expected Results are no Longer attainable	Scope, quality and time
Availability of expert.	Implementation Could be constrained	Quality
Unavailability of greenhouse Construction materials in Sufficient quantities.	Unable to complete Project activity on time	time
Inadequate Communication	Planned deadlines may not be honour In time	Scope, time, quality

Budget

Cost has not yet being ascertained.

Milestones and dates

Milestone	Start date	End date
FGP CHARTER	FEBRUARY 25, 2020	MARCH 1, 2020
WORK BREAK DOWN STRUCTURE(WBS)	FEBRUARY 25, 2020	MARCH 1, 2020
CHAPTER 1- INTRODUCTION	MARCH2,2020	MARCH 8TH,2020
CHAPTER-2-THEORETICAL FRAMEWORK	MARCH 9, 2020	MARCH 15TH, 2020
CHAPTER 3- METHODOLOGICAL	MARCH 16TH 2020	MARCH 22ND, 2020
EXECUTIVE SUMMARY	MARCH 23RD, 2020	MARCH 29TH, 2020

Relevant historical information

The Georgetown Secondary School is a Co-ed school that comprises of over four hundred and twenty five students (425). The school is located in the rural area of the country.The Schools' philosophy and commitment is that it rrecognizes that the teaching-learning process is the raison d'etre of the school and that it exists to meet the educational needs of both its students and the wider community. They therefore perceive their role in national development as that of fostering partnerships between the school and stakeholders. As such, the school focus would be that of the educational development of the surrounding community.

Stakeholders

Direct stakeholders:
Ministry of Education
Ministry of Agriculture
Management and Principal of GSS
Indirect stakeholders:
Project Manager
Teachers
Students
community

Project Manager: Sybil Jennings   **Signature: S Jennings**

Authorized by: Ronald Clarke   **Signature: R Clarke**

Appendix 2: FGP WBS

phases	WBS Code	Task
0	0	Final Graduation Project
1	1	**Graduation seminar**
	1.1	FGP Deliverables
	1.1.1	Charter
	1.1.2.	WBS
	1.1.3	Chapter 1 Introduction
	1.1.4	Chapter II Theoretical Framework
	1.1.5	Chapter III Methodological Framework
	1.1.6	Annexes
	1.1.6.1	Bibliography
	1.1.6.2	Schedule
2	**2**	**Tutoring Process**
	2.1	Tutor
	2.2	Adjustment of previous Chapter (if needed)
	2.3	Chapter IV Development (result)
	2.4	Chapter V Conclusion
	2.5	Chapter VI recommendations
	2.6	Tutor Approval
3	**3**	**Reading by review**
	3.1	Reviews assignment request
	3.1.1	Assignment of two reviews
	3.1.2	Communication
	3.1.3	FGP submission to reviews
	3.2	Reviews work
	3.2.1	Review 1
	3.2.1.1	FGP reading
	3.2.1.2	Reader 1 repeat
	3.2.2	Review 2
	3.2.2.1	FGP reading
	3.2.2.2	Reader 2
4	**4**	**Adjustment**
	4.1	Report for reviews
	4.2	FGP updates
	4.3	Second Review by reviews
5	**5**	**Presentation to Board of examiners**
	5.1	Final review by board
	5.2	FGP Grade report

Appendix 3: FGP Schedule

FINAL GRADUATION PROJECT DEVELOPMENT SCHEDULE

ID	Task Mode	Task Name	Duration	Start	Finish
1		Final Graduation Project	130 days	Mon 2/24/20	Fri 8/21/20
2		FGP Start	0 days	Mon 2/24/20	Mon 2/24/20
3		1,Graduation Seminar	25 days	Mon 2/24/20	Fri 3/27/20
4		1.1,FGP Deliverables	20 days	Mon 2/24/20	Fri 3/20/20
5		1.1.1,Charter	5 days	Mon 2/24/20	Fri 2/28/20
6		1.1.2,WBS	5 days	Mon 2/24/20	Fri 2/28/20
7		1.1.3,Chapter I. Introduction	5 days	Mon 3/2/20	Fri 3/6/20
8		1.1.4,Chapter II. Theoretical framework	5 days	Mon 3/9/20	Fri 3/13/20
9		1.1.5,Chapter III. Methodological framework	5 days	Mon 3/16/20	Fri 3/20/20
10		1.1.6,Annexes	15 days	Mon 3/2/20	Fri 3/20/20
11		1.1.6.1,Bibliography	5 days	Mon 3/16/20	Fri 3/20/20
12		1.1.6.2,Schedule	5 days	Mon 3/2/20	Fri 3/6/20
13		1.2,Graduation Seminar approv	5 days	Mon 3/23/20	Fri 3/27/20
14		2,Tutoring process	65 days	Mon 3/30/20	Fri 6/26/20
15		2.1,Tutor	3 days	Mon 3/30/20	Wed 4/1/20
16		2.1.1,Tutor assigment	1 day	Mon 3/30/20	Mon 3/30/20
17		2.1.2,Communication	2 days	Tue 3/31/20	Wed 4/1/20
18		2.2,Adjustments of previous chapters (if needed)	5 days	Thu 4/2/20	Wed 4/8/20
19		2.3,Charter IV. Development (Results)	47 days	Thu 4/9/20	Fri 6/12/20
20		2.4,Chapter V. Conclusions	5 days	Mon 6/15/20	Fri 6/19/20
21		2.5,Chapter VI. Recommendatic	5 days	Mon 6/22/20	Fri 6/26/20
22		Tutor approval	0 days	Fri 6/26/20	Fri 6/26/20
23		3,Reading by reviewers	15 days	Mon 6/29/20	Fri 7/17/20
24		3.1,Reviewers assigment reque	5 days	Mon 6/29/20	Fri 7/3/20
25		3.1.1,Assigment of two reviewers	2 days	Mon 6/29/20	Tue 6/30/20
26		3.1.2,Communication	2 days	Wed 7/1/20	Thu 7/2/20
27		3.1.3,FGP submission to reviewers	1 day	Fri 7/3/20	Fri 7/3/20
28		3.2,Reviewers work	10 days	Mon 7/6/20	Fri 7/17/20
29		3.2.1,Reviewer	10 days	Mon 7/6/20	Fri 7/17/20
30		3.2.1.1,FGP reading	9 days	Mon 7/6/20	Thu 7/16/20
31		3.2.1.2,Reader 1 report	1 day	Fri 7/17/20	Fri 7/17/20
32		3.2.2,Reviewer	10 days	Mon 7/6/20	Fri 7/17/20
33		3.2.2.1,FGP reading	9 days	Mon 7/6/20	Thu 7/16/20
34		3.2.2.2,Reader 2 report	1 day	Fri 7/17/20	Fri 7/17/20
35		4,Adjustments	20 days	Mon 7/20/20	Fri 8/14/20
36		4.1,Report for reviewers	9 days	Mon 7/20/20	Thu 7/30/20
37		4.2,FGP update	1 day	Fri 7/31/20	Fri 7/31/20
38		4.3,Second review by reviewers	10 days	Mon 8/3/20	Fri 8/14/20
39		5,Presentation to Board of Exami	5 days	Mon 8/17/20	Fri 8/21/20
40		5.1,Final review by board	2 days	Mon 8/17/20	Tue 8/18/20
41		5.2,FGP grade report	3 days	Wed 8/19/20	Fri 8/21/20
42		FGP End	0 days	Fri 8/21/20	Fri 8/21/20

Project: FGP_Schedule
Date: Sun 3/8/20

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

Appendix 4: Other relevant information

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Diamonds Village, Colonarie P.O., St. Vincent.
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E-mail: loroggie@hotmail.com
_____
_____

The Professor
Universidad Para La Cooperacion Internacional (UCI)
Costa Rica

Dear Madam,

I have examined the Final Graduation Project Re: Project Management Plan for Constructing a Greenhouse at the Georgetown Secondary School for Sybil Sylvia Jennings as was requested by your institution.

In my estimation, it has adequately met English Language requirements. I beg that all due courtesies be given to her.

Sincerely yours

Lornetta Rodgers

THE UNIVERSITY OF THE WEST INDIES

Lornetta Lynetta Ernesta Rodgers

having completed the Course of Study approved by the University and having satisfied the Examiners, has this day been admitted by the Senate to the Degree of

MASTER OF ARTS

Communication For Social And Behaviour Change

April 8, 2016

THE UNIVERSITY OF THE WEST INDIES

Lornetta Lynetta Ernesta Rodgers

having completed the Course of Study approved by the University and having satisfied the Examiners, has this day been admitted by the Senate to the Degree of

BACHELOR OF ARTS

English(Major)

with

Second Class Honours (Lower Division)

JULY 1, 2005

DATE

_____
VICE-CHANCELLOR