UNIVERSIDAD PARA LA COOPERACION INTERNACIONAL
(UCI)

PROJECT MANAGEMENT PLAN FOR THE CONSTRUCTION OF AN ICE CREAM PLANT

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

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This Final Graduation Project was approved by the University as
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DEDICATION

This project is dedicated to my mother who, despite all I have achieved scholarly, pushes me to achieve more with every opportunity that arises.

ACKNOWLEDGMENTS

Thanks to all of the professors at UCI who have guided me and my cohorts through this process up to this point.

I would like to especially thank my tutor Karolina Jimenez who would have been there for feedback whenever I needed her to be, who pushed the extra mile so that I could finish this project to the best of my abilities.

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ABBREVIATIONS AND ACRONYMS

- AC: Actual Cost
- CAPM: Certified Associate in Project Management
- CRL: Chefette Restaurants Ltd
- CM: Construction Manager
- CMAA: Construction Management Association of America
- CA: Cost Account
- CPI: Cost Performance Index
- CV: Cost Variance
- EV: Earned Value
- EVM: Earned Value Management
- FGP: Final Graduation Project
- IPMA: International Project Management Association
- MCL: Moorjani Caribbean Ltd
- Para: Paragraph
- PV: Planned Value
- *PMBOK® Guide: Project Management Book of Knowledge*
- PMI: Project Management Institute
- PMP: Project Management Professional
- UCI: Universidad para la Cooperación Internacional
- WBS: Work Breakdown Structure

EXECUTIVE SUMMARY (ABSTRACT)

Despite the harsh economic times that can be seen all over the Caribbean, and to some extent, the world, Chefette Restaurants has been able to steadily increase their market share by having the most restaurant locations of any fast food restaurant in Barbados. With its profits, Chefette Restaurants seeks to invest in itself once again and not only be a choice for food locally but to become a household name in other parts of the Caribbean. The first step in this process is to be able to produce the amount of raw materials necessary to provide all of its locations with a great variety of food. They are achieving part of this goal by constructing an ice cream plant in Barbados. This ice cream plant would be producing their own brand of ice cream that would serve two purposes. Manufacturing their own brand of ice cream would mean they no longer have to import from neighbouring island Trinidad and Tobago and Chefette Restaurants would be able to export their brand of ice cream to other Caribbean territories so that it could be sold regionally.

Moorjani Caribbean Ltd (MCL) is a small but growing construction company that has been contracted to construct the ice cream plant. MCL and Chefette Restaurants have worked together in the past as MCL has been contracted to construct restaurants in the past. MCL and Chefette Restaurants have built a good working relationship and it continues to prosper with this project.

MCL has used construction management tools and techniques thus far in its time as a construction company, but the owner feels it is time that the company moves in a project management direction by developing a formal project management plan for this project to guide all of the critical aspects of the project’s lifecycle and that can be used as a template for other project management plans going forward.

The general objective of the Final Graduation Project (FGP) was to develop a Project Management Plan within the standards of the Project Management Institute (PMI), to manage the construction of an ice cream plant. The specific objectives were: to develop an integration management plan to unify and coordinate the processes and project management activities during the project, to create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included, to create a time management plan to develop a project schedule that ensures the project is completed within the time constraints, to create a cost management plan to develop the project budget, as well as, tools for managing the project budget to ensure it is completed within the budget constraints, to create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meets the needs of the client and project management team, to create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project, to create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders, to create a risk management plan to ensure that all potential project risks are identified,

examined, planned for, and monitored for the successful completion of the project, to create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services, and to create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.

The methodology used for the research was analytical. The main sources used to gather information included A Guide to the Project Management Body of Knowledge (*PMBOK ® Guide*) Sixth Edition, interviews which were held with the performing organization, and the internet. The information was analysed to create each subcomponent of the subsidiary plans used to develop the Project Management Plan for the construction of an Ice Cream Plant.

The Project Management Plan provided a new methodology for the project team to build a more thorough project management plan for this project. The Scope Management Plan allows the project team to fully breakdown each part of the project scope. MCL developed the Schedule Management Plan for this project to plan their schedule as they have considered each activity beforehand and can therefore do a better estimation of the overall project schedule. The Cost Management Plan was developed to ensure the client knew how much funding was needed to complete the project successfully. The Quality Management Plan ensures that the processes used during the project and the final product of the project are of acceptable quality. The Resource Management Plan identified the human and physical resources needed to successfully complete the project. The Project Communications Plan was developed so that each stakeholder had all information pertinent to them as often as they needed it and in the best forum to receive it. The Risk Management plan allows the project team to split the project risks and opportunities to the members of the project team who would be best suited for each particular risk. The Procurement Management Plan was developed to ensure that the same process was used for each vendor contracted to provide a service or material for the project. The Stakeholder Management Plan allows the project team to truly dissect each stakeholder to ascertain their needs and their stake in the project.

It is recommended that the project team at Moorjani Caribbean Ltd consider the use of the planning process and documents developed during the development of the Project Management Plan for the Construction of the Ice Cream Plant as a basis for implementing a methodology for similar projects in the future, as well as, hiring a Project Management Office who can review said documents. Additionally, Moorjani Caribbean Ltd should seek to utilise document management and storage systems, to organise, store, and create a central location for project planning documents and future Organisational Process Assets, as well as, invest in project management software to make the planning process easier. Finally, MCL should enroll each project management staff member in a short course in Project Management to become more familiar with PMI best practices.

1. INTRODUCTION

1.1 Background

Moorjani Caribbean Ltd. Is an experienced contractor in the construction industry. They continue to be awarded many contracts for the construction and renovation of various types of buildings. The current owner of the company inherited the company from his father who started it 40 years ago. During that time, Moorjani Caribbean Ltd. has been able to employ many people and keep them employed despite the harsh economic conditions in Barbados. That speaks to the adaptability of the company to not just survive but to thrive despite the industrial climate. Moorjani Caribbean Ltd. is usually contracted to construct or renovate the building itself, but the scope of work does not include the finishing touches associated with any building such as the furnishings, plumbing, electrical work, or any of the equipment or machinery that needs to be installed. The process of construction heavily uses project management principles, but these come from the experience of the older employees of the company and not from standards from any project management institution.

The company has been contracted to construct a 30,000 square feet two-story building which will house an ice cream plant for Chefette Restaurants Ltd. This includes the concrete, blocks, and steel necessary to complete the structure. As was mentioned previously, MCL has had success with their construction management focus, however the company would like to introduce a more holistic project management approach to its work and would like this project to be the first. Creating a Project Management Plan for this project is not a requirement from the client but doing so would greatly help Moorjani Caribbean Ltd. going forward to make sure that all projects are completed with the highest of standards.

This project is not the largest that the company has ever done but it provides a great opportunity for the company to create a Project Management Plan that can be used as a template for future projects. With the creation of this plan it is expected that the level of project success will improve significantly, allowing the company to increase its profits while creating a name for itself as one of the larger construction companies on the island. Hopefully in doing so, business opportunities are increased, and it allows for the company to capture a fair market share.

1.2 Statement of the Problem

Up until this point Moorjani Caribbean Ltd. has only used construction guidelines to deliver products. However, the project management approach in use is not sufficient to successfully continually deliver a product without finding themselves always rushing to meet the deadline. Because of this problem, the current owner wanted to use project management processes and principles as outlined by the PMI for the ice cream plant project to increase the chance of delivering the product with more efficiency thus improving the status of the company. Each element of the Project Management Plan will be created, along with all of the tools, techniques, and concepts used to justify each management decision selected for application.

1.3 Purpose

In order to increase the chances of successfully constructing an ice cream plant for Chefette Restaurants Ltd., the Project Manager will seek to develop the Project Management Plan by detailing the management of all critical aspects of the project. Each step is to be coordinated strategically to develop all of the subsidiary documents which will be used as a guide during project execution. The research proposal will explore the Project Management Institute's (PMI) guide to effectively create a Project Management Plan, providing justification for the decisions made while developing the project's integration, scope, time, cost, quality, resources, communication, risk, procurement, and stakeholder management plans.

1.4 General Objective

To develop a Project Management Plan within the standards of the Project Management Institute, to manage the construction of an ice cream plant.

1.5 Specific Objectives

1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project.
2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included.
3. To create a schedule management plan to develop a project schedule that ensures the project is completed within the time constraints.
4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure it is completed within the budget constraints.
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meets the needs of the client and project management team.
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.

10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.

2. THEORETICAL FRAMEWORK

2.1 Company Background

Moorjani Caribbean Ltd. is a small construction company that has been steadily growing in the last few years as the projects they have been taking have been growing in size. Moorjani Caribbean Ltd. is committed to teamwork and producing a high-quality product in the shortest time possible. Even though this is not the largest project the company has been contracted to complete, it is still an important project for the company. It is important because it allows the company to formally introduce project management principles that can be used as a template for future projects. With this in mind, the Managing Director has agreed that a comprehensive project management plan be produced.

The company was contracted to complete this project because not only does it have the technical expertise and experience, but it is also known to complete all work in the shortest amount of time possible with a high quality.

2.2 Mission and Vision Statements

2.2.1 Mission

Moorjani Caribbean Ltd.'s mission is to provide our employees with an honest and helpful working environment, where every employee individually and collectively, can dedicate themselves to providing our customers with exceptional workmanship, extraordinary service, and professional integrity. Our commitment to this mission will allow us to become not only a premier construction company, but the premier construction company in Barbados (Moorjani Caribbean Ltd, 1985).

The owner of the Company, Richard Moorjani, strives to establish long-term relationships with his clients by providing a quality and safe service that will leave a legacy for generations to come.

2.2.2 Vision

Moorjani Caribbean Ltd.'s vision is to be the leading construction company in their chosen markets, sought after by potential clients and employees for our track record in reliable execution, cost effectiveness, and world class technical sophistication. (Moorjani Caribbean Ltd, 1985).

2.3 Organizational Structure

Moorjani Caribbean Ltd. is a relatively small company. There are sixteen (16) full time employees. These include project team members and office staff. This number does not include subcontracted and site workers. Figure 1 shows the company's organizational structure.

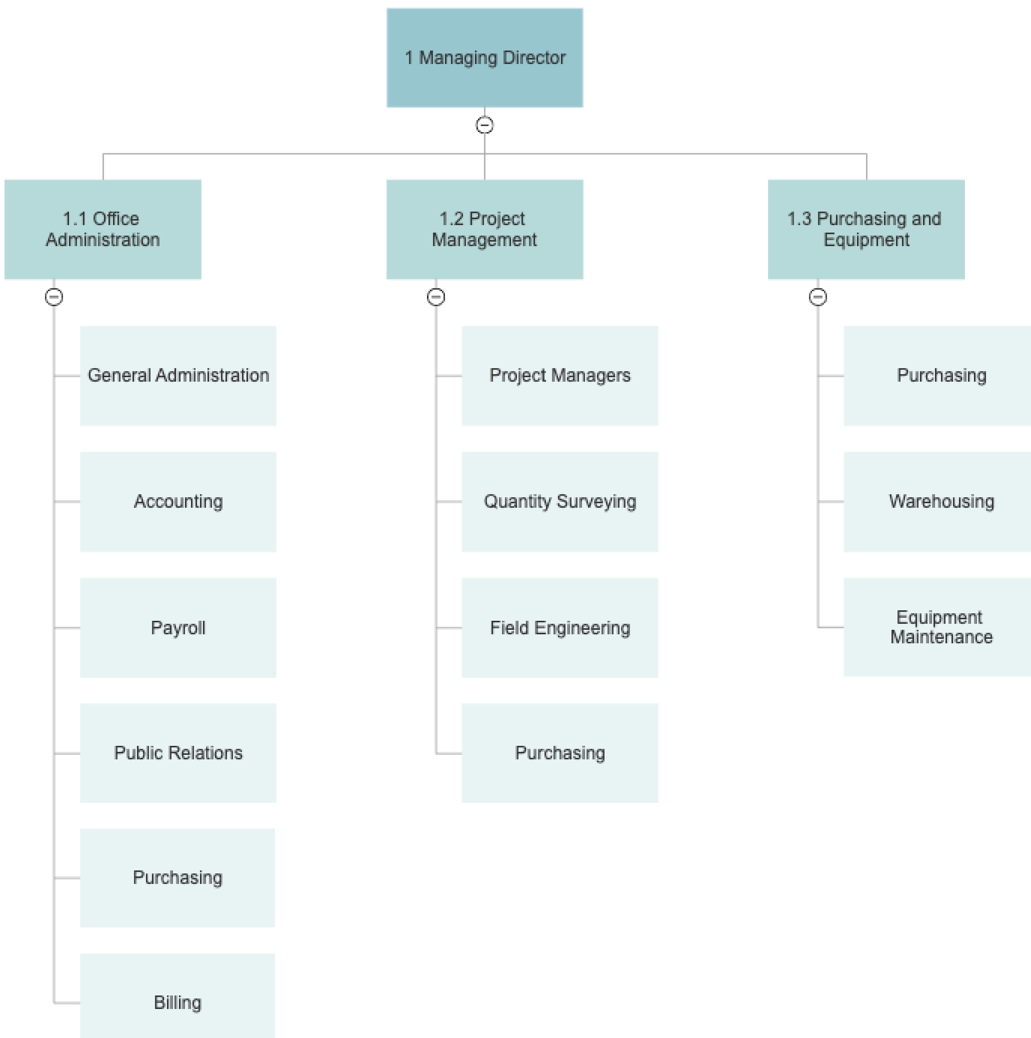

Figure 1 Organizational Structure (Source: T. Forde, The Author, 2020)

2.4 Products Offered

Moorjani Caribbean Ltd. offers general construction and renovation services.

2.5 Project Management Concepts

2.5.1 Project

Project Management Institute (PMI) (2017) defines a project as, “a temporary endeavour undertaken to create a unique product, service, or result” (p. 4). PMI (2017) goes on to say, “projects are undertaken to fulfill objectives by producing deliverables. An objective is defined as an outcome toward which work is to be directed, a strategic position to be attained, a purpose to be achieved, a result to be obtained, a product to be produced, or a service to be performed. A deliverable is defined as 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” (p. 4). Each project is very much unique in that the product from a project will be different for each project even if the same design, materials, and labour are used.

At Moorjani Caribbean Ltd., a project is defined from the contractor point-of-view. It is defined as an endeavour that involves planning, executing, and closing with the delivery of a product that adheres to the cost, time, quality, and aesthetic controls agreed upon in the contract.

2.5.2 Project Management

PMI (2017) says, “project management is not new. It has been in use for hundreds of years” (p. 1). Even though it may not have had an official term for it, project management as we know it today has been in use for a long time. It has been used in projects such as the Pyramids of Giza, the Great Wall of China, and the Panama Canal. Westland (2018) says, “it wasn’t until the 1900s that project management as we know it began to take form. As projects became industrialized, the process to manage them also experienced a revolution” (para. 15). Westland (2018) goes on to say the following:

> In 1965, the International Project Management Association (IPMA) was founded. It is the world's first project management association. Founded in Vienna as a means for project managers to network, the organization is now registered in Switzerland and is compiled of 50 national and internationally oriented project management associations. As of 2012 it had over 120,000 members. The non-profit Project Management Institute (PMI) was founded by five volunteers in 1969. Incorporated in Pennsylvania, it held its first symposium in Atlanta in 1969. It has since published A Guide to the Project Management Body of Knowledge (PMBOK), which outlines the processes and knowledge areas of project management and became standard in 1998. PMI is also a certification body, offering both the Certified Associate in Project Management (CAPM) and the Project Management Professional (PMP). (p. 20).

In construction, projects are usually completed using either project management, construction management, or a combination of both. In Barbados, it is more common to find organizations using construction management during construction than project management. Project management and construction management are similar, however, construction management is more specific to construction projects, whereas project management can be for any type of project. According to the Construction Management Association of America (CMAA) (2020) construction management is defined as, "a professional service that provides a project's owner(s) with effective management of the project's schedule, cost, quality, safety, scope, and function. Construction management is compatible with all project delivery methods. No matter the setting, a Construction Manager's (CMs) responsibility is to the owner and to a successful Project" (p. 1).

Within every sector, specifically construction, the discipline of project management is integral to success. PMI's *PMBOK® Guide* is a globally recognized standard that details how to initiate, plan, execute, monitor, and control and close a project. It can be used as a tool to ensure that all project management professionals are speaking the same language and understand the stages and role of the project. For this reason, the *PMBOK® Guide* will be used as the main source of reference to manage the development of the Project Management Plan.

According to PMI (2017), “project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (p. 8). The development of the Final Graduation Project (FGP) will consist of the creation of the Project Management Plan for the building of an Ice Cream Plant and will be managed as a project. During the initiation phase, the project will commence with the creation of the project charter. Once the charter is reviewed, accepted and formally authorized by the sponsor, the formal identity of the Project Manager will be revealed, authorizing him to apply organization resources to project activities. The initiation, planning, execution, monitoring and controlling and closing phases (stages) for the creation of the Project Management Plan will occur during the development of the Final Graduation project. After which, the construction of the Ice Cream Plant project will be managed as another project with six (6) phases. Each phase is identified below:

1. Phase 1: Initiation Phase
2. Phase 2: Pre-Construction Phase
3. Phase 3: Construction
4. Phase 4: Post Construction Phase
5. Phase 5: Project Closure

2.5.3 Project Life Cycle

PMI (2017) defines the project life cycle as, “the series of phases that a project passes through from its start to its completion. It provides the basic framework for managing the project” (p. 19). Project Life cycles can be predictive, adaptive, iterative, incremental, or a hybrid model and with the project life cycle there are generally one or more phases that are associated with the development of the product, service, or result.

Figure 2 shows the project life cycle that is used at Moorjani Caribbean Ltd.

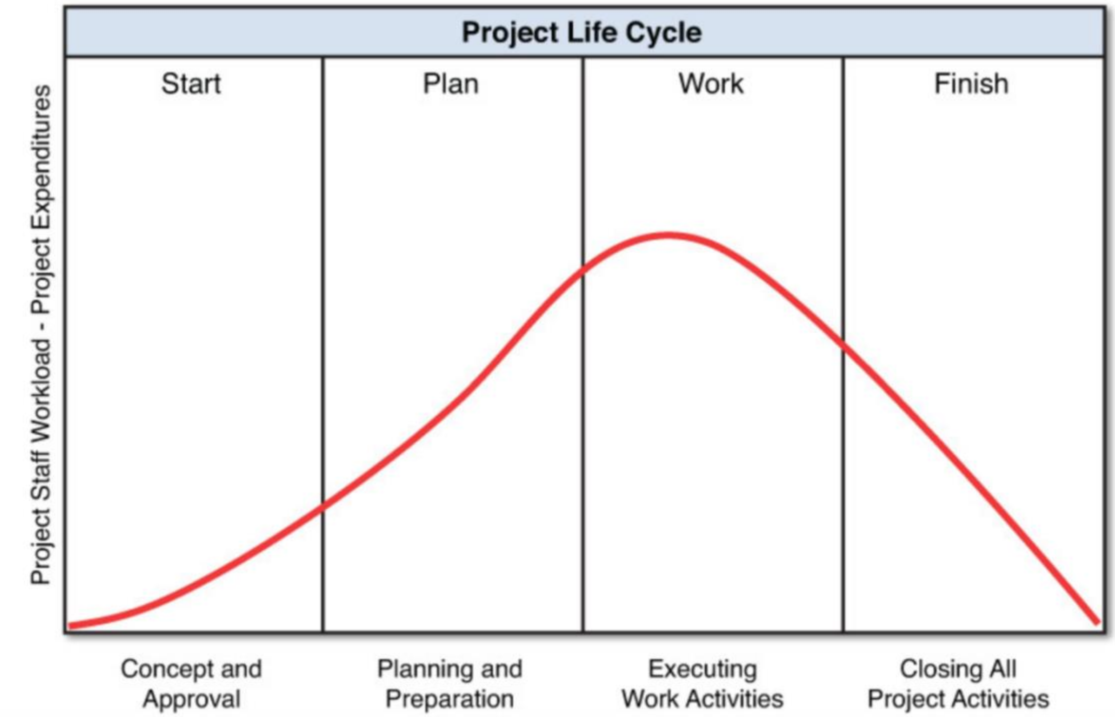

Figure 2 Project Life Cycle Stages of Progression. Source: (R. Wilson, 2015, p. 12)

2.5.4 Project Management Processes

PMI (2017) defines a project management process group as," a logical grouping of project management processes to achieve specific project objectives" (p. 23). Only the initiating and planning processes will be used to develop the project management plan for the construction of an Ice Cream Plant. The project management plan will be a compilation of subsidiary documents created as a result of each initiating and planning process activity. Figure 3 shows the details of the initiating and planning process to be applied during the development of a project management plan for the construction of an Ice Cream Plant.

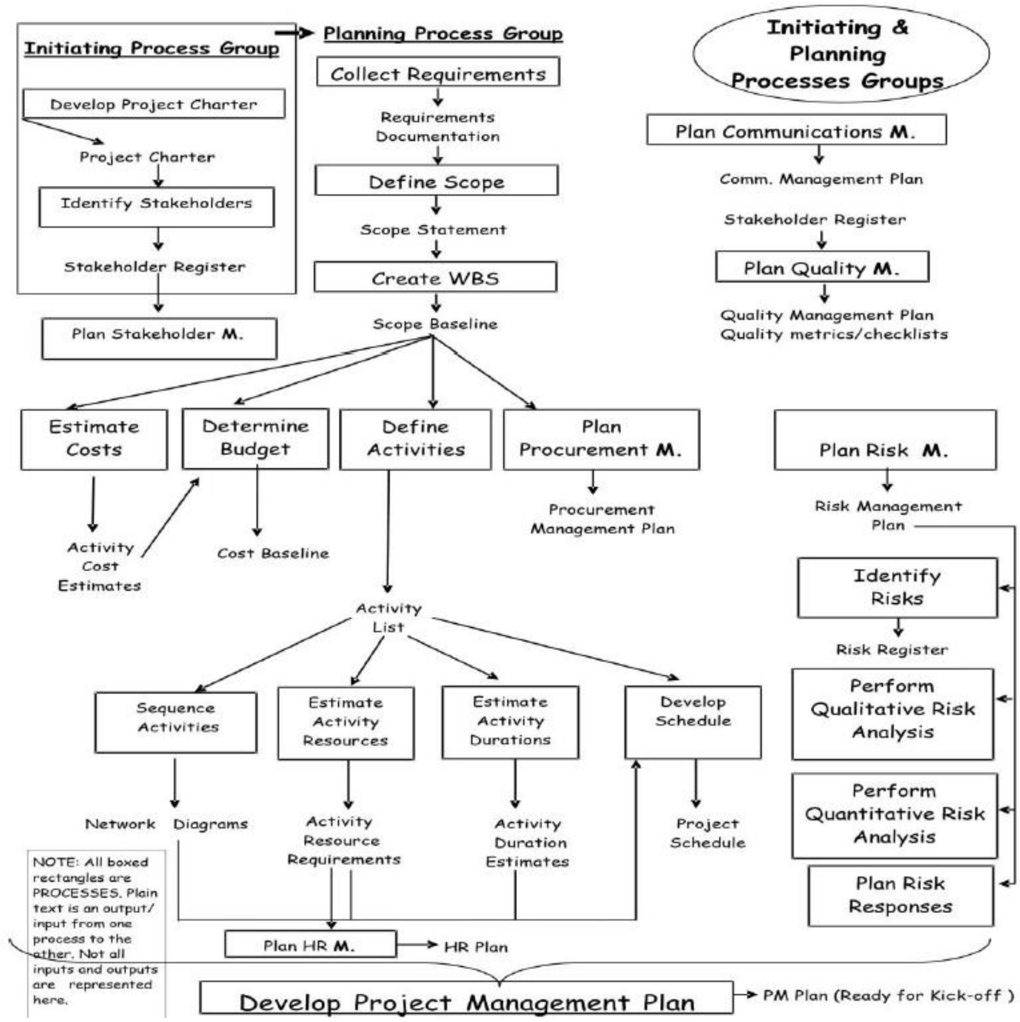

Figure 3 Initiating and Planning Processes. Source: (PMI, 2013, p. 51)

2.5.5 Project Management Knowledge Areas

There are “47 project management processes identified in the *PMBOK® Guide*, … [that have been] … grouped into ten separate knowledge areas” (PMI, 2017, p. 422). All of which will be used during the lifecycle of the FGP.

The ten knowledge areas of project management (Project Management Institute, 2017), are as follows.

2.5.5.1 Project Integration Management

PMI (2017) defines Project Integration Management as “the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups. In the project management context, integration includes characteristics of unification, consolidation, communication, and interrelationship” (p. 69). Figure 4 shows the processes involved in project integration management.

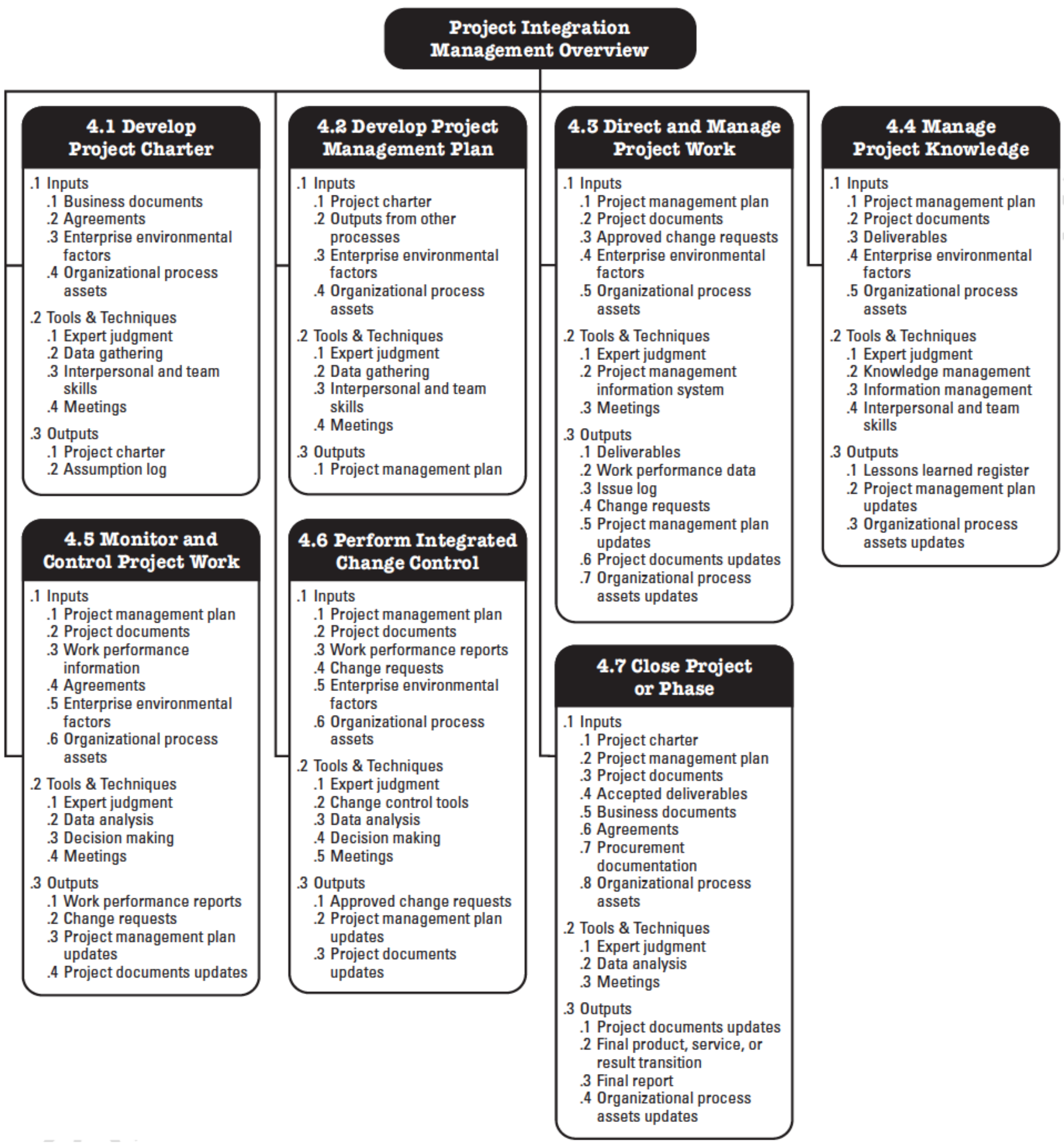

Figure 4 Project Integration Management Overview. Source: (PMI, 2017, p. 71)

Process 4.1 will be used to develop the project charter that will begin the development of the PMP for the construction of the ice cream plant. Additionally, Process 4.2 will be used as a guide throughout the development of the FGP results.

2.5.5.2 Project Scope Management

PMI (2017) defines project scope management as “the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully” (p. 129). Figure 5 shows the processes involved in project scope management.

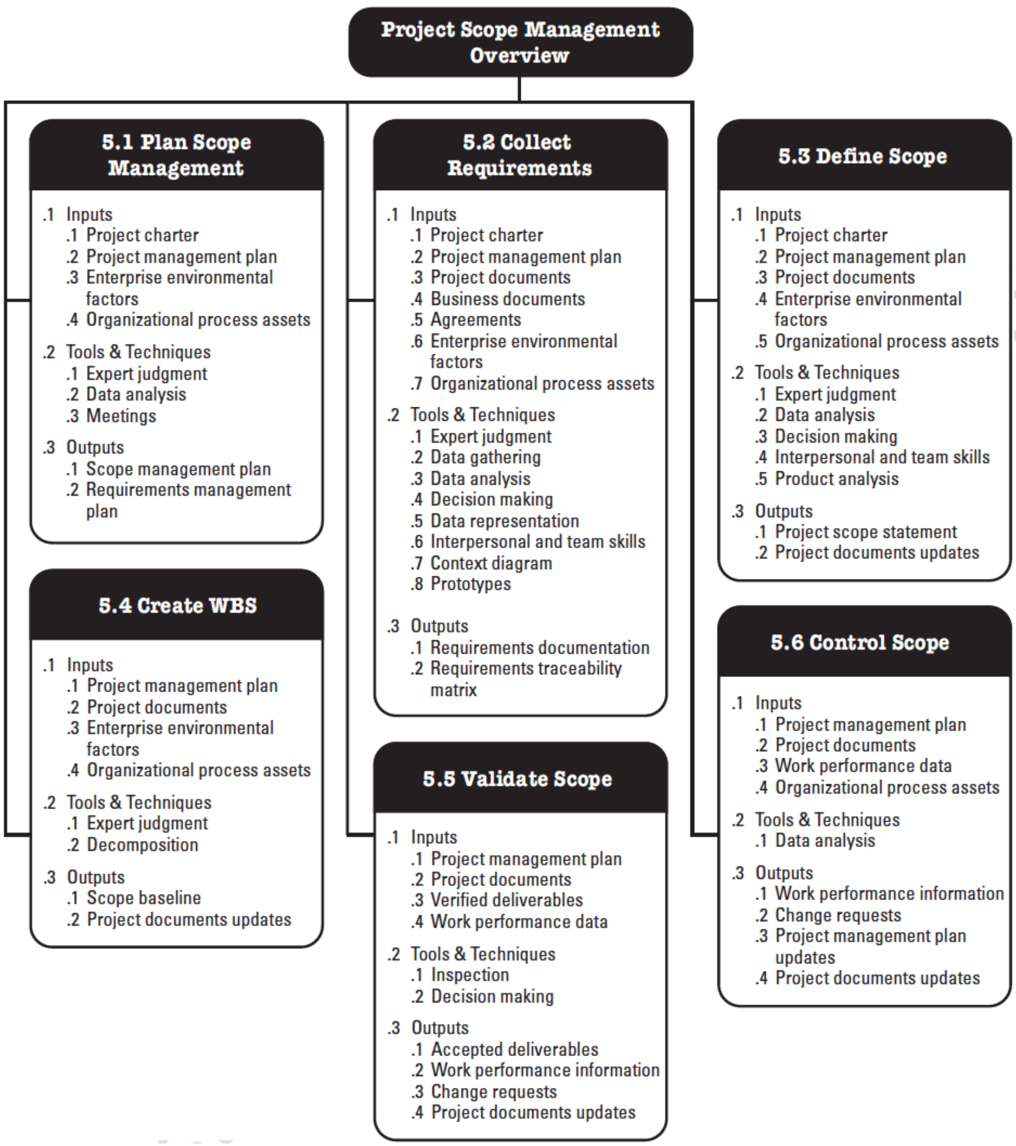

Figure 5 Project Scope Management Overview. Source: (PMI, 2017, p. 129)

Processes 5.1 through to 5.4 will be used to develop the scope management plan for the construction of the ice cream plant project.

2.5.5.3 Project Schedule Management

PMI (2017) defines project schedule management as "the processes required to manage the timely completion of the project" (p. 173). Figure 6 shows the processes involved in project schedule management. All of the processes seen in the figure will be used in the development of the PMP for the construction of an ice cream plant.

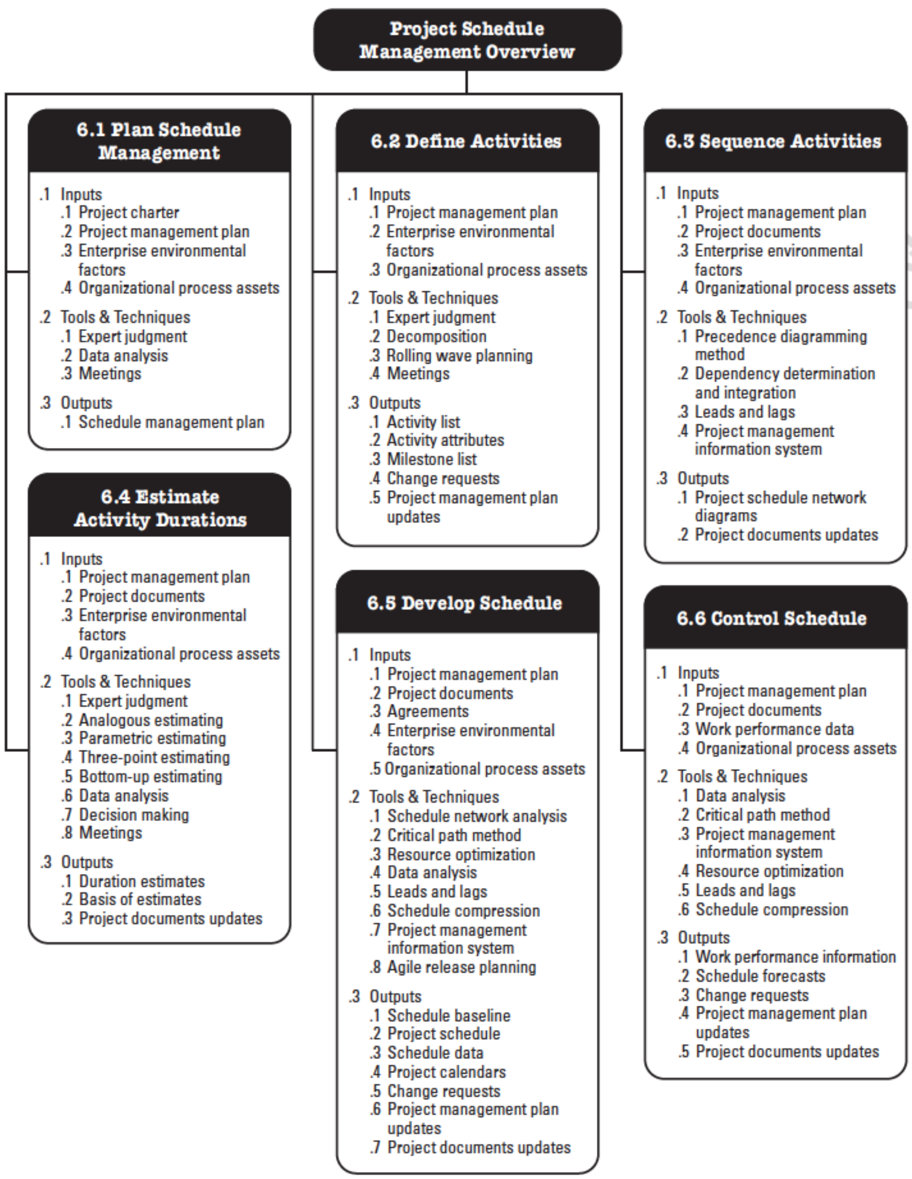

Figure 6 Project Schedule Overview. Source: (PMI, 2017, p. 174)

2.5.5.4 Project Cost Management

PMI (2017) defines project cost management as, “the processes involved in planning, estimating, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget” (p. 231). Figure 7 shows the processes involved in project cost management.

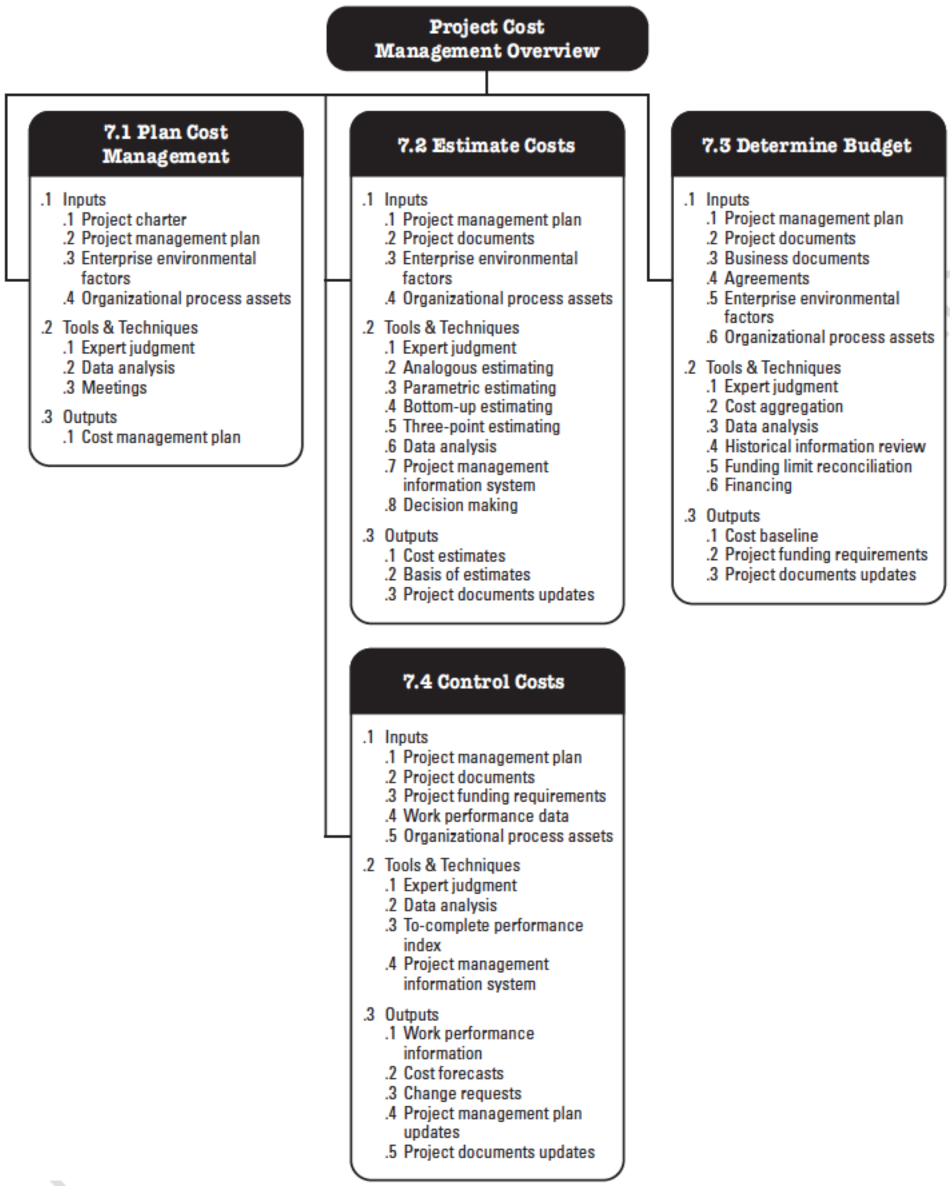

Figure 7 Project Cost Management Overview. Source: (PMI, 2017, p. 232)

Processes 7.1 to 7.3 will be used in the development of the project management plan for the construction of the ice cream plant.

2.5.5.5 Project Quality Management

PMI (2017) defines project quality management as, “processes for incorporating the organization’s quality policy regarding planning, managing, and controlling project and product quality requirements in order to meet the stakeholders’ objectives” (p. 271). PMI (2017) lists the processes involved in project quality management as:

- Plan Quality Management – The process of identifying quality requirements for the project and its deliverables and documenting how the project will demonstrate compliance with quality requirements and/or standards.
- Manage Quality – The process of translating the quality management plan into executable quality activities that incorporate the organization’s quality policies into the project.
- Control Quality – The process of monitoring and recording the results of executing the quality management activities to assess performance and ensure the project outputs are complete, correct, and meet customer expectations. (p. 271)

Plan Quality Management will be the only process involved in developing the project management plan for the construction of the ice cream plant.

2.5.5.6 Project Resource Management

PMI (2017) defines project resource management as, “processes to identify, acquire, and manage the resources needed for the successful completion of the project. PMI (2017) lists the processes involved in project resource management as:

- Plan Resource Management – The process of defining how to estimate, acquire, manage, and utilize physical and team resources.
- Estimate Activity Resources – The process of estimating team resources and the type and quantities of material, equipment, and supplies necessary to perform project work.

- Acquire Resources – The process of obtaining team members, facilities, equipment, materials, supplies, and other resources necessary to complete project work.
- Develop Team – The process of improving competencies, team member interaction, and the overall team environment to enhance project performance.
- Manage Team – The process of tracking team member performance, providing feedback, resolving issues, and managing team changes to optimize project performance.
- Control Resources – The process of ensuring that the physical resources assigned and allocated to the project are available as planned, as well as monitoring team changes to optimize project performance. (p. 307)

Only Plan Resource Management will be used in developing the project management plan for the construction of the ice cream plant.

2.5.5.7 Project Communications Management

PMI (2017) defines project communications management as, “processes necessary to ensure that the information needs of the project and its stakeholders are met through development of artifacts and implementation of activities designed to achieve effective information exchange” (p. 359). PMI (2017) lists the processes involved in project communications management as:

- Plan Communications Management – The process of developing an appropriate approach and plan for project communication activities based on the information needs of each stakeholder or group, available organizational assets, and the needs of the project.
- Manage Communications – The process of ensuring timely and appropriate collection, creation, distribution, storage, retrieval, management, monitoring, and the ultimate disposition of project information.

- Monitor Communications – The process of ensuring the information needs of the project and its stakeholders are met. (p. 359)

Only Plan Communications Management will be used in the development of the project management plan for the construction of the ice cream plant.

2.5.5.8 Project Risk Management

PMI (2017) defines project risk management as, "processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project" (p. 395). PMI (2017) lists the processes involved in project risk management as:

- Plan Risk Management – The process of defining how to conduct risk management activities for a project.
- Identify Risks – The process of identifying individual project risks as well as sources of overall project risk and documenting their characteristics.
- Perform Qualitative Risk Analysis – The process of prioritizing individual project risks for further analysis or action by assessing their probability of occurrence and impact as well as other characteristics.
- Perform Quantitative Risk Analysis – The process of numerically analysing the combined effect of identified individual project risks and other sources of uncertainty on overall project objectives.
- Plan Risk Responses – The process of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks.
- Implement Risk Responses – The process of implementing agreed-upon risk response plans.
- Monitor Risks – The process of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk process effectiveness throughout the project. (p. 395)

Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, and Plan Risk Responses will be used to develop the project management plan for the construction of the ice cream plant.

2.5.5.9 Project Procurement Management

PMI (2017) defines project procurement management as, "processes necessary to purchase or acquire products, services, or results needed from outside the project team" (p. 459). PMI (2017) lists the processes involved in project procurement management as:

- Plan Procurement Management – The process of documenting project procurement decisions, specifying the approach, and identifying potential sellers.
- Conduct Procurements – The process of obtaining seller responses, selecting a seller, and awarding a contract.
- Control Procurements – The process of managing procurement relationships, monitoring contract performance, making changes and corrections as appropriate, and closing out contracts. (p. 459)

Only Plan Procurement Management will be used in the development of the project management plan for the construction of the ice cream plant.

2.5.5.10 Project Stakeholder Management

PMI (2017) defines project stakeholder management as, "processes required to identify people, groups, or organizations that could impact or be impacted by the project, to analyse stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution" (p. 503). PMI (2017) lists the processes involved in project stakeholder management as:

- Identify Stakeholders – The process of identifying project stakeholders regularly and analysing and documenting relevant information regarding their interests, involvement, interdependences, influence, and potential impact on project success.
- Plan Stakeholder Management – The process of developing approaches to involve project stakeholders based on their needs, expectations, interests, and potential impact on the project.
- Manage Stakeholder Engagement – The process of communicating and working with stakeholders to meet their needs and expectations, address issues, and foster appropriate stakeholder engagement involvement.
- Monitor Stakeholder Engagement – The process of monitoring project stakeholder relationships and tailoring strategies for engaging stakeholders through the modification of engagement strategies and plans. (p. 503)

Identify Stakeholders and Plan Stakeholder Management will be used to develop the project management plan for the construction of the ice cream plant.

3 METHODOLOGICAL FRAMEWORK

3.1 Information Sources

Information can be obtained from many sources. In earlier times, going to a library to do research was one certain way of making sure that the information obtained was from a trusted source. With the advent of the internet, an overwhelming amount of information is available within seconds without having to leave the comfort of home. However, due to the nature of the internet, anyone who has access to it can publish information to the internet. With that being said, it is extremely important to use trusted sources to make sure that the information that is used is as accurate as possible.

Despite the vast amount of information available from many sources, there are only three types of information sources. These three types are primary, secondary, and tertiary information sources. The University of Minnesota (n.d.) says, “these classifications are based on the originality of the material and the proximity of the source or origin. This informs the reader as to whether the author is reporting information that is first-hand or is conveying the experiences and opinions of others which is considered second hand” (para. 1). The development of the Final Graduation will be done with primary and secondary information sources.

3.1.1 Primary Sources

The University of Minnesota (n.d.) describe primary information sources as, “records of events or evidence as they are first described or actually happened without any interpretation or commentary. It is information that is shown for the first time or original materials on which other research is based” (para. 2). For the development of the Final Graduation Project, the primary information sources that will be used are personal interviews with members of Moorjani Caribbean Ltd., interviews with other stakeholders, drawings from the design engineers and architects, and scholarly journal articles. Chart 1 will note the specific primary information sources that will be used.

3.1.2 Secondary Sources

The University of Minnesota (n.d.) defines secondary information sources as, "an analysis or restatement of primary sources. They often try to describe or explain primary sources. They tend to be works which summarize, interpret, reorganize, or otherwise provide an added value to a primary source" (para. 4). For the development of the Final Graduation Project, secondary sources such as the PMBOK® Guide and articles will be used. Chart 1 shows a list of secondary sources used for each objective of the Final Graduation Project.

Chart 1 Information Sources (Source: T. Forde, The Author, March 2020)

Objectives	Information sources	
	Primary	**Secondary**
1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project.	▪ Personal Interview with Richard Moorjani, Managing Director.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
3. To create a schedule management plan to develop a project schedule that ensures the project is completed within the time constraints.	▪ Personal Interview with Gerardo Thomas, Junior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet

Objectives	Information sources	
	Primary	Secondary
4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure the project is completed within the budget constraints.	▪ Personal Interview with Doug McGougan, Quantity Surveyor.	▪ PMBOK ® Guide, 7th Edition ▪ Practice Standard for Project Estimating ▪ Internet
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meet the needs of the client and project management team.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Project Quality Management: Why, What, and How ▪ Internet
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.	▪ Personal Interview with Doug McGougan, Quantity Surveyor.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet

Objectives	Information sources	
	Primary	Secondary
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.	▪ Personal Interview with Gerardo Thomas, Junior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet

3.2 Research Methods

According to Bhat (n.d.), research is “a careful consideration of study regarding a particular concern or problem using scientific methods. According to the American sociologist Earl Robert Babbie, “Research is a systematic inquiry to describe, explain, predict, and control the observed phenomenon” (para. 1). The Merriam-Webster Dictionary (n.d.) defines scientific method as, “principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses” (para. 1). Therefore, a research method is a procedure for the careful consideration of study for a particular concern or problem. In this case, research methods will be used to complete the Final Graduation Project.

3.2.1 Analytical Method

Yang (n.d.) in his article says, “analytical research attempts to establish *why* it is that way or how it came to be” (para. 7). Yang (n.d.) goes on to say, “analytical research usually concerns itself with cause-effect relationships” (para. 8). Therefore, analytical research uses information that is already available to come to a conclusion.

3.2.2 Interviews Method

Research Methodology defines an interview as, “qualitative research technique which involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program or situation” (para. 1). There are three different formats of interviews: structured, semi-structured, and unstructured. Research Methodology says the following about each type of interview:

> Structured interviews consist of a series of pre-determined questions that all interviewees answer in the same order. Data analysis usually tends to be more straightforward because researcher can compare and contrast different answers given to the same questions. Unstructured interviews are usually the least reliable from research viewpoint, because no questions are prepared prior to the interview and data collection is conducted in an informal manner. Unstructured interviews can be associated with a high level of bias and comparison of answers given by different respondents tends to be difficult due to the differences in formulation of questions. Semi-structured interviews contain the components of both structured and unstructured interviews. In semi-structured interviews, interviewer prepares a set of same questions to be answered by all interviewees. At the same time, additional

questions might be asked during interviews to clarify and/or further expand certain issues. (paras. 3-5)

Chart 2 shows the research method for each specific objective.

Chart 2 Research Methods (Source: T. Forde, The Author, March 2020)

Objectives	Information sources	
	Primary	**Secondary**
1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project.	▪ Personal Interview with Richard Moorjani, Managing Director.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
3. To create a schedule management plan to develop a project schedule that ensures the project is completed within the time constraints.	▪ Personal Interview with Gerardo Thomas, Junior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet

Objectives	Information sources	
	Primary	Secondary
4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure the project is completed within the budget constraints.	▪ Personal Interview with Doug McGougan, Quantity Surveyor.	▪ PMBOK ® Guide, 7th Edition ▪ Practice Standard for Project Estimating ▪ Internet
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meet the needs of the client and project management team.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Project Quality Management: Why, What, and How ▪ Internet
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.	▪ Personal Interview with Doug McGougan, Quantity Surveyor.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet

Objectives	Information sources	
	Primary	Secondary
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.	▪ Personal Interview with Gerardo Thomas, Junior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet
10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.	▪ Personal Interview with Sami Barshini, Senior Project Manager.	▪ PMBOK ® Guide, 7th Edition ▪ Internet

3.3 Tools

PMI (2017) defines a tool as “something tangible, such as a template or software program, used in performing an activity to produce a product or result” (p. 725). Each tool used in the Final Graduation Project is identified and explained below.

Chart 3 Tools (Source: T. Forde, The Author, March 2020)

Objectives	Tools
1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project.	▪ Expert Judgement. ▪ Data Gathering. ▪ Meetings
2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included.	▪ Expert Judgement. ▪ Data Gathering. ▪ Meetings
3. To create a schedule management plan to develop a project schedule that ensures the project is completed within the time constraints.	▪ Microsoft Project ▪ Expert Judgement. ▪ Data Analysis ▪ Meetings
4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure the project is completed within the budget constraints	▪ Microsoft Excel ▪ Expert Judgement. ▪ Data Analysis ▪ Parametric Estimating ▪ Meetings
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meet the needs of the client and project management team.	▪ Expert Judgement. ▪ Data Gathering ▪ Meetings

Objectives	Tools
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.	▪ Expert Judgement ▪ Data Gathering ▪ Meetings
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.	▪ Expert judgment ▪ Analysis ▪ Meetings
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.	▪ Microsoft Excel ▪ Expert Judgement. ▪ Data Analysis ▪ Meetings
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.	▪ Expert Judgement. ▪ Data Gathering ▪ Meetings
10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.	▪ Microsoft Excel ▪ Expert Judgement. ▪ Meetings

3.4 Assumptions and Constraints

PMI (2017) defines an assumption as “a factor in the planning process considered to be true, real, or uncertain, without proof or demonstration” (p. 699). PMI (2017) also defines a constraint as “a limiting factor that affects the execution of a project, program, portfolio, or process” (p. 701). Chart 4 shows the assumptions and constraints considered on the Final Graduation Project for each specific objective.

Chart 4 Assumptions and Constraints (Source: T. Forde, The Author, March 2020)

Objectives	Assumptions	Constraints
1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project.	The charter will be created before all other subsidiary documents.	There are only seven (7) days allowed to create the project charter.
2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included.	The client has disclosed all information with regards to what they want to achieve with this project.	The client is considering an expansion of the project scope to include another floor for the Ice Cream Plant.
3. To create a schedule management plan to develop a project schedule that ensures the project is completed within the time constraints.	The project can be completed in the time frame allotted by the client.	The total time needed to complete the project must not exceed eighteen (18) months.

Objectives	Assumptions	Constraints
4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure the project is completed within the budget constraints.	The budget created during the planning process will cover all expenses used during the project.	The contract is a fixed price contract and any costs incurred over the budged will be at the risk of the contractor.
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meet the needs of the client and project management team.	The quality management plan will identify all quality requirements for the project.	The final product is able to withstand category 5 hurricane force winds, as well as earthquakes of up to 7 on the Richter scale.
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.	The organization has adequate resources to successfully complete the project on time and under budget.	The resources are limited to what is locally available due to the time available to complete the project.

Objectives	Assumptions	Constraints
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.	The organization has the technology required to satisfy the communication needs of all stakeholders.	Electricity and internet access are necessary and dependable.
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.	All risks will be identified during this process.	There will only be room in the budget for five (5) main risk contingency plans.
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.	The organization has a list of approved sellers.	International suppliers will not be used as they can cause delays in the project schedule that cannot be afforded.
10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.	All stakeholders will be identified, and their contact information will be accurate.	Not all stakeholders can be treated equally.

3.5 Deliverables

PMI (2017) defines a deliverable as, "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" (p. 704). Chart 5 shows the expected deliverables for each specific objective.

Chart 5 Deliverables (Source: T. Forde, The Author, March 2020)

Objectives	Deliverables
1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project.	▪ Project Charter ▪ Project Management Plan
2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included.	▪ Scope Management Plan, ▪ Requirements Management Plan ▪ Requirements Traceability Matrix
3. To create a schedule management plan to develop a project schedule that ensures the project is completed within the time constraints.	▪ Schedule Management Plan ▪ Activity List ▪ Schedule Network Diagram ▪ Schedule in Gantt chart.
4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure the project is completed within the budget constraints.	▪ Cost Management Plan ▪ Cost Baseline

Objectives	Deliverables
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meet the needs of the client and project management team.	▪ Quality Management Plan
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.	▪ Resource Management Plan
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.	▪ Communication Management Plan
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.	▪ Risk Management Plan ▪ Risk Register
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.	▪ Procurement Management Plan
10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.	▪ Stakeholder Management Plan ▪ Stakeholder Register

4 RESULTS

4.1 Project Integration Management

The Project Integration Management Plan considers the Project Charter and the Project Management Plan.

4.1.1 Project Charter

The Project Charter formally authorized the project and provided the Senior Project Manager with the authority to apply organisational resources to the project to produce the Project Management Plan.

A Project Charter was the first process in the Project Integration Management knowledge area. In addition, it was the first step in developing the Project Management Plan for the construction of an Ice Cream Plant.

An interview with the Senior Project Manager, Sami Barshini was conducted to develop the Project Charter.

Chart 6 Project Charter (Source: T. Forde, The Author, March 2020)

PROJECT CHARTER
Project Name
Project Management Plan for the construction of an Ice Cream Plant
Project Purpose/Justification
The construction of the ice cream plant arises from the objective of Chefette Restaurants Limited (CRL) to become the best fast food franchise in the Caribbean. Furthermore, it is the goal of the owners to reduce costs on having their ice cream brand produced overseas and then shipped to Barbados.
Business Objectives
The following business objectives have been established with respect to the PMP project for the construction of the ice cream plant:

1	To determine the feasibility and impact of an ice cream plant for Chefette Restaurants Limited in order to determine if the project should be considered.
2	To design an ice cream plant to allow Chefette Restaurants Limited to be able to produce their brand of ice cream locally at the highest standard.
3	To create a project site that is well prepared for construction and to verify that the structural steel for the building is designed and manufactured to the specifications necessary to ensure safety and high quality.
4	To construct the ice cream plant to the highest quality possible under budget and ahead of schedule in order to provide the client with the product that was requested.
5	To handover the completed ice cream plant to the client in order to close the project.
6	To manage the project with the best practices identified by the Project Management Institute in the Project Management Body of Knowledge ® to provide the best possible service to the client.

Project Description

Stakeholders

Chefette Restaurants Limited

- Owner
- Project Manager

Tatem Architects

- Architect

Professional Engineering Services Limited

- Structural Engineer

Edge Engineering Limited

- Mechanical Engineer
- Electrical Engineer

Moorjani Caribbean Limited

- Owner
- Senior Project Manager

- Junior Project Manager
- Site Engineers
- Administrative Assistant
- Storeroom Clerk
- Masons
- Carpenters
- Labourers

Subcontractors:

- Steel Bending (A.G. Steel Bending)
- Excavation/Backfilling (C.O. Williams)
- Plumbing (A.J. Mechanical)
- Electrical (TMR Ltd)
- Air-Condition (21 Degrees)
- Fireproofing (Regional Fire and Security)
- Crane (Crane and Equipment)
- Tiling (Alex Clarke)
- Painting (John Forde)

Suppliers

- Kooyman Barbados
- Carter's General Store
- BRC West Indies Limited
- Ready Mix
- Structural Steel Systems

Government Agencies

- Ministry of Health

Measurable Project Objectives and Success Criteria

Requirements

- The ice cream plant is to be constructed so that it can withstand hurricanes stronger than category 5.
- The ice cream plant is to be constructed so that it can withstand earthquakes stronger than 7 on the Richter Scale.

- The ice cream plant is to be constructed so that all concrete block walls and concrete floors are to be reinforced with steel. - The ice cream plant is to be constructed so that there is adequate lighting and fresh air ventilation for the people occupying the building. - The ice cream plant is to be constructed so that there is an emergency means of egress. - The ice cream plant is to be constructed so that there is a fire suppression system installed.
Constraints
- The project should not exceed $6.5 million Barbados dollars. - The project duration should not exceed 18 months.
Assumptions
- It is assumed that sufficient skilled workers will be available for the duration of the project. - It is assumed that all approvals necessary to begin construction will be approved by all regulatory agencies. - It is assumed that there will not be any national shutdowns for the duration of the project. - It is assumed that the client is sufficiently funded to sponsor the entire project. - It is assumed that there will not be any major storms during the construction period of the project.
Preliminary Scope
The preliminary project scope is as follows: a. **Foundation** – see Scope Management Plan for specifications b. **Ground Floor** – see Scope Management Plan for specifications c. **Roof** – see Scope Management Plan for specifications The following items are excluded from MCL’s scope: i. Equipment Procurement and Installation ii. Furniture Procurement and Installation
Risks

- If there are natural disasters (e.g. hurricanes) occurring during construction, then the project schedule can be delayed, and project material may be damaged.
- If workers are injured on the job site, then it may delay the project schedule and more resources will have to be found to replace the injured workers.
- If there is a delay in shipment of necessary materials, then the project schedule will be delayed.
- If equipment malfunctions during construction, then it will have to be replaced which may delay the project schedule.
- If errors are made during material fabrication, then the project schedule will be delayed as time would be wasted waiting on the correct material to arrive.
- If material is damaged during shipment, then the project schedule may be delayed as new material needs to be ordered.
- If there is damage to material on site, then it needs to be replaced which increases the project costs.
- If prices of material change during construction, then the project budget will have to be increased.
- If concrete fails compression testing, then the areas built with that concrete will have to be redone causing a delay in project schedule and an increase in project costs.
- If the client changes project requirements during construction, then there will be delay in project schedule and an increase in project costs as more work would need to be done than previously agreed upon.

Project Deliverables

1. Feasibility Report & Environmental Impact Assessment
2. Design Drawings (Architectural Drawings, Structural Drawings, and MEP Drawings)
3. Cleared Project Site and Structural Steel as Built Drawings
4. Completed Ice Cream Plant
5. Completed Building Handover Documents
6. Updated Project Management Plan

Summary Milestone Schedule

1. Project Initiation/Kick-off	January 15, 2021
2 Ice Cream Plant Design Completed	February 22, 2021
3. Ground-breaking Ceremony	April 26, 2021
4. Excavation and Backfilling Completed	June 30, 2021
5. Foundation Completed	July 31, 2021
6. Steel Structure Erected	August 5, 2021
7. Completion of Perimeter Walls	October 5, 2021
8. Completion of Ground Floor Slab	November 8, 2021
9. Completion of Interior Walls	December 4, 2021
10. Installation of All Windows and Doors	January 18, 2022
11. Completion of Plumbing Work	February 12, 2022
12. Completion of Electrical Work	February 13, 2022
13. Completion of Painting	March 1, 2022
14. Final Building Inspection	March 18, 2022
15. Project End	March 21, 2022

Project Budget

Item	**Costs**
Construction and Administration	$5,708,550.00
Permits	$20,000.00
Contingency (3%)	$171,856.50
Management Reserve (5%)	$295,020.33
Grand Total	**$6,195,426.83**

Project Approval

In order to gain project approval, the ice cream plant must be delivered by April 15th, 2022 with all of the details agreed upon in the project scope.

Project Manager

The Senior Project Manager is Sami Barshini. The Junior Project Manager is Gerardo Thomas who will act on his behalf in his absence. Responsibilities include the following: Production, Coordination, Quality Control, Procurement, Code Compliance, Reporting and Project Finances	
Authorization	
Approved by:	**Date:**

4.1.2 Project Management Plan

The development of the Project Management Plan is the second process in the Project Integration Management knowledge area comprised of the subsidiary plans developed during the Final Graduation Project.

In addition, the Project Management Plan considers the following processes: Change Control, Lessons Learned and Project Closure, which are described hereafter.

4.1.2.1 Change Control Process

If any changes to the project scope have to be made, then this process will be completed through integrated change control.

a. Any member of the project team or any stakeholder may make a request for a change and this is done by completing a Change Order Request.
b. The member should submit the “Change Order Request” to the Senior Project Manager of MCL.
c. The Senior Project Manager will review the “Change Order Request” and will decide whether to approve it or not.
d. If the Senior Project Manager accepts it then he will present it to the Project Manager from Chefette Restaurants Limited and the Project Sponsor.

e. If the change order is accepted by the Project Manager and Project Sponsor, then the change order will be formally accepted by it being signed by both parties.
f. The Senior Project Manager will update all project documents and communicate the change to all project team members and stakeholders through a change directive.

4.1.2.2 Lessons Learned

PMI (2017) defines the lessons learned register as a repository of lessons learned throughout the project lifecycle that can be used in future projects undertaken by the organization (p. 104). The documentation of the lessons will consider the following process:

a. At the end of each project phase an analysis of the completed work and the processes gone through to complete the work will be developed.
b. Any challenges, problems, realized risks and opportunities will be recorded and the impact, recommendations and proposed actions will be recorded too.
c. Based on this, actions will be taken accordingly to minimize the negative impact or to increase the opportunity in the case of a positive impact.
d. In the meantime, the document should also be stored so that anyone can retrieve it whenever the company suspect a similar lesson learned.

A template of how to document the lessons learned is shown in Appendix 6.

4.1.2.3 Project Closure

PMI (2017) says, “during project closure, the project manager reviews prior phase documentation, customer acceptance documentation from the Validate Scope process, and the agreement (if applicable) to ensure that all project requirements are completed prior to finalizing the closure of the project” (p. 128). Once the project has been completed then the senior project manager will go through all of these processes to formally close out the ice cream plant project.

The following activities will be undertaken to ensure the successful closure of this project:

a. The Senior Project Manager, the Project Manager, and the Project Sponsor will do a final inspection of the building to make sure that all agreed work has been completed to an acceptable standard.
b. If there are any notes from the inspection, then the Senior Project Manager will complete these punch list items and reschedule another final inspection.
c. Once all work has been approved then the Project Sponsor will complete the deliverable acceptance form and it will be signed by both the Project Sponsor, the Senior Project Manager, and the Project Manager.
d. The keys to the building will then be handed over to the Project Sponsor.

4.2 Scope Management Plan

The Scope Management Plan provides the scope for the project. This plan will document the approach to scope management, the roles and responsibilities of the project team as it relates to the project scope, scope definition, verification, change control measures, and the work breakdown structure.

This project is the construction of an Ice Cream Plant. The owners of Chefette Restaurants Ltd. necessitated the construction of this manufacturing plant to not only reduce importation costs, but to expand their business from a local franchise to a regional one.

4.2.1 Roles and Responsibilities

The Project team will all play key roles in managing the scope of the project. Therefore, it is important that each member understand their respective responsibilities in order to ensure that all work performed during the project is only the work outlined in the project scope. Chart 7 defines the roles and responsibilities of the project team for the scope management of this project.

Chart 7 Roles and Responsibilities (Source: T. Forde, The Author, March 2020)

Name	Role	Responsibilities
Chefette Restaurants Limited	Project Sponsor	• Approve or deny change order requests. • Accept or decline project deliverables. • Propose scope changes.
Sami Barshini	Senior Project Manager, MCL	• Verify project scope. • Evaluate change order requests. • Evaluate impact of scope changes. • Organize change control meetings. • Communicate change directives. • Update project documents upon approval of change order requests. • Propose scope changes.
Jason Stanley	Project Manager, CRL	• Evaluate change order requests. • Propose scope changes.
Gerardo Thomas, Tito Dignos, Tyrell Forde	Junior Project Manager and Site Engineers	• Participate in change control meetings. • Communicate change control requests to the project managers. • Propose scope changes.
Stakeholders	Subcontractors and Site Workers	• Propose scope changes. • Execute change directives.

4.2.2 Scope Management Approach

Scope Management will be the sole responsibility of the Senior Project Manager. The Scope Statement, Work Breakdown Structure (WBS), and Work Breakdown Structure Dictionary are what define the scope for this project.

Proposed changes to the scope can be made by any member of the project team or any of the stakeholders as described in section 4.1.2.1 Change Control Process.

The PMBOK ® Guide's project scope management process will be used to identify, develop, maintain, and manage the requirements of the project. The processes used in this overall process are as follows:

- Collect requirements – the process of determining, documenting, and managing the stakeholder's needs, regulatory requirements, and industry standards as it applies to the project objectives.
- Define scope – the process of developing a detailed description of all necessary work in order to satisfy the stakeholder's needs, regulatory requirements, and industry standards.
- Create WBS – the process of subdividing project deliverables into smaller, more manageable components.
- Validate Scope – the process of formally accepting the project scope developed from the stakeholder's requirements.
- Control Scope – the process of monitoring and managing any changes to the project scope.

4.2.3 Collect Requirements

It is important to establish a common understanding of the requirements that will be addressed by the project between the customer and organization throughout the project lifecycle. Therefore, ensure that requirements are determined and accepted to establish a baseline for development, acquisition, or management; and to ensure plans, work products, and activities are consistent with the requirements.

The requirements documentation and the requirements traceability matrix are all applicable to this process.

4.2.3.1 Requirements Documentation

Requirements documentation describes how individual requirements meet the business needs for the project. Requirements may start out at a high level and become progressively more detailed as more information about the requirements is known. Before being installed, requirements need to be clear (measurable and testable), traceable, complete, consistent and acceptable to key stakeholders (PMI, p. 184, 2017). The following chart describes the requirements.

Chart 8 Requirements (Source: T. Forde, The Author, March 2020)

Customer Needs	Functional Requirements	Technical Requirements	Priority	Raised by
Use existing property.	Land Surveyor to provide boundary drawing to Architect and Project Sponsor.	Building must be within property boundaries.	High	Project Sponsor
Building laid out to efficiently use available property area.	Use boundary drawing to design and produce architectural site plan.	Site plan to indicate proposed location of building on site area.	High	Project Sponsor
Building must be constructed with structural steel.	Send out invitations to tender to produce the steel frame for the building.	Structural steel to be produced as required by structural design.	High	Structural Engineer
Building must be structurally sound.	Consultation and approval should be done by a registered professional structural engineer.	Building should adhere to local building codes and industry standards.	High	Project Sponsor

Customer Needs	Functional Requirements	Technical Requirements	Priority	Raised by
Building must have electricity.	Consultation and approval should be done by a registered professional electrical engineer.	All electrical design should be based on the expected electrical load based on equipment and use of the building.	High	Project Sponsor
Building must have running water.	Consultation and approval should be done by a registered professional mechanical engineer.	All plumbing should be designed based on the building use for supply, waste, and ventilation.	High	Project Sponsor
Building must have wastewater treatment capabilities.	Consultation and approval should be done by a registered professional environmental engineer.	Wastewater treatment should be designed based on expected load from plant.	High	Local Building Code
Building must be adequately sized to allow for plant machinery.	Architect to design building based on equipment necessary based on industry standards.	Building should have enough room for equipment installation and maintenance.	High	Industry Standard
Building must have access for handicapped.	Architect to design building to accommodate differently abled persons.	Being differently abled should not stop you from entering the building therefore	High	Project Sponsor

Customer Needs	Functional Requirements	Technical Requirements	Priority	Raised by
		this aspect should be considered.		

4.2.3.2 Requirements Traceability Matrix

The requirements traceability matrix is a grid that links product requirements from their origin to the deliverables that satisfy them.

The implementation of a traceability matrix helps ensure that each requirement adds business value by linking it to the business and project objectives. It provides a means to track requirements throughout the project life cycle, helping to ensure that requirements approved in the requirements documentation are delivered at the end of the project. Finally, it provides a structure for managing changes to the product scope (PMI, p. 185, 2017).

The requirements traceability matrix has been depicted in the following chart.

Chart 9 Requirements Traceability Matrix (Source: T. Forde, The Author, March 2020)

Customer Needs	Functional Requirements	Technical Requirements	Priority	Project Objective	WBS ID	Architectural Design Document	Verification
Use existing property.	Land Surveyor to provide boundary drawing to Architect and Project Sponsor.	Building must be within property boundaries.	High	To determine the feasibility and impact of an ice cream plant for Chefette Restaurants Limited in order to determine if the project should be considered.	1.2.1	Boundary Drawing	
Building laid out to efficiently use available property area.	Use boundary drawing to design and produce architectural site plan.	Site plan to indicate proposed location of building on site area.	High	To design an ice cream plant to allow Chefette Restaurants Limited to be able to produce their brand of ice cream locally at the highest standard.	1.2.1	Site Plan	
Building must be constructed with structural steel.	Send out invitations to tender to produce the steel frame for the building.	Structural steel to be produced as required by structural design.	High	To create a project site that is well prepared for construction and to verify that the structural steel for the building is designed and manufactured to the specifications necessary to ensure safety and high quality.	1.3.2	Structural design and steel shop drawings.	

Customer Needs	Functional Requirements	Technical Requirements	Priority	Project Objective	WBS ID	Architectural Design Document	Verification
Building must be structurally sound.	Consultation and approval should be done by a registered professional structural engineer.	Building should adhere to local building codes and industry standards.	High	To construct the ice cream plant to the highest quality possible under budget and ahead of schedule in order to provide the client with the product that was requested.	1.4	Complete structural drawings.	
Building must have electricity.	Consultation and approval should be done by a registered professional electrical engineer.	All electrical design should be based on the expected electrical load based on equipment and use of the building.	High	To construct the ice cream plant to the highest quality possible under budget and ahead of schedule in order to provide the client with the product that was requested.	1.4.6	Electrical layout and schedules.	
Building must have running water.	Consultation and approval should be done by a registered professional mechanical engineer.	All plumbing should be designed based on the building use for supply, waste, and ventilation.	High	To construct the ice cream plant to the highest quality possible under budget and ahead of schedule in order to provide the client with the product that was requested.	1.4.7	Plumbing layout and schedules.	

Customer Needs	Functional Requirements	Technical Requirements	Priority	Project Objective	WBS ID	Architectural Design Document	Verification
Building must have wastewater treatment capabilities.	Consultation and approval should be done by a registered professional environmental engineer.	Wastewater treatment should be designed based on expected load from plant.	High	To construct the ice cream plant to the highest quality possible under budget and ahead of schedule in order to provide the client with the product that was requested.	1.4	Wastewater treatment design drawings.	
Building must be adequately sized to allow for plant machinery.	Architect to design building based on equipment necessary based on industry standards.	Building should have enough room for equipment installation and maintenance.	High	To design an ice cream plant to allow Chefette Restaurants Limited to be able to produce their brand of ice cream locally at the highest standard.	1.2.1	Architectural Drawings	
Building must have access for handicapped.	Architect to design building to accommodate differently abled persons.	Being differently abled should not stop you from entering the building therefore this aspect should be considered.	High	To design an ice cream plant to allow Chefette Restaurants Limited to be able to produce their brand of ice cream locally at the highest standard.	1.2.1	Architectural Drawings	

4.2.4 Scope Definition

The scope for this project was defined through a comprehensive requirements collection process. This process began with a thorough analysis of the owner's objectives, building codes, and documentation relative to industry standards. Secondly, the input from the architect, design engineer, and fabricators was also analyzed. After, the Senior and Junior Project Managers of MCL developed the requirements management plan, requirements documentation, and requirements traceability matrix for the building specifications.

4.2.5 Project Scope Statement

The project scope statement provides a detailed description of the project, deliverables, constraints, and acceptance criteria. The scope statement contains only the work that should be performed. Any work outside of the scope statement should not be performed.

Chart 10 Project Scope Statement (Source: T. Forde, The Author, July 2020)

Project Name	
Project Management Plan for the construction of an Ice Cream Plant	
Product Scope Description	
The product of this endeavor is the construction of an Ice Cream Plant. This project is being performed by Moorjani Caribbean Limited as a means of expanding their business portfolio and growing as a construction business. The manufacturing plant will allow Chefette Restaurants to produce their own brand of ice cream locally as opposed to importing it from a neighboring Caribbean country.	
Project Deliverables	**Acceptance Criteria**
- Feasibility Report and Environmental Impact Assessment	- Typed in size 12 font with 1.5 spacing and justified.
- Design Drawings (Architectural Drawings, Structural Drawings, and MEP Drawings) (*)	- Foundation – All columns and deep strip footing will be constructed using reinforced bars and concrete from Ready Mix. The steel columns are to be erected once the foundation is

	complete and inside of the building has been filled and compacted to the required level with 4-inch marl. - Ground Floor – The finished floor height will be 94.53 meters with the freezer having a finished floor height of 94.20 meters from sea level - Roof – Fabricator to provide structural steel for rafters, as well as, framing, purlins, and sheeting. Figure 4 shows the roof framing for the ice cream plant.
- Cleared Project Site and Structural Steel as Built Drawings	- Saved as a dwg file as well as a pdf.
- Completed Ice Cream Plant	- Compliance with the design - The building will be composed of a steel structure with reinforced concrete foundation and floors with reinforced concrete block walls.
(*) Appendix 4 shows the structural and architectural drawings for the Ice Cream Plant.	
Project Exclusions	
Items Excluded a. Equipment procurement and installation. b. Furniture procurement and installation.	
Project Constraints	
1. The project should not exceed $6 million Barbados dollars. 2. The project duration should not exceed 18 months.	
Assumptions	
1. It is assumed that sufficient skilled workers will be available for the duration of the project. 2. It is assumed that all approvals necessary to begin construction will be approved by all regulatory agencies.	

3. It is assumed that there will not be any national shutdowns for the duration of the project.
4. It is assumed that the client is sufficiently funded to sponsor the entire project.
5. It is assumed that there will not be any major storms during the construction period of the project.

4.2.6 Work Breakdown Structure (WBS)

The project is broken down into five phases: the initiation phase, the design phase, the preconstruction phase, the construction phase, and the project closure phase. Each of these phases is then further subdivided into work packages. Figure 8 shows the WBS for the Ice Cream Plant Project.

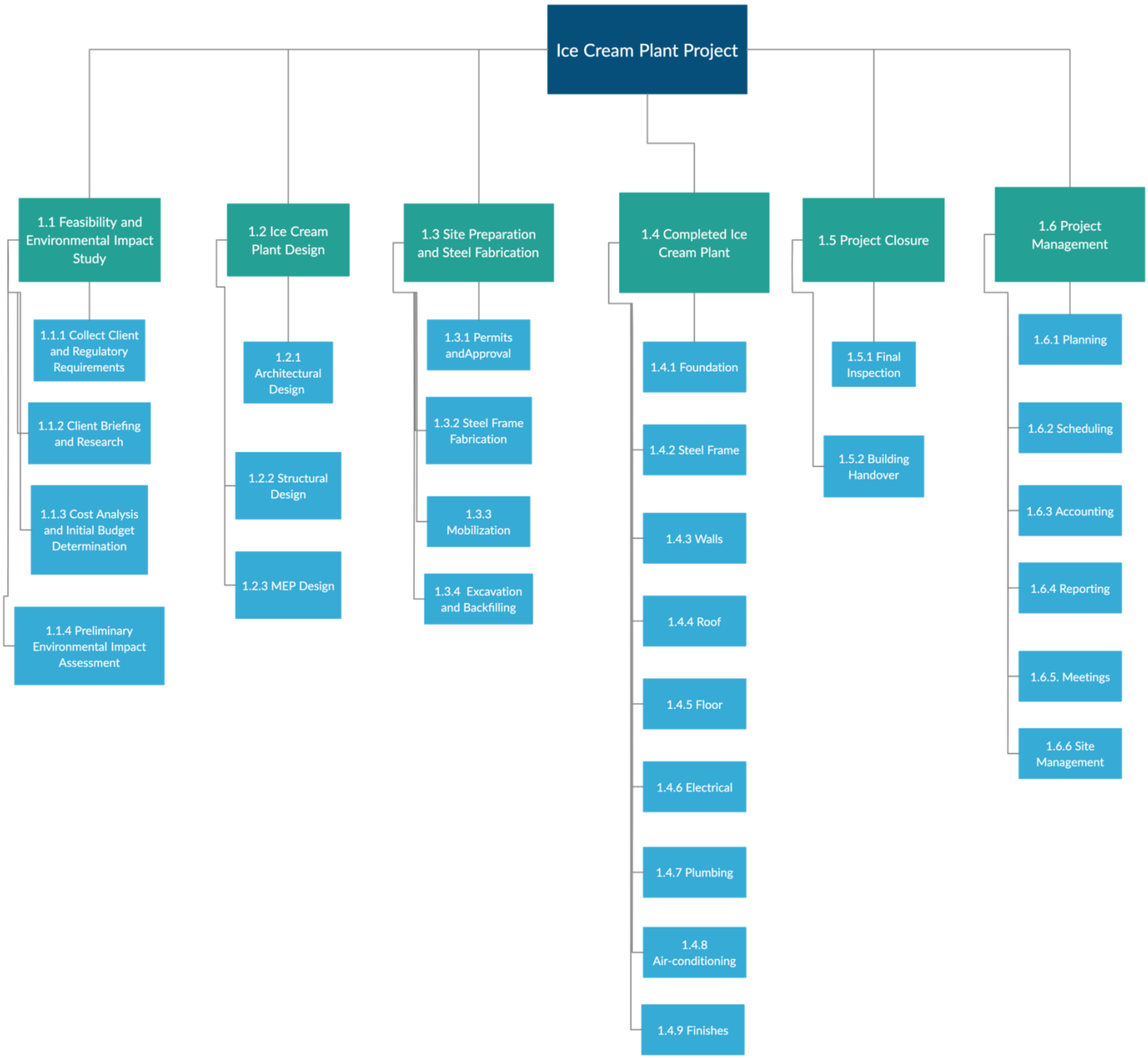

Figure 8 Work Breakdown Structure (WBS).Source: (T. Forde, The Author, July 2020)

PMI (2017) defines the WBS dictionary as, "a document that provides detailed deliverable, activity, and scheduling information about each component in the WBS" (p. 162). The project team will use the WBS Dictionary as a statement of work for each WBS element. Chart 11 shows the WBS Dictionary.

Chart 11 WBS Dictionary (Source: T. Forde, The Author, July 2020)

Level	WBS Code	Element Name	Description of Work	Deliverables	Budget	Resources
1	**1.1**	**Feasibility and Environmental Impact Study**	**Commencement of Conceptualization**		**$44,200.00**	
2	1.1.1	Collect Client and Regulatory Requirements	Meetings held to ascertain client and regulatory needs for the project.	Initial Requirements Documentation	$10,000.00	Computer Building Codes Industry Standards
2	1.1.2	Client Briefing and Research	Briefing of the project with the architect and other consultants and them doing research on standards to be used on the project.	Client Directive	$22,200.00	Computer Industry Standards Building Codes
2	1.1.3	Cost Analysis and Initial Budget Determination	Calculating the financial commitment needed from the project sponsor based on the client's requirements.	Cost Evaluation	$4,000.00	Project Scope
2	1.1.4	Preliminary Environmental Impact Assessment	Determining the impact of the project on the surrounding environment.	Environmental Assessment Study	$8,000.00	Architectural Sketches Project Scope

Level	WBS Code	Element Name	Description of Work	Deliverables	Budget	Resources
1	**1.2**	**Ice Cream Plant Design**	**Collaborative Efforts of Consultants**		**$130,000.00**	
2	1.2.1	Architectural Design	Graphical representation of client requirements.	Architectural Drawings	$15,000.00	Computer AutoCAD Software
2	1.2.2	Structural Design	Structural Engineer's and steel fabricator's building design.	Structural Drawings	$69,000.00	Computer AutoCAD Software
2	1.2.3	MEP Design	Mechanical and Electrical Engineers' building design.	Services Drawings	$46,000.00	Computer AutoCAD Software
1	**1.3**	**Site Preparation and Steel Fabrication**	**Site is made ready for construction to begin and the structural steel is manufactured and shipped to site.**		**$1,539,000.00**	
2	1.3.1	Permits and Approval	The process of making an application for the necessary permits from the following public offices: *Town and Country Planning *Ministry of Environment and National Beautification *Ministry of Health and Wellness	Permits to proceed	$15,000.00	Architectural Drawings

Level	WBS Code	Element Name	Description of Work	Deliverables	Budget	Resources
2	1.3.2	Steel Frame Fabrication	Structural Systems contracted to produce steel structure based on structural design.	Steel Structure	$1,434,000.00	Structural Drawings
2	1.3.3	Mobilization	Preparing project site for construction to begin.	Installation of the following items: *Hoarding *Control Points *Datum Lines *Site Office *Bathrooms *Temporary Power *Water	$30,000.00	Crane, concrete truck, tractor with auger, total station, electronic level
2	1.3.4	Excavation and Backfilling	Bringing project site to desired elevation with compacted marl fill.		$60,000.00	Excavators, dump trucks, rollers, tractors
1	**1.4**	**Completed Ice Cream Plant**	**Project execution**		**$1,386.080.00**	
2	1.4.1	Foundation	*Layout *Concrete Blinding *Column Footing and Strip Footing *Blockwork	Completed building foundation.	$211,480.00	Total Station, Boxing, Carpenters, Masons, Labourers, Concrete, Concrete Truck,

Level	WBS Code	Element Name	Description of Work	Deliverables	Budget	Resources
			*Steel Column Bolts *Reinforced Concrete Capping Beam *Backfill			Rebar, Steel benders, Scaffolding
2	1.4.2	Steel Frame	Erection of steel structure.	Completed and Plumbed Steel Structure	$45,600.00	Crane, structural steel, and bolts
2	1.4.3	Walls	Perimeter and internal blockwork and capping beams.	Completed perimeter and interior walls.	$71,000.00	Concrete blocks, cement mixer, sand, cement, masons, and labourers
2	1.4.4	Roof	Installation of roof panels and guttering.	Completed roof and guttering.	$30,000.00	Loadall, roof panels, guttering
2	1.4.5	Floor	Pouring of reinforced concrete floor slab.	Completed floor slab.	$258,000.00	Concrete, rebar, masons, carpenters, insulation.
2	1.4.6	Electrical	*Installing Conduit *Running Cable *Installing Plug and IT Boxes *Installing Lighting	Completed electrical work.	$275,000.00	Subcontractors
2	1.4.7	Plumbing	*Installing pipework *Installing floor drains *Installing sinks *Installing toilets	Completed plumbing work.	$250,000.00	Subcontractors

Level	WBS Code	Element Name	Description of Work	Deliverables	Budget	Resources
2	1.4.8	Air-conditioning	*Installing units *Gassing units	Completed air-conditioning work.	$40,000.00	Subcontractors
2	1.4.9	Finishes	*Plastering and painting walls *Installation of runners and ceiling tiles *Tiling floors *Installation of doors *Installation of windows *Installation of signage		$205,000.00	Cement mixer, cement, sand, ceiling tiles, doors, windows, signs
1	**1.5**	**Project Closure**	**The completion of the project and the handover of the ice cream plant.**		**N/A**	
2	1.5.1	Final Inspection	Building Inspection performed by Town and Country Planning, the Ministry of Health, and the Project Director.	Quality Checklist Requirements Document	N/A	
2	1.5.2	Building Handover	Handover of the Ice Cream Plant to the Project Sponsor.		N/A	
1	**1.6**	**Project Management**	**The management of planning, executing, monitoring, controlling, and closing of the project.**		**$409,000**	

Level	WBS Code	Element Name	Description of Work	Deliverables	Budget	Resources
2	1.6.1	Planning	Planning and updating project activities.	Project Management Plan	$60,000.00	
2	1.6.2	Scheduling	Planning and managing project activities timeline.	Project Schedule	$30,000.00	
2	1.6.3	Accounting	Monitoring and documenting project expenditures.	Financial Reports	$35,000.00	
2	1.6.4	Reporting	Documenting daily project activities.	Project Reports	$48,000.00	
2	1.6.5	Meetings	Updates on project progress as well as any changes in project scope or schedule.	Progress Meetings	$20,000.00	
2	1.6.6	Site Management	Daily management of construction site.	Site Management	$216,000.00	

4.2.7 Scope Verification

Before the project begins, the Project Director will verify that all project requirements have been addressed by the project scope and that no extra work has been included. Once this is complete, the Project Director will formally meet with the Project Sponsor to accept the project scope. Once the project scope has been formally accepted, this establishes the project baseline.

The Junior Project Manager will track the progress of the project's activities daily using a report that will be submitted to the Senior Project Manager. These reports will be used to track the overall progress of the project.

Chart 12 shows the evaluation checklist that can be used as acceptance criteria for the client.

Chart 12 Evaluation Checklist (Source: T. Forde, The Author, July 2020)

Evaluation Criteria	Yes	No	ID	Remarks
Customer Needs				
• Safety				
• Ease of Use				
• Flow of Traffic				
Functional Requirements				
• Proper Ventilation				
• Access for Handicapped				
• Adequate Drainage				
• Adequate Lighting				
• Emergency Egress				
• Fire Suppression				
• Adequate Restroom Facilities				
Technical Requirements				

Evaluation Criteria	Yes	No	ID	Remarks
• Building must adhere to local building code requirements and industry standards.				
• Building must be able to withstand a category five (5) hurricane and an earthquake of over 7 on the Richter scale.				
• All concrete block walls and concrete floors should be reinforced with steel.				

4.2.8 Scope Control

The project team will make sure that only agreed upon work from the project scope will be performed. If any changes to the project scope have to be made, then this process will be completed through integrated change control. Any member of the project team or any stakeholder may make a request for a scope change and this is done by completing a change order form and submitting it to the Project Director. The Project Director will then review the change order request and if he accepts it then he will present it to the Project Manager from Chefette Restaurants and the Project Sponsor. If the change order is accepted by the Project Manager and Project Sponsor, then the change order will be formally accepted by it being signed by both parties and the Project Director will update all project documents and communicate the scope directive to all project team members and stakeholders.

4.3 Schedule Management Plan

PMI (2017) defines Plan Schedule Management as, “the process of establishing the policies, procedures, and documentation for planning, developing, managing, executing, and controlling the project schedule” (p. 179). The inputs for this process were the Project Charter and the Scope Management Plan. The tools and techniques used to develop the schedule management plan were expert judgement, data analysis, and meetings. The project schedule is the guide for how the project will be completed. The schedule is a critical component of the project because it provides the project team and the stakeholders with a visual of when the project can be expected to be completed as well as if the project is ahead or behind schedule.

4.3.1 Schedule Management Approach

The project schedule will be created using Microsoft Project 2019. Activity definition will identify the specific activities necessary to complete the work packages necessary 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 each activity.

4.3.2 Roles and Responsibilities

The senior project manager will be responsible for breaking down the work packages into activities that will provide a basis for sequencing and estimating duration with the project team. The junior project manager will create the project schedule using Microsoft Project 2019 and the schedule will be validated with the project team and the stakeholders. The senior project manager will obtain schedule approval from the project sponsor.

4.3.3 Activity List

PMI (2017) defines the define activities process as, “the process of identifying and documenting specific actions to be performed to produce the project deliverables” (p. 183). Activity Attributes was not developed as an output to this process because the information detailed in the Activity Attributes were already captured in other plans included in the Final Graduation Project. Chart 13 shows the activity list.

Chart 13 Activity List. Source (T. Forde, Author, July 2020)

Activity ID Number	Activity Name	Description of Work	Responsibility
Deliverable 1 Feasibility and Environmental Impact Study			
1.1.1	Collect client and regulatory requirements	Meetings held to ascertain client and regulatory needs for the project.	Architect, Senior Project Manager
1.1.1.1	Meet Client		Architect, Senior Project Manager
1.1.1.2	Collect client's requirements	Calculating the financial commitment needed from the project sponsor based on the client's requirements.	Senior Project Manager, Junior Project Manager
1.1.1.3	Identify industry requirements	Conducting research on ice cream plant industry to identify minimum requirements.	Architect
1.1.2	Client Briefing and Research	Briefing of the project with the architect and other consultants and them doing research on standards to be used on the project.	Architect, Senior Project Manager
1.1.2.1	Building code research	Conducting research on local building code to determine minimum requirements.	Architect
1.1.2.2	Client's briefing defined	Meeting with client.	Architect, Senior Project Manager, Junior Project Manager
1.1.2.3	Design considerations and restrictions	Identifying any other considerations and restrictions with regards to the building design.	Architect
1.1.2.4	Complete Feasibility Study	Determining if the project should go ahead or not.	Senior Project Manager

Activity ID Number	Activity Name	Description of Work	Responsibility
1.1.3	Cost analysis and initial budget determination	Calculating the type of financial commitment needed based on the project requirements.	Senior Project Manager Quantity Surveyor
1.1.3.1	Parametric cost estimation	Estimating using information of known construction rates.	Quantity Surveyor
1.1.3.2	Total budget determination	Determining the total budget.	Senior Project Manager
1.1.4	Preliminary environmental impact assessment	Determining the impact, the construction of the plant will have on its direct environment.	Senior Project Manager
1.1.4.1	Scoping	Identifying which potential impacts are relevant to assess and identifying alternatives solutions to avoid, mitigate or compensate adverse impacts on biodiversity.	Senior Project Manager
1.1.4.2	Assessment and Evaluation	Assessing and evaluating potential impacts and solutions.	Senior Project Manager
1.1.4.3	Report	Writing the Environmental Impact Assessment.	Senior Project Manager
Deliverable 2 Ice Cream Plant Design			
1.2.1	Architectural Design	Graphical representation of client requirements.	Architect
1.2.1.1	Conceptual design	First designs of the project.	Architect
1.2.1.2	Design document review	Design review by client.	Architect
1.2.1.3	Design document approval	Design approval by client.	Architect

Activity ID Number	Activity Name	Description of Work	Responsibility
1.2.2	Structural Design	Structural Engineer's and steel fabricator's building design.	Structural Engineer, Steel Fabricator
1.2.2.1	Structural design based on architect's conceptual design	Structural design of building.	Structural Engineer
1.2.2.2	Steel frame design based on requirements	Design of structural steel.	Steel Fabricator
1.2.3	MEP Design	Mechanical and Electrical Engineers' building design.	Mechanical Engineer, Electrical Engineer
1.2.3.1	Plumbing design	Location and type of all plumbing in the building.	Mechanical Engineer
1.2.3.2	Electrical design	Location and type of all electrical elements in the building.	Electrical Engineer
1.2.3.3	Air-conditioning design	Location and size of all units in the building.	Mechanical Engineer
Deliverable 3 Site Preparation and Steel Fabrication			
1.3.1	Permits and approval	The process of making an application for the necessary permit from the Ministry of Health.	Senior Project Manager
1.3.1.1	Submission of design documents to Ministry of Health for permission to construct a building.	Applying for permit to begin construction.	Senior Project Manager
1.3.1.2	Building permit issued	Permit extended to begin construction.	Senior Project Manager

Activity ID Number	Activity Name	Description of Work	Responsibility
1.3.2	Steel frame fabrication	Fabrication of steel structure.	Steel Fabricator
1.3.2.1	Steel frame manufacture	The manufacturing of the steel pieces.	Steel Fabricator
1.3.2.2	Steel frame shipment	Shipping the steel to Barbados.	Steel Fabricator
1.3.2.3	Steel frame delivered to site	Clearing the steel from the port and delivering it to site.	Senior Project Manager
1.3.3	Mobilization	Preparing project site for construction to begin.	Senior Project Manager, Junior Project Manager, Site Engineers
1.3.3.1	Site Boundary layout	Layout of the site boundary.	Land Surveyor
1.3.3.2	Hoarding erection	Erecting the hoarding on the boundary of the project site.	Junior Project Manager
1.3.3.3	Site offices, bathrooms, and containers delivery on site	Container offices and bathrooms delivering to project site.	Junior Project Manager
1.3.3.4	Delivery of construction equipment to site	Equipment being moved from last project site to this project site.	Junior Project Manager
1.3.4	Excavation and backfilling	Bringing project site to desired elevation with compacted marl fill.	C. O. Williams
1.3.4.1	Excavation of existing material	Removal of existing material.	C. O. Williams
1.3.4.2	Backfilling and compacting with marl	Putting down marl to required elevation.	C. O. Williams

Activity ID Number	Activity Name	Description of Work	Responsibility
Deliverable 4 Completed Ice Cream Plant			
1.4.1	Foundation	*Layout *Concrete Blinding *Column Footing and Strip Footing *Blockwork *Steel Column Bolts *Reinforced Concrete Capping Beam *Backfill	Site Engineers, Carpenters, Masons, Labourers, Steel Benders
1.4.1.1	Foundation layout	Layout of building foundation.	Site Engineers
1.4.1.2	Concrete blinding	Pouring this layer of concrete.	Masons, Labourers, Carpenters
1.4.1.3	Casting column and strip footing	Building formwork, placing steel reinforcement, and pouring concrete.	Masons, Labourers, Carpenters, Steel Benders
1.4.1.4	Blockwork	Building blocks.	Masons, Labourers
1.4.1.5	Casting capping beam and column with bolts	Building formwork, placing steel reinforcement and bolts, and pouring concrete.	Masons, Labourers, Carpenters
1.4.1.6	Backfill	Adding marl inside of structure to bring it to correct elevation.	C.O. Williams
1.4.2	Steel frame	Erection of steel structure.	Structural Systems, Crane and Equipment
1.4.2.1	Erection of steel	Erecting steel structure.	Steel Erectors
1.4.2.2	Plumbing of steel structure	Tightening bolts and making sure structure is plumb.	Steel Erectors
1.4.3	Walls	Perimeter and internal blockwork and capping beams.	Masons, Labourers, Steel Benders, Site Engineers, Carpenters

Activity ID Number	Activity Name	Description of Work	Responsibility
1.4.3.1	Perimeter walls and capping beams	Building blocks on perimeter walls and building formwork, placing steel reinforcement, and pouring concrete.	Masons, Labourers, Carpenters, Steel Benders
1.4.3.2	Interior walls and capping beams	Building blocks on interior walls and building formwork, placing steel reinforcement, and pouring concrete.	Masons, Labourers, Carpenters, Steel Benders
1.4.4	Roof	Installation of roof panels and guttering.	Labourers, Crane and Equipment
1.4.4.1	Roof panels	Installing roof panels.	Labourers, Crane and Equipment.
1.4.4.2	Perimeter guttering	Installing guttering around building.	Labourers, Loadall
1.4.5	Floor	Pouring of reinforced concrete floor slab.	Masons, Labourers, Steel Benders, Site Engineers
1.4.5.1	Freezer slab	Pouring the bottom and top slab of the freezer.	Masons, Labourers, Steel Benders
1.4.5.2	Boiler room slab	Pouring the slab of the boiler room area.	Masons, Labourers, Steel Benders
1.4.5.3	Remaining floor slab	Pouring the slab for the rest of the building.	Masons, Labourers, Steel Benders
1.4.6	Electrical	Installing all electrical elements in the building.	TMR
1.4.6.1	Conduit through slab	Installing conduit in the floor slabs.	TMR
1.4.6.2	Extending conduit in wall	Extending and adding extra conduit in the walls.	TMR
1.4.6.3	Pulling cable	Pulling cable through conduit.	TMR
1.4.6.4	Installing plug and IT boxes	Installing plug and IT boxes in the walls.	TMR
1.4.6.5	Lighting	Installing lighting in the ceiling and on the walls.	TMR

Activity ID Number	Activity Name	Description of Work	Responsibility
1.4.7	Plumbing	Installing all plumbing elements in the building.	A. J. Mechanical
1.4.7.1.	Pipe through slab	Installing pipe in the floor slabs.	A. J. Mechanical
1.4.7.2	Extending pipe in walls	Extending pipes in the walls.	A. J. Mechanical
1.4.7.3	Roof drains	Extending pipe to the roof.	A. J. Mechanical
1.4.7.4	Sinks	Installing all sinks.	A. J. Mechanical
1.4.7.5	Toilets	Installing all toilets.	A. J. Mechanical
1.4.7.6	Floor Drains	Installing all floor drains in the slabs.	A. J. Mechanical
1.4.8	Air-conditioning	Installing all air-conditioning elements in the building.	21 Degrees
1.4.8.1	Installation of units	Installing evaporators and condensers in the building.	21 Degrees
1.4.8.2	Gassing of units	Gassing of all installed units in the building.	21 Degrees
1.4.9	Finishes	All work to be done once the structure has been completed.	Masons, Carpenters, Tilers, Labourers
1.4.9.1	Plastering and painting of walls	Plastering all walls.	Masons, Labourers
1.4.9.2	Doors	Installing all doors.	Carpenters
1.4.9.3	Windows	Installing all windows.	Carpenters
1.4.9.4	Signage	Installing outdoor and indoor signage.	Labourers
Deliverable 5 Project Closure			
1.5.1	Final Inspection	Building Inspection performed by the Ministry of Health and the Senior Project Manager.	Senior Project Manager, Junior Project Manager, Project Sponsor
1.5.1.1	Application for final inspection.	Applying for the final building inspection to the Ministry of Health.	Junior Project Manager

Activity ID Number	Activity Name	Description of Work	Responsibility
1.5.1.2	Building walkthrough	Building walkthrough and inspection with a Health officer from the Ministry of Health.	Senior Project Manager
1.5.1.3	Building sign off	Building approval from the Ministry of Health.	Senior Project Manager
1.5.2	Building Handover	Handover of the Ice Cream Plant to the Project Sponsor.	Senior Project Manager, Junior Project Manager, Project Sponsor
1.5.2.1	Building Handover meeting.	Meeting with the Project Sponsor to complete paperwork to officially close project.	Senior Project Manager, Junior Project Manager, Project Sponsor
1.5.2.2	Building handover presentation.	Presenting the keys for the building to the Project Sponsor.	Senior Project Manager, Junior Project Manager, Project Sponsor
Deliverable 6 Project Management			
1.6.1	Planning	Planning and updating project activities.	Senior Project Manager, Junior Project Manager
1.6.1.1	Initial Impact Assessment	Conducting the initial impact assessment.	Senior Project Manager
1.6.1.2	Site Investigation Report	Conducting the site investigation and making a report.	Junior Project Manager
1.6.1.3	Feasibility Study	Determining whether the project is a go or no go.	Senior Project Manager
1.6.1.4	Project Charter commissioned	Writing the project charter.	Senior Project Manager
1.6.1.5	Approval of Project Charter	Approving the project charter.	Project Sponsor
1.6.1.6	Architectural design sent to consultants	Architectural drawings sent to other consultants so they can design.	Architect

Activity ID Number	Activity Name	Description of Work	Responsibility
1.6.1.7	Preliminary Budget Determination	Determining budget based on requirements and design.	Quantity Surveyor, Senior Project Manager
1.6.1.8	Revisions and adjustments to management documents	Updating all project documents.	Senior Project Manager, Junior Project Manager
1.6.1.9	Project Management Plan	Writing project management plan.	Senior Project Manager
1.6.1.10	Procurements	All materials or work needed outside of the project team.	Senior Project Manager, Junior Project Manager
1.6.1.10.1	Request for tenders	Distributing requests for tenders.	Senior Project Manager, Junior Project Manager
1.6.1.10.2	Tender Meeting	Meeting for proposals to be submitted.	Senior Project Manager, Junior Project Manager
1.6.1.10.3	Contract review	Review of submitted proposals.	Senior Project Manager, Junior Project Manager
1.6.1.10.4	Award contracts	Awarding contracts to the subcontractors selected.	Senior Project Manager, Junior Project Manager
1.6.1.10.5	Long lead items sourced	Sourcing long lead items.	Senior Project Manager
1.6.2	Scheduling	Planning and managing project activities timeline.	Senior Project Manager, Junior Project Manager
1.6.2.1	Manage project schedule	Adjusting work plan if necessary, to stay on schedule.	Senior Project Manager, Junior Project Manager
1.6.2.2	Update project schedule.	Updating project schedule as activities are added or removed.	Senior Project Manager, Junior Project Manager

Activity ID Number	Activity Name	Description of Work	Responsibility
1.6.3	Accounting	Monitoring and documenting project expenditures.	Senior Project Manager, Junior Project Manager
1.6.3.1	Manage project budget	Monitoring and controlling project expenditures to stay under budget.	Senior Project Manager, Junior Project Manager
1.6.3.2	Update project budget	Updating project budget as activities as added or removed.	Senior Project Manager, Junior Project Manager
1.6.4	Reporting	Documenting daily project activities.	Senior Project Manager, Junior Project Manager
1.6.4.1	Daily Reports	Writing daily reports of project progress.	Junior Project Manager
1.6.4.2	Meeting Minutes	Write and publish minutes of every project meeting.	Senior Project Manager
1.6.5	Meetings	Updates on project progress as well as any changes in project scope or schedule.	Senior Project Manager, Junior Project Manager
1.6.5.1	Bi-Monthly Meetings	Conduct bi-monthly site progress meetings and other planned meetings.	Senior Project Manager, Junior Project Manager
1.6.5.2	Weekly Site Meetings	Conduct weekly site meetings with project team, site workers, and subcontractors working on site.	Senior Project Manager, Junior Project Manager, Site Engineers, Site Superintendent
1.6.6	Site Management	Daily management of construction site.	Senior Project Manager, Junior Project Manager, Site Foreman, Site Engineers
1.6.6.1	Monitor material on site	Making sure adequate material is always available on site.	Site Foreman, Senior Project Manager, Junior Project Manager

Activity ID Number	Activity Name	Description of Work	Responsibility
1.6.6.2	Monitor work completed on site	Making sure that all work completed on site is done correctly and efficiently.	Site Foreman, Senior Project Manager, Junior Project Manager, Site Engineers

The following were designated as milestones for the project:

1. Project Initiation/Kick-off
2. Ice Cream Plant Design Completed
3. Ground-breaking Ceremony
4. Excavation and Backfilling Completed
5. Foundation Completed
6. Steel Structure Erected
7. Perimeter Walls and Beams Completed
8. Ground Floor Slab Completed
9. Interior Walls and Beams Completed
10. All Windows and Doors Installed
11. Plumbing Work Completed
12. Electrical Work Completed
13. Painting Completed
14. Final Building Inspection
15. Project End

4.3.4 Schedule Network Diagram

The schedule network diagram will document the relationships between project activities. The Schedule Management Plan, Activity List, Milestone List, and Project scope Statement were used as inputs to this process. The tool used for this process would have been meetings with the Senior Project Manager to verify the correct arrangement of each activity. Figure 9 shows the schedule Network Diagram.

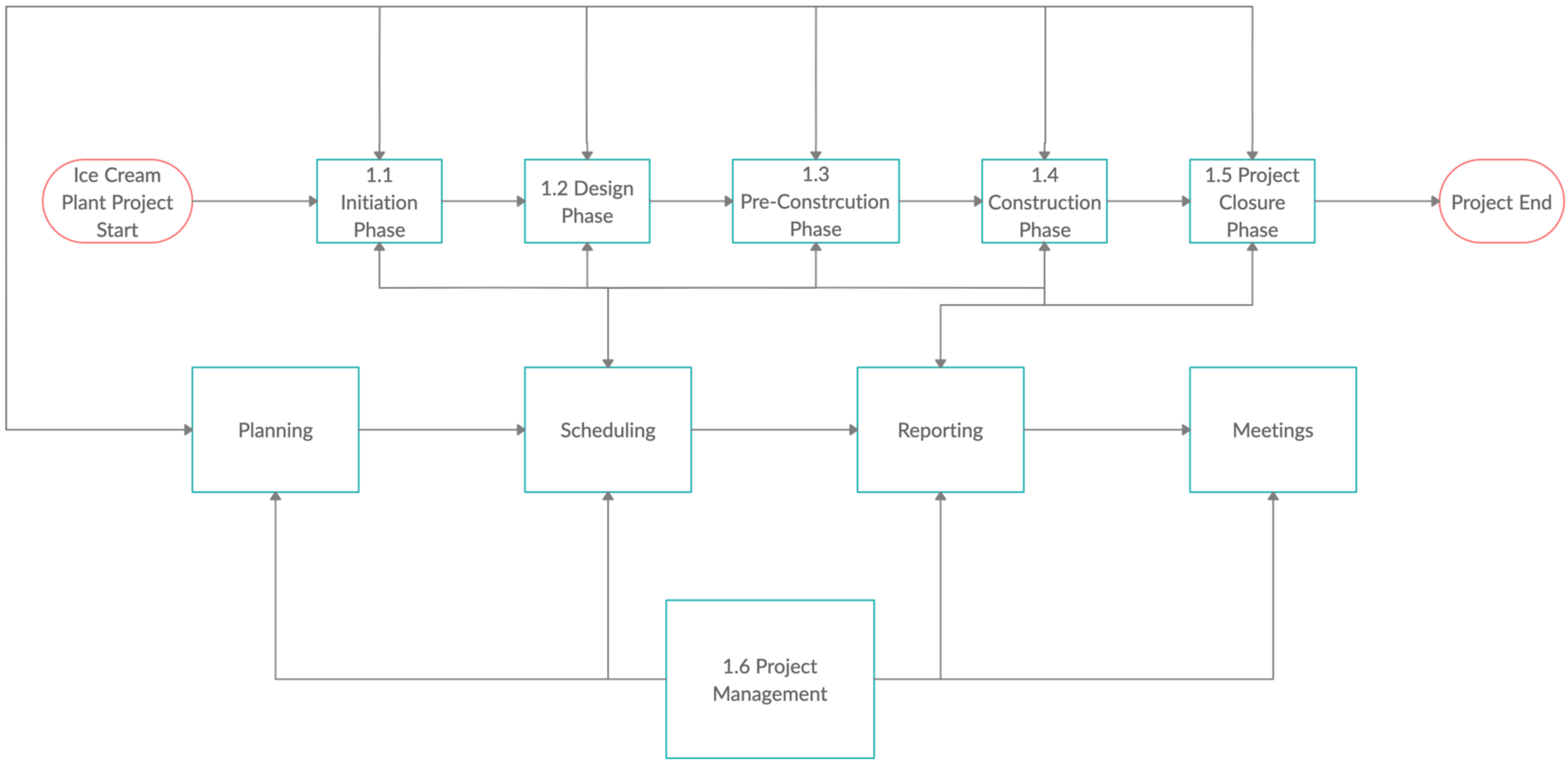

Figure 9 Schedule Network Diagram. Source (T. Forde, Author, July 2020)

4.3.5 Estimating Activity Durations

PMI (2017) defines estimate activity durations as, “the process of estimating the number of work periods needed to complete the individual activities with estimated resources” (p. 195). For this project, the project team used the schedule management plan, and activity list as the inputs for this process. Additionally, the project team used parametric estimating to estimate the duration for each activity. PMI (2017) defines parametric estimating as, “an estimating technique in which an algorithm is used to calculate cost or duration based on historical data and project parameters. Parametric estimating uses a statistical relationship between historical data and other variables (e.g. square footage in construction) to calculate an estimate for activity parameters, such as cost, budget, and duration” (p. 200). Chart 14 shows the estimated activity duration and resource

Chart 14 Estimated Activity Duration and Resource Assignment. Source (T. Forde, The Author, July 2020)

Task Name	Duration	Resource Names
1.0 ICE CREAM PLANT PROJECT	**387 days**	
1.1 Feasibility and Environmental Impact Study	**16 days**	
1.1.0 Project Initiation/Kick-off	0 days	Architect, Senior Project Manager, Project Manager (CRL)
1.1.1 Collect client and regulatory requirements	4 days	Architect, Senior Project Manager
1.1.1.1 Meet Client	1 day	Architect, Senior Project Manager, Junior Project Manager
1.1.1.2 Collect client's requirements	1 day	Architect, Senior Project Manager, Junior Project Manager
1.1.1.3 Identify industry requirements	1 day	Architect, Senior Project Manager, Junior Project Manager
1.1.2 Client briefing and research	3 days	Architect, Senior Project Manager
1.1.2.1 Building code research	1 day	Architect
1.1.2.2 Client's briefing defined	1 day	Architect
1.1.2.3 Complete feasibility study	1 day	Architect
1.1.3 Cost analysis and initial budget determination	11 days	Senior Project Manager
1.1.3.1 Parametric cost estimation	5 days	Quantity Surveyor
1.1.3.2 Total budget determination	6 days	Senior Project Manager
1.1.4 Preliminary environmental impact assessment	3 days	Senior Project Manager
1.1.4.1 Scoping	1 day	Senior Project Manager
1.1.4.2 Assessment and Evaluation	1 day	Senior Project Manager
1.1.4.3 Report	1 day	Senior Project Manager
1.2 Ice Cream Plant Design	**180 days**	
1.2.1 Architectural Design	35 days	Architect

Task Name	Duration	Resource Names
1.2.1.1 Conceptual design	21 days	Architect
1.2.1.2 Design documents	7 days	Architect
1.2.1.3 Design document review	5 days	Project Sponsor
1.2.1.4 Design document approval	0 days	Project Sponsor
1.2.2 Structural Design	42 days	Structural Engineer, Structural Systems
1.2.2.1 Structural design based on architect's conceptual design	21 days	Structural Engineer
1.2.2.2 Steel frame design based on requirements	21 days	Structural Systems
1.2.3 MEP Design	14 days	Mechanical Engineer, Electrical Engineer
1.2.3.1 Plumbing design	5 days	Mechanical Engineer
1.2.3.2 Electrical design	5 days	Electrical Engineer
1.2.3.3 Air-conditioning design	4 days	Mechanical Engineer
1.3 Site Preparation and Steel Fabrication	**70 days**	
1.3.1 Permits and approval	6 days	Senior Project Manager
1.3.1.1 Submission of design documents to Ministry of Health for permission to construct a building.	5 days	Senior Project Manager
1.3.1.2 Building permit issued	1 day	Senior Project Manager
1.3.2 Steel frame fabrication	29 days	Structural Systems
1.3.2.1 Steel frame manufacture	15 days	Structural Systems
1.3.2.2 Steel frame shipment	7 days	Structural Systems
1.3.2.3 Steel frame delivered to site	7 days	Senior Project Manager
1.3.3 Mobilization	5 days	Land surveyor, carpenters, labourers, Junior Project Manager
1.3.3.1 Site Boundary layout	1 day	Land surveyor
1.3.3.2 Hoarding erection	2 days	Carpenters and labourers

Task Name	Duration	Resource Names
1.3.3.3 Site offices, bathrooms, and containers delivery on site	1 day	Junior Project Manager
1.3.3.4 Delivery of construction equipment to site	1 day	Junior Project Manager
1.3.4 Excavation and backfilling	30 days	C.O. Williams
1.3.4.1 Excavation of existing material	10 days	C.O. Williams
1.3.4.2 Backfilling and compacting with marl	20 days	C.O. Williams
1.4 Completed Ice Cream Plant	**324 days**	
1.4.1 Foundation	86 days	Site Engineers, Carpenters, Masons, Labourers, Senior Project Manager, Junior Project Manager, Site Superintendent
1.4.1.1 Foundation layout	2 days	Site Engineers
1.4.1.2 Concrete blinding	9 days	Carpenters, Masons, Labourers, Foremen
1.4.1.3 Casting column and strip footing	15 days	Carpenters, Masons, Labourers, Foremen, Steel benders
1.4.1.4 Blockwork	14 days	Masons, Labourers, Foremen
1.4.1.5 Casting capping beam and column with bolts	28 days	Carpenters, Masons, Labourers, Foremen
1.4.1.6 Backfill	18 days	C.O. Williams
1.4.2 Steel frame	14 days	Crane and Equipment, Structural Systems
1.4.2.1 Erection of steel	12 days	Crane and Equipment, Structural Systems
1.4.2.2 Plumbing of steel structure	2 days	Crane and Equipment, Structural Systems
1.4.3 Walls	50 days	Carpenters, Masons, Labourers, Site Engineers, Senior Project Manager, Junior Project Manager, Site Superintendent, Foremen
1.4.3.1 Perimeter walls and capping beams	30 days	Carpenters, Masons, Labourers, Foremen, Steel benders

Task Name	Duration	Resource Names
1.4.3.2 Interior walls and capping beams	20 days	Carpenters, Masons, Labourers, Foremen, Steel benders
1.4.4 Roof	26 days	Carpenters, labourers, Plumbers, Site Engineers, Senior Project Manager, Junior Project Manager, Site Superintendent
1.4.4.1 Roof panels	15 days	Carpenters, Labourers
1.4.4.2 Perimeter guttering	11 days	Plumbers
1.4.5 Floor	26 days	Carpenters, Masons, Labourers, Foremen, Steel benders, Site Engineers, Senior Project Manager, Junior Project Manager, Site Superintendent
1.4.5.1 Freezer slab	16 days	Carpenters, Masons, Labourers, Foremen, Steel benders
1.4.5.2 Boiler room slab	5 days	Carpenters, Masons, Labourers, Foremen, Steel benders
1.4.5.3 Remaining floor slab	5 days	Carpenters, Masons, Labourers, Foremen, Steel benders
1.4.6 Electrical	36 days	Electricians
1.4.6.1 Conduit through slab	3 days	Electricians
1.4.6.2 Extending conduit in wall	5 days	Electricians
1.4.6.3 Pulling cable	9 days	Electricians
1.4.6.4 Installing plug and IT boxes	9 days	Electricians
1.4.6.5 Lighting	10 days	Electricians
1.4.7 Plumbing	31 days	Plumbers
1.4.7.1. Pipe through slab	14 days	Plumbers
1.4.7.2 Extending pipe in walls	5 days	Plumbers
1.4.7.3 Roof drains	5 days	Plumbers

Task Name	Duration	Resource Names
1.4.7.4 Sinks	2 days	Plumbers
1.4.7.5 Toilets	3 days	Plumbers
1.4.7.6 Floor Drains	2 days	Plumbers
1.4.8 Air-conditioning	5 days	A/C Technicians
1.4.8.1 Installation of units	3 days	A/C Technicians
1.4.8.2 Gassing of units	2 days	A/C Technicians
1.4.9 Finishes	55 days	Senior Project Manager, Junior Project Manager, Site Superintendent,
1.4.9.1 Plastering and painting of walls	27 days	Masons, Labourers
1.4.9.2 Doors	15 days	Carpenters, Labourers
1.4.9.3 Windows	12 days	Carpenters, Labourers
1.4.9.4 Signage	1 day	Labourers
1.5 Project Closure	**3 days**	
1.5.1 Final Inspection	2 days	Project Sponsor, Senior Project Manager, Project Manager (CRL)
1.5.1.1 Application for final inspection.	1 day	Junior Project Manager
1.5.1.2 Building walkthrough	1 day	Project Sponsor, Senior Project Manager, Project Manager (CRL)
1.5.1.3 Building sign off	0 days	Project Sponsor, Senior Project Manager, Project Manager (CRL)
1.5.2 Building Handover	1 day	Project Sponsor, Senior Project Manager, Junior Project Manager, Project Manager (CRL)
1.5.2.1 Building Handover meeting.	1 day	Project Sponsor, Senior Project Manager, Junior Project Manager, Project Manager (CRL)
1.5.2.2 Building handover presentation.	0 days	Project Sponsor, Senior Project Manager, Junior Project Manager, Project Manager (CRL)

Task Name	Duration	Resource Names
1.6 Project Management	**375 days**	
1.6.1 Planning	324 days	Senior Project Manager, Junior Project Manager
1.6.1.1 Initial Impact Assessment	14 days	Senior Project Manager, Junior Project Manager
1.6.1.2 Site Investigation Report	3 days	Senior Project Manager, Junior Project Manager
1.6.1.3 Feasibility Study	7 days	Senior Project Manager, Quantity Surveyor
1.6.1.4 Project Charter commissioned	1 day	Senior Project Manager, Junior Project Manager
1.6.1.5 Approval of Project Charter	0 days	Senior Project Manager, Junior Project Manager, Project Sponsor
1.6.1.6 Architectural design sent to consultants	0 days	Architect
1.6.1.7 Preliminary Budget Determination	4 days	Senior Project Manager, Junior Project Manager, Quantity Surveyor
1.6.1.8 Revisions and adjustments to management documents	324 days	Senior Project Manager, Junior Project Manager
1.6.1.9 Project Management Plan	40 days	Senior Project Manager, Junior Project Manager
1.6.1.10 Procurements	324 days	Senior Project Manager, Junior Project Manager, Project Sponsor
1.6.1.10.1 Request for tenders	14 days	Senior Project Manager, Junior Project Manager, Project Sponsor
1.6.1.10.2 Tender Meeting	1 day	Senior Project Manager, Junior Project Manager, Project Sponsor, Subcontractors
1.6.1.10.3 Contract review	3 days	Senior Project Manager, Junior Project Manager, Project Sponsor
1.6.1.10.4 Award contracts	0 days	Senior Project Manager, Junior Project Manager, Project Sponsor
1.6.1.10.5 Long lead items sourced	2 days	Junior Project Manager
1.6.2 Scheduling	324 days	Senior Project Manager, Junior Project Manager

Task Name	Duration	Resource Names
1.6.2.1 Manage project schedule	324 days	Senior Project Manager, Junior Project Manager
1.6.2.2 Update project schedule	324 days	Senior Project Manager, Junior Project Manager
1.6.3 Accounting	324 days	Accountant
1.6.3.1 Manage project budget	324 days	Accountant, Senior Project Manager
1.6.3.2 Update project budget	324 days	Senior Project Manager
1.6.4 Reporting	324 days	Senior Project Manager, Junior Project Manager
1.6.4.1 Write daily reports of project progress	324 days	Junior Project Manager
1.6.4.2 Write and publish minutes of every project meeting	324 days	Senior Project Manager
1.6.5 Meetings	324 days	Senior Project Manager, Junior Project Manager
1.6.5.1 Conduct bi-monthly progress meetings and other planned meetings	324 days	Senior Project Manager, Junior Project Manager
1.6.5.2 Weekly site meetings	324 days	Senior Project Manager, Junior Project Manager, Site Engineers, Site Superintendent
1.6.6 Site Management	324 days	Senior Project Manager, Junior Project Manager, Site Superintendent, Site Engineers
1.6.6.1 Monitor material on site	324 days	Senior Project Manager, Junior Project Manager, Site Superintendent, Site Engineers
1.6.6.2 Monitor work completed on site	324 days	Senior Project Manager, Junior Project Manager, Site Superintendent, Site Engineers

4.3.6 Development of Project Schedule

The final process of Project Schedule Management for this plan is to develop the project schedule. The inputs to this process were the Schedule Management Plan, Activity List, Project Schedule Network Diagram, and Estimated Activity Durations. The tools and techniques used to develop the project schedule were schedule network analysis and Microsoft Project 2019. Figure 10 shows the project schedule.

Task Name	Duration	Start	Finish
1.0 ICE CREAM PLANT PROJECT	307 days	Fri 1/15/21	Mon 3/21/22
1.1 Feasibility and Environmental Impact Study	16 days	Fri 1/15/21	Fri 2/5/21
1.2 Ice Cream Plant Design	56 days	Mon 2/8/21	Mon 4/26/21
1.3 Site Preparation and Steel Fabrication	125 days	Mon 2/8/21	Fri 7/30/21
1.4 Completed Ice Cream Plant	186 days	Thu 7/1/21	Thu 3/17/22
1.5 Project Closure	1 day?	Mon 3/21/22	Mon 3/21/22
1.6 Project Management	291 days	Mon 2/8/21	Mon 3/21/22

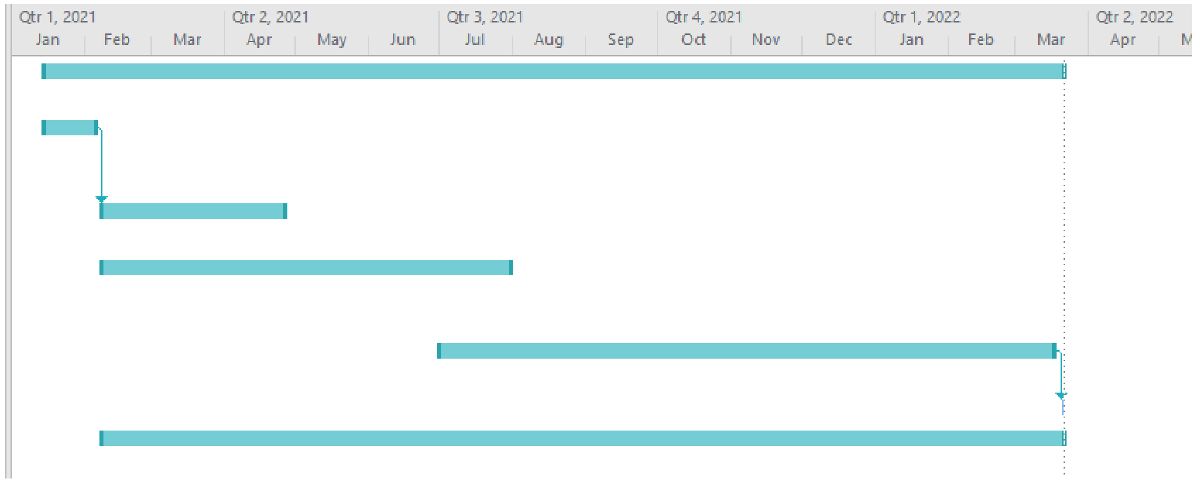

Figure 10 Ice Cream Plant Project Schedule. Source (T. Forde, The Author, August 2020)

4.4 Cost Management Plan

PMI (2017) defines Project Cost Management as, “the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget” (p. 231).

4.4.1 Plan Cost Management

The first process of Project Cost Management is Plan Cost Management. The inputs used for this process were the project charter and the schedule management plan. The tools and techniques used for this process were expert judgement, data analysis, and meetings. Following this process, the Project Charter, Scope Management Plan, and Schedule Management Plan were updated.

The Senior Project Manager will be responsible for managing and reporting on the project’s budget throughout the duration of the project. The Senior Project Manager will distribute a monthly financial report via email to all relevant stakeholders. In addition, updates will be presented in the bi-monthly progress meeting by the Senior and Junior Project Managers on the previous month’s cost performance. Cost performance will be measured using Earned Value Management (EVM). Earned Value calculations for the Cost Accounts (CA) created at the second level of the WBS, will measure and manage the financial performance of the project. Credit for work completed 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 the given time of the evaluation as compared to the total cost required to complete the work package.

Proposed changes to the cost baseline can be made by any member of the project team or any of the stakeholders as described in section 4.1.2.1 Change Control Process

PMI (2017) defines earned value analysis as an analysis that, “compares the performance measurement baseline to the actual schedule and cost performance. EVM integrates the scope baseline with the cost baseline and schedule baseline to form the performance measurement baseline" (p. 261). EVM develops the following three dimensions for each work package and control account:

1. Planned Value (PV) – the authorized budget assigned to scheduled work.
2. Earned Value (EV) – the measure of work performed expressed in terms of the budget authorized for that work.
3. Actual Cost (AC) – the realised cost incurred for the work performed on an activity during a specific time period.

Cost variance (CV) is defined as the amount of budget deficit or surplus at a given point in time, expressed as the difference between earned value and actual cost. It is equal to the EV minus the AC. The cost performance index (CPI) is a measure of the cost efficiency of budgeted resources, expressed as a ratio of earned value to actual cost. A CPI value of less than 1.0 indicates a cost overrun for work completed and a CPI value greater than 1.0 indicates a cost underrun of performance to date. (PMI, 2017, p.262-263) In the case of this project, a CPI change of -0.1 will change the status of the control account to cautionary, where this control account should be monitored more closely to see if it changes further. A CPI change of -0.2 will change the status of the control account to alert where corrective action will be needed to bring the control account back to cautionary status at the minimum.

The corrective action will be implemented via a Cost Performance Index Corrective Action Plan. The Senior Project Manager will present the Project Sponsor with options for corrective action and the Project Sponsor will select a corrective action to implement. Once an option is selected, the Senior Project Manager will present the Project Sponsor with the formal corrective action plan based on the option selected and it will detail all the actions necessary to bring the project back under budget.

4.4.2 Estimate Project Costs

The Cost Management Plan was used as an input for this process. The tools and techniques used for this process were expert judgement, parametric estimating and meetings with the Senior Project Manager and the Junior Project Manager. In order to determine the cost of each work package, the costs were first estimated for each activity required for the individual work package. To do this, parametric estimating was used as we had data on costs per task related to each activity for each work package. Additionally, the cost estimate included a contingency reserve of 3%. These estimates can be found in Chart 11.

4.4.3 Determine Project Budget

Using the information from the estimated project costs, the scope baseline, cost management plan, and project schedule, the project budget was determined by aggregating the costs of each work package. Chart 15 shows the budget for the Ice Cream Plant Project.

Chart 15 Budget for Ice Cream Plant Project. Source (T. Forde, The Author, August 2020)

Expense	Quantity	Unit Cost	Total Cost
Construction/Subcontractors	36		**$1,388,320.00**
MCL	27		$ 670,720.00
Carpenters	5	$ 28,000.00	$ 140,000.00
Masons	6	$ 28,800.00	$ 172,800.00
Labourers	10	$ 22,000.00	$ 220,000.00
Welders	2	$ 22,000.00	$ 44,000.00
Operators	2	$ 24,960.00	$ 49,920.00
Mixer Operators	2	$ 22,000.00	$ 44,000.00
Subcontractors	9		$ 717,600.00
Steel Bending	1	$ 120,000.00	$ 120,000.00
Excavation/Backfilling	1	$ 200,000.00	$ 200,000.00
Plumbing	1	$ 150,000.00	$ 150,000.00
Electrical	1	$ 175,000.00	$ 175,000.00
Structural Steel Erection	1	$ 30,000.00	$ 30,000.00
Air-conditioning	1	$ 30,000.00	$ 30,000.00

Expense	Quantity	Unit Cost	Total Cost
Crane	1	$ 5,600.00	$ 5,600.00
Tiling	1	$2,000	$ 2,000.00
Painting	1	$ 5,000.00	$ 5,000.00
Administrative/Professional	10		**$1,910,320.00**
Architecture	1		$ 68,000.00
Architect	1	$ 68,000.00	$ 68,000.00
Project Management	8		$ 767,000.00
Senior Project Manager	1	$ 120,000.00	$ 120,000.00
Junior Project Manager	1	$ 96,000.00	$ 96,000.00
Quantity Surveyor	1	$ 180,000.00	$ 180,000.00
Site Engineers	2	$ 80,000.00	$ 160,000.00
Administrative Assistant	1	$ 36,000.00	$ 36,000.00
Structural Engineer	1	$ 90,000.00	$ 90,000.00
Mechanical Engineer	1	$ 85,000.00	$ 85,000.00
Land Surveying	1		$ 40,000.00
Land Surveyor	1	$ 40,000.00	$ 40,000.00
Site Management	2		$ 80,160.00
Site Superintendent	1	$ 60,000.00	$ 60,000.00
Storeroom Clerk	1	$ 20,160.00	$ 20,160.00
Vendors	6		**$2,409,910.00**
Structural Systems	1	$1,434,000.00	$1,434,000.00
Kooyman Barbados	1	$105,000	$ 105,000.00
Carter’s General Stores	1	$ 100,000.00	$ 100,000.00
BRC West Indies Ltd	1	$ 160,000.00	$ 160,000.00
Ready Mix	1	$ 235,910.00	$ 235,910.00
Ready Block	1	$ 375,000.00	$ 375,000.00
Permits			**$ 20,000.00**
Contingency (3%)			**$ 171,856.50**
Management Reserve (5%)			**$ 295,020.33**
TOTAL			**$6,195,426.83**

4.5 Quality Management Plan

In order to ensure that the client is satisfied with the product of the project, the quality management plan will verify that the processes and materials used during the project will be of adequate standard. This will be done by doing the following:

- Ensuring quality is planned into the project
- Defining how quality will be managed
- Defining quality assurance activities
- Defining quality control activities
- Defining acceptable quality standards

4.5.1 Quality Management Approach

In order for the project to be successful, the ice cream plant project will meet its quality objectives by utilizing an integrated quality approach to define quality standards, quality metrics, and how to continuously improve quality. Product and process quality for the Construction of the Ice Cream Plant will be defined by MCL's current standards for construction, as well as, industry standards identified during research for an ice cream plant. As a company that has successfully completed construction projects before, MCL's quality standards can be attested to. The Senior Project Manager will define and document all organisational and project specific process and product standards. All quality documentation will become part of the Project Management Plan.

The Senior Project Manager will be responsible for working with the Junior Project Manager, Site Engineers, and Site Superintendent to define the quality metrics that will be used to measure quality throughout the project lifecycle. Any member of the project team can identify ways that quality may be improved. Each recommendation will be reviewed to determine its impact on the project budget and the current processes used and if it is implemented, the Junior Project Manager will update all project documentation to include the improvement.

4.5.2 Quality Standards

4.5.2.1 Product Quality

The product quality standards and requirements will be determined by the Senior Project Manager. These standards will be based on the construction standards set by MCL. These standards were not previously documented so the Senior Project Manager will be using his expert judgement to document the company standards. In addition to the company standards, there will be industry specific product standards identified from research that will be added to the quality standards for this project. The Change Control process identified in chapter 4.1.2.1 will be used to make any additions to the quality standards for the product.

4.5.2.2 Process Quality

The process quality standards and requirements will be determined by the Senior Project Manager. These standards will be based on the construction standards set by MCL. These standards were not previously documented so the Senior Project will be using his expert judgement to document the company standards. The Change Control process identified in chapter 4.1.2.1 will be used to make any additions to the quality standards for the product.

4.5.3 Quality Assurance

The quality assurance of the Construction of the Ice Cream Plant focuses on the processes used in the construction of the building. The Senior Project Manager and Junior Project Manager will perform assessments at planned intervals throughout the project to ensure all processes are being correctly implemented and executed. Additionally, the most important quality assurance process will be the Professional Structural Engineer inspecting the placement of all steel reinforcement of columns, beams, or floors before they are poured. Only once the placement has been approved will the concrete be poured. Chart 16 outlines the key quality assurance metrics for the project.

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, they are corrected as quickly and efficiently as possible under the supervision of the Senior Project Manager. The Junior Project Manager will schedule regular project management reviews by a third-party project management office to ensure that proper project management processes are being implemented. Finally, once all quality assurance documentation is reviewed, the results should be used to improve project processes as process improvement is an important aspect of quality assurance. All process improvements should be documented and communicated to all stakeholders.

4.5.4 Quality Control

The quality control of the Construction of the Ice Cream Plant focuses on identifying and correcting any defects found during the construction of the building. Chart 16 outlines the key quality control metrics for this project.

Chart 16 Key Quality Control Metrics. Source (T.Forde, The Author, August 2020)

Process Action	Acceptable Process Standard	Assessment Interval
Structural Steel Inspection	Adequate workmanship	Once
High-Strength Bolting Inspection	Proper bolt torque	Every connection
Field Weld Inspection	*Equally distributed *No waste * Zero porosity *Tight weld *Required strength	Every weld

Process Action	Acceptable Process Standard	Assessment Interval
Concrete Compression Testing of Concrete Cubes	4500 psi compressive strength at 28 days	Every concrete pour of column, beam, or floor

In addition, day-to-day inspections of the project work will be conducted by the Senior Project Manager, Junior Project Manager, Site Engineers, and Site Superintendent to ensure all project work is completed to the highest standard possible.

4.6 Resource Management Plan

The Resource Management Plan is an important tool in the construction of the ice cream plant. It will aid in the management of the project's team and physical resources throughout the project until its closure. The Resources Management Plan will include:

- Roles and responsibilities
- Project Organisation charts
- Staffing management plan

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 (PMI, 2017, p. 312).

4.6.1 Roles and Responsibilities

For the Construction of the Ice cream Plant to be successful as a project, the project team must clearly understand each of their roles and responsibilities. It is only with that clear understanding that each member of the project team will successfully complete their portion of the project work. For this project, the following roles and responsibilities were established:

- **Architect (A), (1 position):** responsible for ensuring the building aesthetics, function, and use of space is adhered to. The Architect is also responsible for all of the various disciplines, excluding the project manager and production of project documents.

- **Senior Project Manager (SPM), (1 position):** responsible for the overall success of the project. The SPM must authorise and approve all project expenditures. The SPM is also responsible for ensuring that work activities meet established acceptability criteria and fall within acceptable variances. The SPM will also be responsible for reporting project status in accordance with the communications management plan. The SPM will evaluate the performance of all project team members. The SPM is also responsible for acquiring team and physical resources for the project. The SPM must possess the following skills: leadership, ability to budget, ability to schedule, and effective communication.

- **Junior Project Manager (JPM), (1 position):** responsible for creating project planning documents, taking meeting minutes, reporting to the SPM on changes and updates to the project for approval. Managing the procurement process and collecting daily reports from the site management team. The JPM is also responsible for broadcasting daily site reports to the relevant stakeholders as directed by the SPM.

- **Site Engineer (SE), (2 positions):** responsible for laying out of all elements of the building, finding any clashes between the structural and architectural drawings, doing any calculations necessary, and providing as-built drawings to the architect. The SE is also responsible for explaining any details to the subcontractors or project team members about what needs to be done to complete the task, as well as, providing datum lines where necessary.

- **Site Superintendent (SS), (1 position):** responsible for any and all production and business pertaining to the site works.

- **Administrative Assistant (AA), (1 position):** responsible for all office work and acts as an assistant to both the SPM and JPM. Also responsible for ensuring that office supplies are always in stock.

- **Storeroom Clerk (SC), (1 position):** responsible for ensuring that the storeroom is always stocked with the materials necessary to complete the project successfully. Additionally, the SC is responsible for ensuring that all tools and equipment used in a particular day are returned and accounted for at the end of the day.

- **Accountant (Ac), (1 position):** responsible for all financial transactions and financial reporting pertaining to the project.

- **Electrical Engineer (EE), (1 position):** responsible for ensuring the building operates at an optimum and efficient electrical capacity. The EE is also responsible for developing an electrical floorplan, lighting layout, switches, plugs, and emergency lighting.

- **Structural Engineer (SEn), (1 position):** responsible for the structural integrity of the building and is responsible for developing the structural drawings.

- **Mechanical Engineer (ME), (1 position):** responsible for the air-conditioning systems, ensuring that they provide adequate cooling throughout the office areas of the building. The ME is also responsible for producing floorplans depicting the waste and supply lines for water, connections to the sewer system, and the locations of all toilets, sinks, and floor drains. The ME is also responsible for developing drawings for both the plumbing and the air-conditioning.

- **Quantity Surveyor (QS), (1 position):** responsible for collecting data based on the construction specifications and drafting documents to develop a cost analysis for the project.

- **Land Surveyor (LS), (1 position):** responsible for laying out the site boundary and identifying control points.

- **Electrical Subcontractor (ES), (1 position):** responsible for installing all building and site electrical elements as per electrical and site layouts and schedules.

- **Plumbing Subcontractor (PS), (1 position):** responsible for installing all building and site plumbing elements as per mechanical drawings and schedules.

- **Air-Condition Subcontractor (ACS), (1 position):** responsible for installing all air-condition elements as per mechanical drawings and schedules.

- **Steel Bending Subcontractor (SBS), (1 position):** responsible for cutting and bending and placing all reinforced steel as required by the structural drawings.

- **Excavation/Backfilling Subcontractor (EBS), (1 position):** responsible for removing and adding required material in all locations specified by the structural drawings.

- **Tiling Subcontractor (TS), (1 position):** responsible for installing tiles as per layouts and in accordance with acceptable industry standards.

- **Structural Steel Erection Subcontractor (SSES), (1 position):** responsible for the erection and plumbing of the structural steel based on the structural drawings.

- **Crane Subcontractor (CS), (1 position):** responsible for assisting the SSES with the erection of the structural steel.

- **Painting Subcontractor (PS), (1 position):** responsible for all painting necessary for the project.

4.6.2 Project Organisational Charts

Chart 17 shows the RACI chart for the Construction of the Ice Cream Plant Project.

Chart 17 RACI Chart. Source (T. Forde, The Author, August 2020)

	Senior Project Manager	Professional Engineers	Site Engineers	Junior Project Manager	Site Superintendent	Site Workers	Accountant	Architect	Subcontractors	Project Sponsor
Requirements Gathering	A	I	I	A	I			R	I	C
Building Design	A	R	I	I	I	I		R	I	C
Change Requests	R	C	I	A	I	I		I	I	C
Feasibility Study	R	I	I	A						I
Contract Administration	R			A			I			I
Site Management	A		I	I	R	I			I	I
Permits/Approvals	R	I	I	A	I	I	I	I	I	I
Project Scope	R	I	I	A	I	I			I	I
Project Communications	R			A						
Project Quality	R	C	I	A	I	I			I	I
Stakeholder Management	R	I	I	A	I	I			I	I

	Senior Project Manager	Professional Engineers	Site Engineers	Junior Project Manager	Site Superintendent	Site Workers	Accountant	Architect	Subcontractors	Project Sponsor
Accounting	A			I			R			I
Status Reports	A	I	I	R	I	I			I	I
Procurements	A		I	R	I					I

Key:

R: Responsible for completing the work

A: Accountable for ensuring task completion

C: Consulted before any decisions are made

I: Informed when a decision has been made

4.6.3 Staff Acquisition

For the Construction of the Ice Cream Plant, the project staff will consist of a few internal resources with regards to the project management and site workers. Much of the work outside of the building structure itself will be subcontracted to external sources. This will be part of the procurements plan for this project. The main office staff of Moorjani Caribbean Ltd who will be splitting their time between office work and project work will work from the main office and will not be required to visit the project site. The project management staff, site workers, and subcontractors will be required to be on site daily until the project is complete or until their part of the scope is complete.

4.6.4 Training

There will be no training provided for any of the Moorjani Caribbean Ltd personnel. All hired personnel were hired as professionals and are capable of providing all functions required by the capacity for which they have been hired.

4.6.5 Performance Reviews

The Senior Project Manager will review the overall performance of the project during the project lifecycle. At the onset of the project, the Senior Project Manager will communicate with the Junior Project Manager, Site Engineers, and Site Superintendent to inform them of all expectations of the work to be performed. It is the Site Superintendent’s responsibility to manage and evaluate each site worker’s performance and judge how effectively they are completing their assigned work. Concurrently, it is the Senior Project Manager’s responsibility to evaluate each of the project management team members, and judge how effectively they are completing the work assigned. At the end of every month, the Senior Project Manager will meet with the project management team and provide feedback on employee project performance. In turn, the Junior Project Manager will meet with the Site Superintendent to review the formal performance reviews on each site worker.

4.6.6 Estimated Physical Resources

Chart 18 shows the estimated physical resources needed to successfully complete the project.

Chart 18 Estimated Physical Resources. Source (T. Forde, The Author, August 2020)

Quantity	Description
1	Steel Structure
70 tons	Reinforcement Steel
104	Bolts
To match steel structure	Purlins
To match purlins	Roof Sheets
1200 cubic meters	Concrete
30 palates	Cement
10 cubic meters	Sand
5 cubic meters	Stone
20 bails	Plywood
4 bails each	Timber (2” x 4”, 1” x 4”)
20 pounds of each	Screws/Nails
50,000	8” Concrete Blocks
40 bails	BRC Brickforce
20	Angle Grinder Discs
10	Chop Saw Blades
2	Impact Wrench
2,800 square feet	Insulation
10 boxes	Ceiling Tiles Tee/Cross tee
20 boxes	Ceiling Tiles
10 boxes	500g Polythene Membrane
12,000 cubic meters	Marl

Quantity	Description
1,000 feet	Guttering
2	Cement Mixer
10	Shovel
10 boxes	Gloves
5 boxes	Dust Masks
1	Compressor
12	Doors
4 palates	Tiles
20 gallons	Paint
8 gallons	Epoxy

4.7 Communication Management Plan

The communication management plan was developed to ensure that information is adequately disseminated to all stakeholders as often as necessary. The plan details how each stakeholder would receive information from the responsible member of the project team, the frequency of that information, and the type of information to be communicated.

4.7.1 Communication Matrix

The communication matrix shows the information to the communicated, communication method, frequency, goal, sender, and receiver of the information. This information is important in ensuring that information is disseminated to all stakeholders as often as necessary. Chart 19 shows the Project Communication matrix for the Ice Cream Plant Project.

Chart 19 Project Communication Matrix. Source (T. Forde, The Author, August 2020)

Communication	Method	Frequency	Goal	Owner	Audience
Project Report	Email	Daily	To update the owner of MCL on the project progress.	Junior Project Manager	Owner (MCL), Senior Project Manager
Project Progress Meeting	Zoom (Online)	Bi-monthly (every two weeks)	To update all the relevant stakeholders of the project progress so far, discuss problems encountered since last meeting, gather feedback and discuss next steps.	Senior Project Manager	Owner (MCL), Project Sponsor, Project Manager (CRL), Junior Project Manager
Site Meeting	Meeting	Weekly	To discuss the plan of activities for the upcoming week, any housekeeping matters that may arise, and any concerns that any project staff may have.	Site Superintendent	Senior Project Manager, Junior Project Manager, Site Engineers, Site Workers

Communication	Method	Frequency	Goal	Owner	Audience
Financial Report	Email	Monthly	To update on project expenditures.	Senior Project Manager	Owner (MCL), Project Sponsor, Project Manager (CRL), Junior Project Manager
Site Management Meeting	Meeting	Weekly	To discuss the work plan for the upcoming week and future deadlines that are critical for project success.	Senior Project Manager	Junior Project Manager, Site Manager, Site Engineers, Site Superintendent
Final Account Meeting	Meeting	Once (At End of Project)	To present complete audit of project finances.	Senior Project Manager	Owner (MCL), Project Sponsor, Project Manager (CRL), Junior Project Manager, Quantity Surveyor, Accountant

Communication	Method	Frequency	Goal	Owner	Audience
Change Order Meeting	Zoom (Online)	As Necessary	To discuss proposed changes to project.	Senior Project Manager	Project Sponsor, Project Manager (CRL)
Consultant Meeting	Meeting	As Necessary	To discuss any issues found with the project design and to create solutions.	Senior Project Manager	Consultants, Junior Project Manager, Site Engineers
Project Debriefing	Meeting	Once (At End of Project)	To discuss lessons learned.	Senior Project Manager	Junior Project Manager, Site Engineers, Site Superintendent

4.7.2 Communication Escalation Process

There is a possibility that an event may occur during the project that would be outside of the project team or Project Manager's authority. This event may be an opportunity or a threat. In this case, the Project Manager determines who should be notified about the event and communicates the details about the event to that person or to that part of the organisation. It is important to note that once the details are communicated, then ownership of that event is shifted to the person or part of the organisation to whom it was communicated.

4.7.3 Monitor Communications

Monitor Communications determines if the planned communications artifacts and activities have had the desired effect of increasing or maintaining stakeholders' support for the project's deliverables and expected outcomes (PMI, 2017, p. 389). The way the Ice Cream Plant Project will determine this will be observation/conversation of/with the team and collecting lessons learned. Observing the project team will be an indicator of whether the communications had their desired effect. If it is found that they are not, then the Project Manager will have a meeting with the communication owner and formulate a plan to assist the owner in communicating with his/her audience. The change in the communication management plan will go through the change control process.

4.8 Risk Management Plan

To adequately identify and plan for the project risks, the project risks were identified and qualitatively analysed, and planned responses were identified for each risk. However, risks were not quantitatively analysed due to lack of resources. To plan risk management, the previously developed subsidiary plans, including the Project Charter, were used as inputs for this process. The tools and techniques used for this process were root cause analysis, expert judgement, and meetings with the Senior and Junior Project Managers.

4.8.1 Risk Breakdown Structure (RBS)

PMI (2017) defines a risk breakdown structure as, “a hierarchical representation of potential sources of risk” (p. 405). An RBS helps the project team consider the full range of sources from which individual project risks may arise (PMI, 2017, p. 405). Chart 20 shows the RBS for the Ice Cream Plant Project.

Chart 20 Risk Breakdown Structure (RBS). Source (T. Forde, The Author, August 2020)

RBS LEVEL 0	RBS LEVEL 1	RBS LEVEL 2	RBS LEVEL 3
0. PROJECT RISK	**1. Technical Risk**	1.1 Scope Definition	1.1.1 The client makes a change to the project scope.
		1.2 Requirement Definition	1.2.1 The industry standard changes.
		1.3 Estimates, Assumptions, Constraints	1.3.1 The cost of material changes during the project.
			1.3.2 The time to complete a task is underestimated.
		1.4 Technical Processes	1.4.1 Labour skill is inadequate.
			1.4.2 Labour skill is greater than expected.
		1.5 Technology	1.5.1 Equipment malfunction during project.
	2. Management Risk	2.1 Project Management	2.1.1 Labour unrest.
		2.2 Operations Management	2.2.1 Staff injury.
			2.2.2 Staff illness.
		2.3 Organization	2.3.1 Staff payment is late.
		2.4 Communication	2.4.1 Stakeholders uninformed.
			2.4.2 Project team not working cohesively.
		2.5 Resourcing	2.5.1 Not enough labour.
			2.5.2 Not enough equipment.
	3. Commercial Risk	3.1 Contractual Terms and Conditions	3.1.1 Poor contract terms.
		3.2 Suppliers and Vendors	3.2.1 Material is delivered late.
			3.2.2 Material is of poor quality.
			3.2.3 Material is damaged.
			3.2.4 Concrete fails compression testing.
			3.2.5 Savings on material purchased in bulk.
		3.3 Subcontracts	3.3.1 Poorly negotiated contract.
			3.3.2 Subpar quality work.
		3.4 Client Stability	3.4.1 Delay in payment from client.

RBS LEVEL 0	RBS LEVEL 1	RBS LEVEL 2	RBS LEVEL 3
	4. External Risk	4.1 Legislation	4.1.1 Local building code changes.
			4.1.2 Permit requirements change.
		4.2 Bad Weather	4.2.1 Rain delay.
			4.2.2 Natural disaster.

4.8.2 Probability and Impact Scales and Matrix.

Charts 21 and 22 show the probability and impact scales and matrix for the Ice Cream Plant project.

Chart 21 Probability and Impact Scale. Source (T. Forde, The Author, August 2020)

Scale	Probability	Probability Score	Impact on Project			
			Schedule	Cost	Scope	Impact Score
Very Low	< 10%	0.1	< 2 weeks	< 1%	Temporary defects, causing minor short-term consequences.	0.05
Low	10% to < 30%	0.3	2 weeks to < 1month	1% to < 2%	Product performance shortfall in area of tertiary (minor) importance.	0.1
Medium	30% to < 50%	0.5	1 month to < 2 months	2% to < 4%	Product performance shortfall in area of secondary importance.	0.2
High	50% to < 70%	0.7	2 months to < 4 months	4% to < 8%	Minor product performance shortfall in area of primary (critical) performance.	0.4

Scale	Probability	Probability Score	Impact on Project			
			Schedule	Cost	Scope	Impact Score
Very High	> 70%	0.9	> 4 months	> 8%	Significant failure of product to meet one of its primary (critical) purposes.	0.8

Chart 22 Probability and Impact Matrix. Source (T. Forde, The Author, August 2020)

Probability		Threats					Opportunities				
	0.9	0.045	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.045
	0.7	0.035	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.035
	0.5	0.025	0.05	0.1	0.2	0.4	0.4	0.2	0.1	0.05	0.025
	0.3	0.015	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.015
	0.1	0.005	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.005
		0.05	0.1	0.2	0.4	0.8	0.8	0.4	0.2	0.1	0.05
		Impact									

4.8.3 Risk Register

PMI (2017) says, "the risk register captures details of identified individual project risks. The results of Perform Qualitative Risk Analysis, Plan Risk Responses, Implement Risk Responses, and Monitor Risk are recorded in the risk register as those processes are conducted throughout the project" (p. 417). Qualitative Risk Analysis will be done using the probability and impact scale and matrix shown above. Chart 22 shows the risk register for the Construction of the Ice Cream Plant Project.

Chart 23 Risk Register. Source (T. Forde, The Author, August 2020)

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
1.1.1	The client adds additional items to the project scope.	The client makes a change to the project scope.	Increase to the project budget and schedule as more activities will be needed to successfully complete the project.	0.1	0.4	0.04	Change in the client's needs.	Senior Project Manager	During the project planning phase, make sure that each part of the plan is reviewed more than once so the client is satisfied that all of his needs will be met by the successful completion of the project.
1.2.1	Experts in the industry make new revelations on what should be used to develop the best product.	The industry standard changes.	Increase to the project budget and schedule as there will be changes to the project scope and possibly procurement plan to ensure that the project satisfies industry standards.	0.1	0.8	0.08	Change in technology in the industry.	Senior Project Manager	During the planning phase of the project, redo all research that was done prior to make sure that what has been designed still meets any new industry standards found.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
1.3.1	Increase in price of raw materials.	The cost of material changes during the project.	Increase to the project budget as cost of materials is greater than estimated cost.	0.3	0.2	0.06	Raw materials become scarce.	Junior Project Manager	Monitor the cost of material during the project and buy in bulk early if necessary, to save on cost.
1.3.2	Misunderstanding all the steps involved to complete a task.	The time to complete a task is underestimated.	Increase to the project schedule as tasks take longer to complete than estimated.	0.5	0.1	0.05	Lack in construction experience.	Junior Project Manager	Consult with those project members with expert judgement to make sure that all task steps are understood clearly.
1.4.1	Labour does not possess as much skill as they professed to have.	Labour skill is inadequate.	Work completed is below standard and has to be redone by another professional.	0.5	0.2	0.1	New labour hired.	Site Superintendent	Properly vet all new staff and ask for examples of their work to ensure their work is high quality.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
1.4.2	Labour did not have many opportunities to work before to show their skill.	Labour skill is greater than expected.	Work is completed ahead of schedule with high quality.	0.5	0.2	0.1	New labour hired.	Site Superint endent	Inquire from highly skilled workers if they have any associates who are of similar skill that could be hired.
1.5.1	Equipment not properly maintained.	Equipment malfunction during project.	Project budget and schedule are increased because equipment has to be replaced and work has to stop until equipment is replaced.	0.3	0.4	0.12	No maintenance plan implemented .	Junior Project Manager	Once equipment arrives on site, ensure that it is working as it should and implement a maintenance schedule to make sure it continues to work well.
2.1.1	Unsatisfactory work conditions.	Labour unrest.	Delay in project schedule as staff refuses to work in current work conditions.	0.3	0.8	0.24	Staff needs not considered.	Senior Project Manager	Ensure that all conditions to be met under the labour laws are met and that staff is comfortable.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
2.2.1	Unsafe work conditions.	Staff injury.	Increase in project budget as medical fees of injured staff member have to be paid and staff member has to be replaced.	0.3	0.4	0.12	Staff safety not prioritised.	Site Superin-tendent	Have a meeting with staff to ensure they understand what is expected of them with regards to safety and to make sure that they have all personal protective equipment they need to safely complete their work.
2.2.2	Contraction of the common cold or flu.	Staff illness.	Delay in project schedule as project resources are temporarily depleted.	0.3	0.1	0.03	Flu season.	Senior Project Manager	Have labour waiting on standby, if possible, to take over for ill staff.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
2.3.1	Miscommunication between office administrator and accountant.	Staff payment is late.	Delay in project schedule because staff is unwilling to work without pay.	0.1	0.8	0.08	Lack of communication between project team members.	Administrative Assistant	Ensure that hours worked for all project staff is sent on time so that it can be processed on time.
2.4.1	Not enough communication between project team and stakeholders.	Stakeholders uninformed.	Client dissatisfaction because the stakeholders are left out of the decision making or are not aware of project progress.	0.1	0.05	0.005	Lack of communication between project team and stakeholders.	Junior Project Manager	Adhere to communication plan recommendations so that all stakeholders are properly informed.
2.4.2	Project team misunderstanding their roles and responsibilities.	Project team not working cohesively.	Delay in project schedule due to project team members not working as a team to complete tasks.	0.1	0.4	0.04	Lack of communication between site management and site workers.	Senior Project Manager	Ensure that all information about roles and responsibilities is properly communicated during weekly project meetings.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
2.5.1	Unable to find suitable workmen to hire for the project.	Not enough labour.	Delay in project schedule due to having insufficient workmen to complete the tasks on time.	0.1	0.4	0.04	Project work done at the same time increases.	Site Superintendent	Inquire from already skilled workmen about associates they may have that are looking for work.
2.5.2	Necessary equipment is unavailable during project.	Not enough equipment.	Delay in project schedule as equipment needed to complete work on time is unavailable.	0.1	0.8	0.08	Project work done at the same time increases.	Senior Project Manager	Inquire from equipment suppliers during the planning stages whether they have capacity to provide for the project so that plans can be made.
3.1.1	First time working on a project of this type.	Poor contract terms.	Project delay because it takes longer for all parties to reach a desirable agreement.	0.1	0.8	0.08	Nobody on the project team specialising in contracts.	Owner (MCL)	Hire a lawyer who specialises in contracts to ensure the terms and conditions are understood by all parties involved.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
3.2.1	Delay in shipment from supplier.	Material is delivered late.	Delay in project schedule because material is not available to complete task.	0.3	0.4	0.12	Request for material.	Senior Project Manager	Order material with enough time to allow for early arrival even if the shipment is late.
3.2.2	Poor fabrication by manufacturer.	Material is of poor quality.	Delay in project schedule as new material will have to be delivered to replace old material.	0.3	0.4	0.12	Request for material.	Senior Project Manager	Ask for supplier material inspection reports prior to shipment of material to ensure highest quality material is being sent.
3.2.3	Not enough care paid to material on site.	Material is damaged.	Increase in project budget as damaged material has to be replaced.	0.5	0.2	0.1	Lack of care by project team members.	Senior Project Manager	Store material on site in an area away from where project work is being completed and there is a lot of traffic.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
3.2.4	Concrete cubes for testing are not produced correctly.	Concrete fails compression testing.	Delay in project schedule and increase in project budget due to all areas where concrete would have failed and needed to be repoured.	0.1	0.8	0.08	Concrete pour.	Senior Project Manager	Properly train mason to produce concrete cubes to the testing standard.
3.2.5	Discount from supplier because of high volume of material purchased.	Savings on material purchased in bulk.	Project completed under budget as materials are cheaper than estimated.	0.5	0.4	0.2	Good relationship with supplier.	Junior Project Manager	Build a good rapport with the supplier by constant and early communication with them.
3.3.1	First time working with a particular subcontractor.	Poorly negotiated contract.	Increase in project budget as subcontractor is able to negotiate a higher pay than they may be worth.	0.1	0.2	0.02	Completed contract with subcontractors.	Senior Project Manager	Have the project team member with the best negotiation skills to ensure that the best contract terms are agreed upon by both parties.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
3.3.2	First time working with a particular subcontractor.	Subpar quality work.	Increase in project budget and delay in project schedule due to the work having to be redone.	0.3	0.4	0.12	Completed contract with subcontractors.	Site Superintendent	In the contract terms, make note that the highest quality work is expected from the subcontractor and if rework needs to be done, it will be done at the expense of them and not the company.
3.4.1	Payment terms not fully agreed upon.	Delay in payment from client.	Delay in project timeline.	0.1	0.8	0.08	Lack in client funds.	Owner (MCL)	Have all funding processes and deadlines agreed upon during project planning stages so there is no delay in project timeline.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
4.1.1	The government changes and makes changes to requirements.	Local building code changes.	Increase in project budget and delay in project schedule due to changes in the scope that would be needed to be made.	0.1	0.4	0.04	Change in government.	Senior Project Manager	When the project is in the planning stages negotiate with the regulatory client that the building code at the time will be used for the project regardless of changes in the future.
4.1.2	The government changes and makes changes to requirements.	Permit requirements change.	Delay in project schedule due to having to meet different requirements to get the construction permit.	0.1	0.2	0.02	Change in government.	Senior Project Manager	When the project is in the planning stages negotiate with the regulatory client that the permit requirements at the time will be used for the project regardless of changes in the future.

RBS Code	Cause	Risk	Consequence	Probability	Impact	PxI	Trigger	Owner	Strategy
4.2.1	Nature.	Rain delay.	Delay in project schedule due to work not being able to be completed in rainy weather.	0.5	0.05	0.025	Weather.	Site Superintendent	Add days to the project schedule during planning to account for possible rain days where no work will be able to be completed.
4.2.2	Nature.	Natural disaster.	Delay in project schedule and increase in project budget due to the site having to be shut down due to impending bad weather and possible material damage.	0.1	0.8	0.08	Weather.	Senior Project Manager	Add days to the project schedule during planning to account for possible rain days where no work will be able to be completed, as well as have project insurance to cover loss due to bad weather.

4.8.4 Risk Monitoring

The Junior 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 Project Team and relevant Stakeholders during the project status meetings. The owner of the particular risk will be responsible for deciding when/if to execute the corresponding risk response.

4.9 Procurement Management Plan

The Procurement Management Plan sets the procurement framework for the project. It serves as a guide for managing procurement throughout the project lifecycle and will be updated as necessary. Due to the experience MCL has with construction, a make-or-buy analysis will not be used for this project. The project team is already very familiar with what can be made versus what has to be purchased. The Procurement Management Plan identifies the types of contracts to be used, the approval process, and the decision criteria. Additionally, it will include procurement risks and procurement risk management considerations, procurement costs determination, procurement documentation usage, and procurement constraints.

4.9.1 Procurement Management Approach

The Senior Project Manager will provide oversight and management for all procurement activities during the project. The Junior Project Manager will work with the Senior Project Manager to identify all items or services to be procured for the successful completion of the project. Once the list has been finalised, the vendor selection, purchasing, and contracting processes will commence.

4.9.2 Procurement Definition

Chart 24 shows the procurement items and services that have been determined to be essential for project success.

Chart 24 Procurement Items and Services. Source (T. Forde, The Author, August 2020)

Item/Service	Justification
Steel Structure	The steel skeleton of the building.
Reinforcement Steel	Used to reinforce concrete beams, columns, and floors.
Bolts	Fasteners for the steel structure.
Purlins	Structure for roof sheets to be fastened.
Roof Sheets	Providing cover for the building.
Steel Erectors	Persons who will erect the steel structure.
Concrete	Mixture of cement, coarse aggregate, fine aggregate, and water that provides strength.
Cement	Used to make mortar, plaster, and concrete.
Sand	Used to make mortar, plaster, concrete, and for sand blinding.
Stone	Used to make concrete.
Plywood	Used to make formwork.
Timber (2” x 4”, 1” x 4”)	Used to make formwork.
Screws/Nails	Fasteners
Concrete Blocks (6”, 8”, and 12”)	Used to build walls.
BRC Brickforce (6”, 8” and 12”)	Used to provide shear strength for block walls.
Angle Grinder Discs	Used to cut steel.
Chop Saw Blades	Used to cut steel.
Impact Wrench	Used to drive bolts.
Insulation	To keep out moisture.
Ceiling Tile Tee/Cross Tee	Used to make ceiling structure for ceiling tiles.
Ceiling Tiles	Used to complete ceiling.
500g Polythene Membrane	Plastic sheets that keep out moisture.

Item/Service	Justification
Marl	Stone of different sizes mixed together.
Guttering	Plastic system used to divert water from roof.
Excavation/Backfilling	Service to remove in-place material and fill it with marl compacted to 98% proctor density.
Plumbing	Service to install all supply and waste pipes, a/c lines, sinks, toilets, and floor drains.
Electrical/IT	Service to install all electrical plugs, lights, switches, and data points.
Air-Conditioning	Service to install and gas a/c units.
Windows	Opening fitted with glass to allow persons inside to see out, as well as, to allow natural light in.
Doors	Entrance to building or room.
Tiles	Aesthetic feature that makes cleaning floors easier.
Paint	Decorative finish for a wall.
Epoxy	Sealed finish for a concrete floor.
Steel Bending	Service to cut, bend, and place reinforcement steel.
Crane	Service to lift heavy objects into place.

In addition to the above list of procurement items, the following individuals are authorized to approve purchases for the project teams:

- Sami Barshini – Senior Project Manager
- Gerardo Thomas – Junior Project Manager
- Yanick Charles – Administrative Assistant
- Ernest Harris – Site Superintendent

4.9.3 Types of Contracts

All services to be procured for this project will be solicited under a firm fixed price contract. The project team will work with the Senior and Junior Project Managers to define the item types, quantities, services, and delivery dates. The Junior Project

Manager will then send out a request for tenders (RFT), and once a vendor is selected, procurement of the items and services will commence. All additional items to be procured for this project will be solicited under a material only contract.

4.9.4 Procurement Risks

Risks that have been identified for the procurement process can be found in section 4.8.1.

4.9.5 Procurement Risk Management

Qualitative analysis and planned risk responses to procurement risks can be found in section 4.8.3.

4.9.6 Cost Determination

Costs will be based on the proposals sent in by the vendor for a particular service. The proposals will include a line-by-line breakdown of the cost to provide the service and using that breakdown, the price for the firm fixed contract will be determined.

4.9.7 Procurement Documentation

The following documents will be developed and maintained in the company's shared drive so that they may be used for future projects:

- Request for Tenders
- Tender Evaluation Form
- Non-disclosure Agreement
- Letter of Intent
- Contracts
- Procurement Audit Form
- Procurement Performance Evaluation Form
- Lessons Learned Form

4.9.8 Procurement Constraints

There are several constraints that must be considered as part of the procurement management plan. These constraints will be communicated to all vendors and included in the RFT. The constraints are as follows:

- Project schedule is not flexible and the procurement activities, contract administration, and contract fulfilment must be completed within the established project schedule.
- Project budget has a contingency reserve built in; however, the reserve may not be applied to procurement activities. Reserves are only to be used in the event of an approved change in project scope. All procurement activities and contract awards must support the approved project scope statement. Any procurement activities or contract awards which specify work which is not in direct support of the project's scope statement will be considered out of scope and disapproved.
- All procurement activities must be performed and managed with current personnel. No additional personnel will be hired or re-allocated to support the procurement activities on this project.

4.9.9 Contract Approval Process

Once solicitations are complete and all tenders have been received by the project team, the approval process will begin. The first step of this process is to conduct a review of all vendor proposals to determine which meet the criteria established by the project team. The criteria for the selection and award of procurement contracts under this project will be based on the following decision criteria:

- Quality
- Cost
- Past Performance

These criteria will be measured by the Project Manager and Assistant Project Manager and the contract will be awarded to the vendor who best meets all three criteria.

4.9.10 Vendor Management

Vendor Management will ultimately be the responsibility of the Senior Project Manager. All vendors providing services on site will be part of the weekly site meeting that sets a plan for the work for the week. Vendors that are only providing materials will not be a part of the meeting. Additionally, the Site Superintendent and Site Engineers will be monitoring the work completed by these vendors to ensure it is of acceptable quality.

4.10 Stakeholder Management Plan

PMI (2017) describes Project Stakeholder Management as, “the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyse stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution” (p. 503).

4.10.1 Identify Stakeholders

PMI (2017) describes this process as, “the process of identifying project stakeholders regularly and analysing and documenting relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success” (p. 507). Once the stakeholders were identified, they were analysed using stakeholder analysis and this information was presented in a stakeholder register matrix. Chart 25 shows the stakeholder register matrix for the Construction of the Ice Cream Plant Project.

Chart 25 Stakeholder Register Matrix. Source (T. Forde, The Author, August 2020)

ID	Stakeholders	Main Expectations	Influence/Impact (Low-Medium-High)
1	Owner, Chefette Restaurants Limited	The successful completion of the ice cream plant project.	High Influence/High Impact
2	Project Manager, Chefette Restaurants Limited	The successful completion of the ice cream plant project.	High Influence/High Impact
3	Architect	To design a plant that meets the needs of the client and satisfies industry and local building code requirements.	High Influence/High Impact
4	Consultants	To design a building that is able to withstand natural disasters and is able to function to the highest standard.	High Influence/High Impact
5	Owner, Moorjani Caribbean Limited	To successfully complete the project and increase the company's reputation as one that can complete projects in the shortest amount of time possible while still being under budget.	High Influence/High Impact

ID	Stakeholders	Main Expectations	Influence/Impact (Low-Medium-High)
6	Project Managers, Moorjani Caribbean Limited	The successful completion of the ice cream plant project.	High Influence/High Impact
7	Site Engineers, Moorjani Caribbean Limited	To layout every part of the project with accuracy so that no work needs to be redone, as well as provide accurate information with regards to every part of the project.	Medium Influence/High Impact
8	Site Workers, Moorjani Caribbean Limited	To complete their work to the highest standard possible.	Low Influence/High Impact
9	Suppliers	To provide the highest quality materials to the project site.	Low Influence/Medium Impact
10	Chefette Restaurant Customers	To be able to buy Chefette brand ice cream outside of the restaurant.	Low Influence/Low Impact
11	Government Agencies	To make sure that the project follows the rules and regulations set by the government.	Low Influence/High Impact
12	Subcontractors	To complete their work to the highest standard possible.	Low Influence/Medium Impact

4.10.2 Power/Interest Classification

The Power/Interest Grid analyses stakeholder groups in a visual manner to further establish stakeholders' level of interest and their ability to influence the project. This is done to further categorise groups in order to determine the best level of engagement for each stakeholder. Figure 11 shows the Power/Interest Grid for the Construction of the Ice Cream Plant Project.

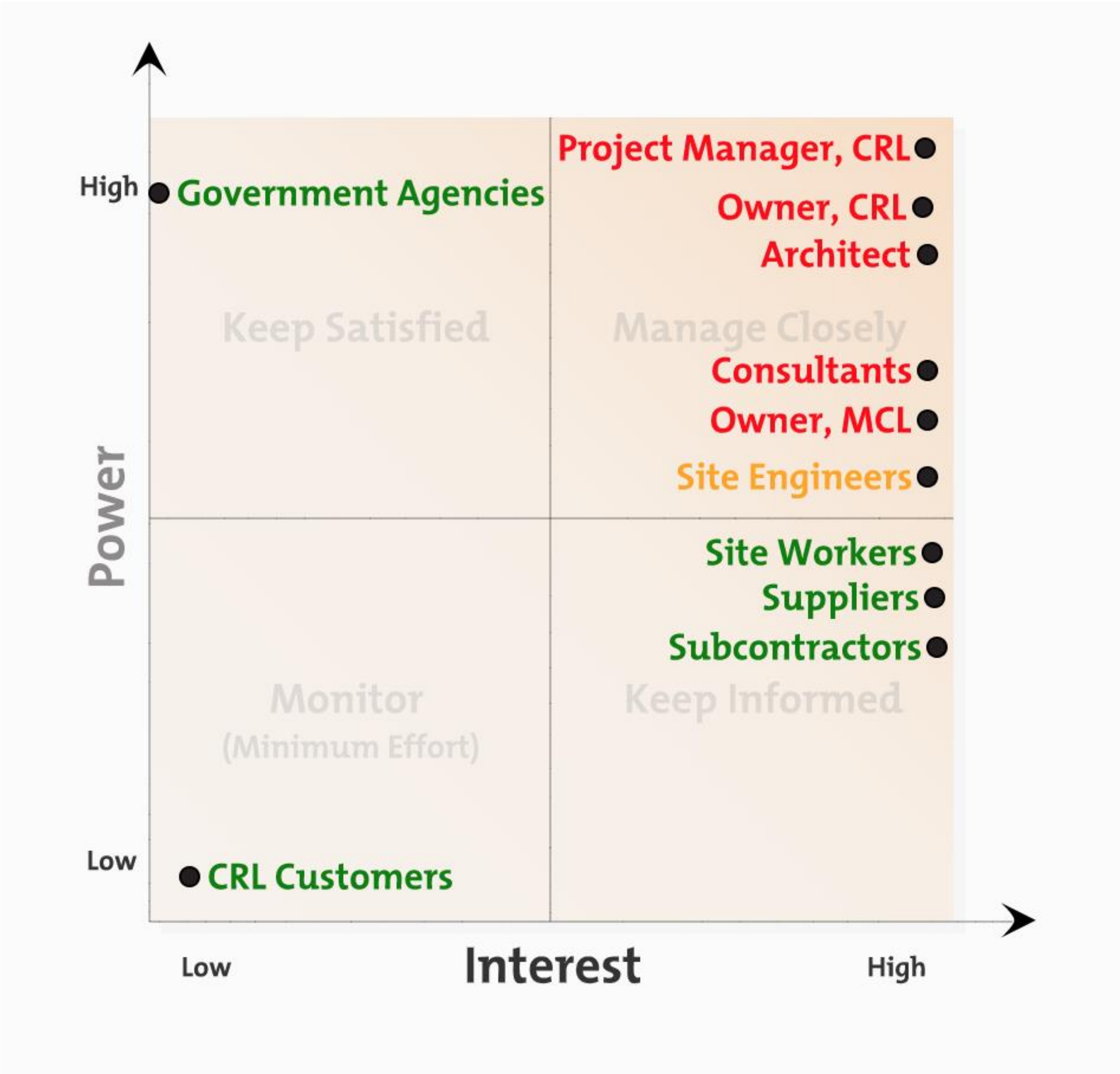

Figure 11 Stakeholder Power/Interest Grid. Source (PMBOK ® Guide p. 512, PMI, 2017)

4.10.3 Stakeholder Strategies

With regards to Figure 11, the stakeholder power/interest grid, the strategies for each category of stakeholders is as follows:

- High power, highly interested people (Manage Closely): the company must fully engage these people and make the greatest efforts to satisfy them. Which would mean that they should be keep abreast of every new development on site, as well as, to be made a part of every major decision before it is implemented.

- High power, less interested people (Keep Satisfied): put enough work in with these people to keep them satisfied, but not so much that they become bored with your message. Which would mean that the stakeholders in this category do not need to be updated about project progress, but if their requirements are ignored, it can greatly affect project progress. Therefore, it is best to do the work required to satisfy their requirements and only update them on project progress if necessary.

- Low power, highly interested people (Keep Informed): adequately inform these people and talk to them to ensure that no major issues are arising. People in this category can often be very helpful with the details of your project. The stakeholders in this category will not be a part of major decisions, however, it is important to keep these stakeholders aware of any changes during the course of the project. Constant communication with these stakeholders is important to make sure the project is being completed successfully, under budget, and on schedule.

- Low power, less interested people (Monitor): again, monitor these people, but do not bore them with excessive communication. With these stakeholders having little interest or power with regards to the project, little work is needed to satisfy them. Therefore, it is just a matter of monitoring these stakeholders to make sure their requirements are met but no need to update them frequently.

4.10.4 Stakeholder Engagement

Based on the information gathered from the Stakeholder Register Matrix and the Communications Management Plan, the Senior Project Manager can determine the level of engagement necessary for each stakeholder. However, it should be noted that the level of engagement required for each stakeholder may vary over the life of the project. Chart 26 shows the Stakeholders Engagement Assessment Matrix which would ensure that the correct level of engagement is being achieved by each stakeholder.

Chart 26 Stakeholders Engagement Assessment Matrix. Source (T. Forde, The Author, August 2020)

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Owner, Chefette Restaurants Limited					C D
Project Manager, Chefette Restaurants Limited					C D
Architect					C D
Consultants					C D
Owner, Moorjani Caribbean Limited					C D
Project Managers, Moorjani Caribbean Limited					C D

Stakeholder	Unaware	Resistant	Neutral	Supportive	Leading
Site Engineers, Moorjani Caribbean Limited					C D
Site Workers, Moorjani Caribbean Limited				C D	
Suppliers				C D	
Chefette Restaurant Customers	C		D		
Government Agencies			C D		
Subcontractors				C D	

- Unaware – this group has no information about the project.
- Resistant – aware of project and resistant to the changes and impacts the project may bring.
- Neutral – aware of the project and neither supportive nor resistant.
- Supportive – aware of the project and the potential changes and impacts and is supportive.
- Leading – aware of the project and actively engaged to ensure the project's success.
- C – Current level of engagement.
- D – Desired level of engagement.

4.10.5 Stakeholder Plan Updates

It should be noted that all documents associated with the Stakeholder Management Plan are not static in nature and should be reviewed at the end of every month and updated if necessary.

5 CONCLUSIONS

1. The Project Management Plan is the culmination of all the subsidiary plans developed in the FGP. The Project Management Plan allows the project team to have documentation of best practices in managing a project for every stage of the project. This is the first time such a plan would have been developed for any project Moorjani Caribbean Ltd would have been contracted to do and it was thought of as a step in the direction of becoming not only a construction company but also a project management company that uses the most updated best practices as described by the Project Management Institute in the *PMBOK ® Guide*. Additionally, the Project Charter being developed as part of this process will serve as a tool for future projects that can be used to formally commence a project for the company, as well as, be a teaching tool for other members of the company who are not familiar with project management principles.

2. The Scope Management Plan allows the project team to fully breakdown each part of the project scope so that no part of what was necessary was missed. This was especially important for this project due to it being the first ice cream plant construction that the company was ever contracted to complete. Even though some parts of the scope would have been familiar to the more experienced members of the project team, other parts of the scope would have been new to everyone and it was important to understand exactly what was needed from the company. Additionally, the Scope Management Plan made sure that the project team only completed the work that was required of them and nothing extra. MCL will be able to use such a plan for projects going forward to streamline their planning process.

3. MCL was familiar with planning schedules for projects prior to developing the Schedule Management Plan for this project but after developing this plan, the project team are now better able to plan their schedule as they have considered each activity beforehand and can therefore do a better estimation

of the overall project schedule. The plan forces the team to determine the critical path which is a best practice for Project Schedule Management.

4. The Cost Management Plan was developed to ensure the client knew how much funding was expected to complete the project successfully. This plan served as a training tool for the project team because it gives an understanding of the costs associated with the project and communicates that each task has a particular cost and shows that making mistakes could be costly to the project and disallow the company from making a profit and being able to pay the project team.

5. Part of meeting the client's needs is producing a product that they find satisfactory and the development of the Quality Management Plan ensures that the processes used during the project and the final product of the product are of acceptable quality. The Quality Management Plan for the Ice Cream Plant project allows members of the project team, regardless of the amount of experience they possess, to be able to discern if a particular task was completed with acceptable quality due to factors of acceptable quality being documented. In the case of the Ice Cream Plant project, this plan would include research done by the project team for aspects that would only pertain to ice cream plants. Therefore, the Quality Management Plan acts as training tool for members of the project team.

6. The Resource Management Plan identified the human and physical resources needed to successfully complete the project and broke down the human resources by role and responsibility. The Resource Management Plan allows the project team to put things in place to ensure that all resources necessary will be available when the project starts. Using the knowledge of the more experienced members of the project team, it will act as a tool for the members with less experience to learn not only what is needed for a project

of this magnitude but what is necessary to complete the project in a particular time frame.

7. The Project Communications Plan was developed so that each stakeholder had all information pertinent to them as often as they needed it and in the best forum to receive it. This would ensure that all stakeholders feel as though they are an important part of the project and it would help to boost the morale of the project team. Before the development of this plan, the type of communications used throughout a project was more reactive without having a true plan to begin with. Now that a formal Communications Management Plan was developed, the project team can now plan their communication ahead of time based on the needs of the stakeholders that they would have researched beforehand. This action would boost the rapport between the stakeholders and the project team.

8. The Risk Management plan allows the project team to allocate the project risks and opportunities to the members of the project team who would be best suited for each particular risk as opposed to the Senior Project Manager managing each risk on his own. The practice of the Senior Project Manager managing each risk would have been a practice used by MCL for every project before this one. Therefore, in adapting to project management principles, the development of a risk management plan was necessary. Additionally, it will build a good habit for the project team to develop planned risk responses for each project risk during the planning stage of the project as opposed to reacting when the risk is about to be realised. Furthermore, it builds the good habit of constantly reassessing the project risks to make sure they are still relevant or to add new risks that may have arisen as the project is executed.

9. The Procurement Management Plan was developed to ensure that the same process was used for each vendor contracted to provide a service or material

for the project. The Project Team can now use this information to ensure that all vendors are evaluated equally to mitigate bias from a particular project team member. Furthermore, it would also ensure that vendors who provide quality services or materials are highlighted and can be used in future projects by the project team to assist in satisfying the client.

10. The Stakeholder Management Plan allows the project team to truly dissect each stakeholder to ascertain their needs and their stake in the project. Having now developed a Stakeholder Management Plan, the project team can use the lessons learned from this plan to assist them in developing the other plans that would be used to make the Project Management Plan as the information found in this plan is the input for many other subsidiary plans.

6 RECOMMENDATIONS

1. Moorjani Caribbean Limited should employ a formal Project Management Office (PMO) to increase the likelihood of project success in the future and to formally document all project management processes so they can be used for future projects. The PMO will be able to review all project management documents developed for this project and improve them. Additionally, the PMO will be able to train current Project Managers on best project management practices and keep them up to date on changes in project management.

2. Moorjani Caribbean Limited should invest in Project Management Software to make the planning process of projects much easier to document. Project Management Software can include Microsoft Project to assist with Project Schedule Management. Other examples of software would be Project Cost Management software. Currently, the company does not have any such software available for staff and any staff that wants to use software has to procure it on their own. Making this software available for all project staff would allow the project team to share files.

3. All Project Management Staff at Moorjani Caribbean Limited should do a short course in Project Management so that they are familiar with the project management best practices outlined by the Project Management Institution. This course would be best implemented as an online course because it would be difficult to have all project staff at the company to have free time all at the same time to complete an in-person course.

4. Moorjani Caribbean Limited should invest in a shared drive so that project documents can easily be shared and found by any member of the project team. This shared drive can be an online service so that staff members do not need to be on the same network to access it. The current process needs an invitation to be sent to project members for each project to be able to see

project information for each project. A shared drive would remove the need for an invitation. All members of the company who have access to the shared drive would have access to all project information on the drive.

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8 APPENDICES

8.1 Appendix 1: FGP Charter

PROJECT CHARTER	
Date:	**Project Name:**
24-Feb-20	Project Management Plan for the Construction of an Ice Cream Plant
Knowledge Areas / PM Processes:	**Application Area (Sector / Activity):**
Knowledge Areas: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management, and Project Stakeholder Management PM Processes: Initiating and Planning	Planning/Construction
Project Start Date:	**Project Finish date:**
24-Feb-20	21-Sep-20
Project Objectives (General and Specific):	
General Objective: To create a Project Management Plan, framed within the standards of the Project Management Institute to manage the building of an ice cream plant. **Specific Objectives:** 1. To develop an integration management plan to unify and coordinate the processes and project management activities during the project. 2. To create a scope management plan to ensure that all work necessary to successfully complete the project is noted and included. 3. To create a time management plan to develop a project schedule that ensures the project is completed within the time constraints.	

4. To create a cost management plan to develop the project budget, as well as tools for managing the project budget to ensure the project is completed within the budget constraints.
5. To create a quality management plan to ensure that the quality of not only the final product but the processes used during the project are of the highest standards and meet the needs of the client and project management team.
6. To create a resource management plan to ensure that all human and material resources are identified and managed effectively to successfully complete the project.
7. To create a communication management plan to ensure timely and effective communication of all necessary information to members of the project management team and the stakeholders.
8. To create a risk management plan to ensure that all potential project risks are identified, examined, planned for, and monitored for the successful completion of the project.
9. To create a project procurement plan to identify what products or services cannot be handled by the project team and from whom to obtain these products and services.
10. To create a stakeholder management plan to ensure effective stakeholder engagement throughout the life of the project.

Project purpose or justification (merit and expected results):

The purpose of creating a Project Management Plan for the Ice Cream Plant is to ensure that the project team follows the best practices in project management during the executing, monitoring and controlling, and closing processes of the project.

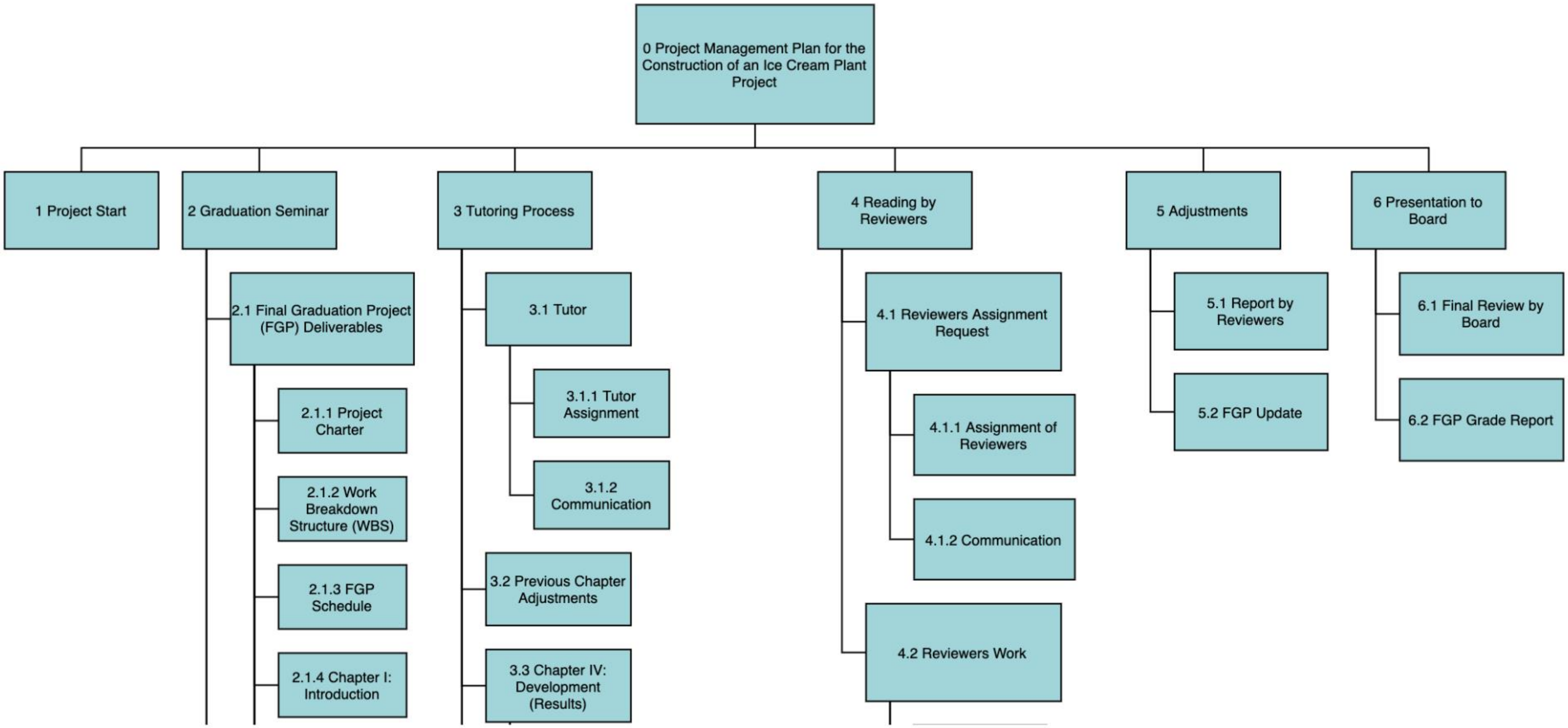
Chefette Restaurants Ltd. has contracted Moorjani Caribbean Inc. to build an ice cream processing plant. The ice cream processing plant will allow Chefette Restaurants Ltd. to produce their personal brand of ice cream in their local country of Barbados. Currently, Chefette Restaurants Ltd. imports their ice cream from a manufacturing plant in Trinidad and Tobago. This investment would be saving Chefette Restaurants Ltd. money in the long term from not having to pay shipping and handling fees as well as import fees. Additionally, with an ice cream plant in Barbados, it would allow the Chefette Brand of ice cream to be exported to other Caribbean countries to allow for franchising of the Chefette

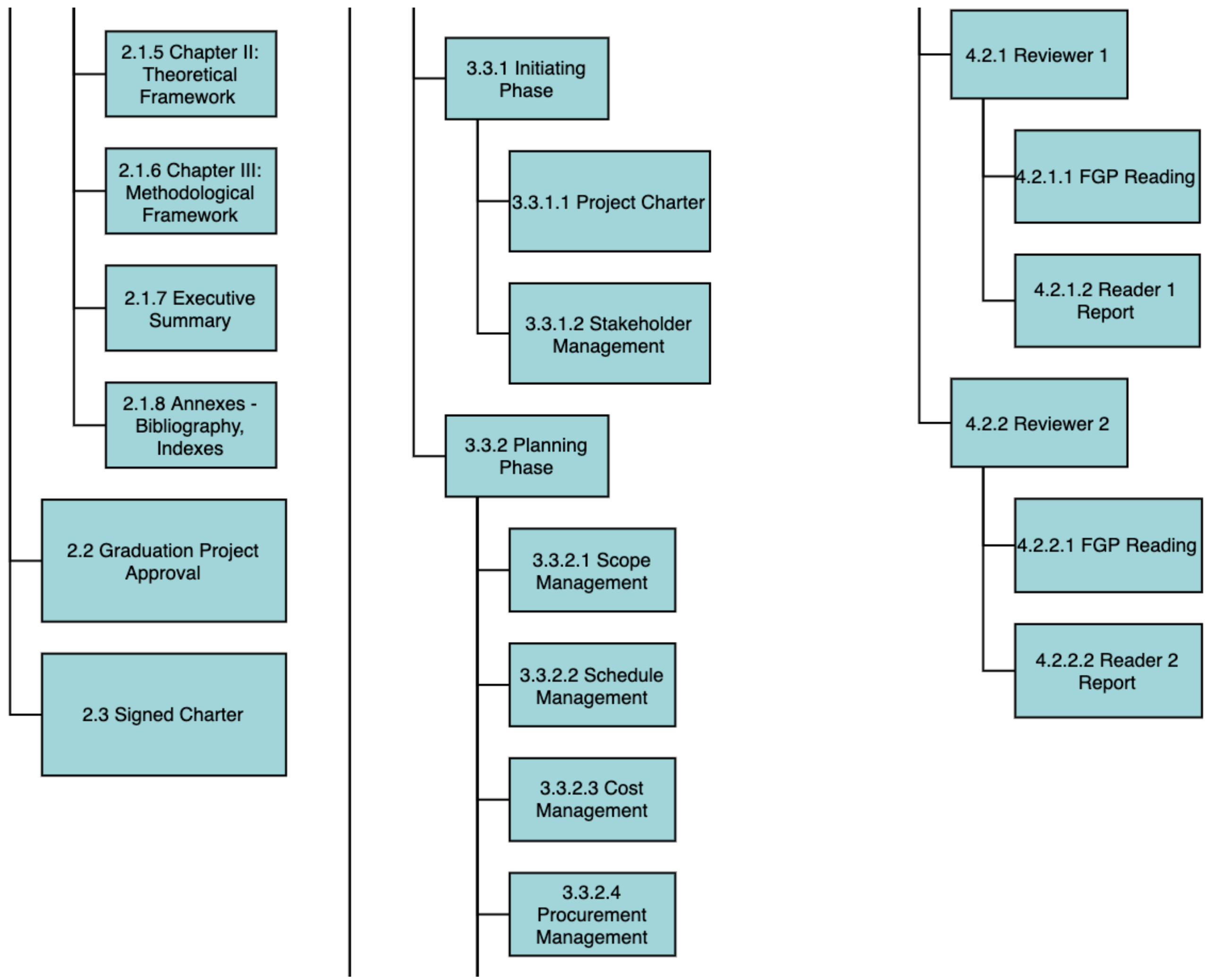
Brand. This would take the business from a local one to a regional one and even possibly an international chain of restaurants in the future. The project management team understands the importance of the planning phase of any project and is of the opinion that a project management plan using the best practices of the Project Management Institute, which is known worldwide for its project management practices and standards, is an important step in the planning process that should not be overlooked.		
Description of Product or Service to be generated by the Project – Project final deliverables:		
The Project Management Plan for the construction of the Ice Cream Plant for Chefette Restaurants Ltd. will be generated by this project. The plan will consist of all subsidiary documents of a project management plan.		
Assumptions:		
Resources: The project can be completed by one person. Resources: The Project manager has the tools necessary to complete the project.		
Constraints:		
Time: Four (4) months. Resources: One (1) person (Project Manager)		
Preliminary Risks:		
1. If the reviewer of the document is not timely with their review, then the final project management plan could be delayed and not completed on time for submission. 2. If the supervisor is late with feedback on the project management plan, then the plan could be made late due to insufficient time to edit and submit.		
Budget:		
The project budget would be to pay the project manager $20/hour working 40-hour weeks for 4 months to complete the Project Management Plan which would be $12,800.00.		
Milestones and dates:		
Milestone	**Start date**	**End date**
Project Start	24-Feb-20	24-Feb-20
Project Charter	24-Feb-20	01-Mar-20
WBS	24-Feb-20	01-Mar-20
Chapter I: Introduction	02-Mar-20	08-Mar-20

Chapter II: Theoretical Framework	09-Mar-20	15-Mar-20
Chapter III: Methodological Framework	16-Mar-20	22-Mar-20
Executive Summary	23-Mar-20	29-Mar-20
Annexes - Bibliography, Indexes	23-Mar-20	29-Mar-20
Signed Charter - Approval	23-Mar-20	29-Mar-20
Tutoring	18-May-20	26-Aug-20
Previous Chapter Adjustments	01-Jun-20	07-Jun-20
Chapter IV: Development (Results)	08-Jun-20	24-Aug-20
a. Integration Management Plan	08-Jun-20	15-Jun-20
b. Scope Management Plan	16-Jun-20	16-Jul-20
c. Schedule Management Plan	16-Jul-20	23-Jul-20
d. Cost Management Plan	24-Jul-20	30-Jul-20
e. Quality Management Plan	30-Jul-20	02-Aug-20
f. Resources Management Plan	02-Aug-20	09-Aug-20
g. Communications Management Plan	10-Aug-20	13-Aug-20
h. Risk Management Plan	14-Aug-20	17-Aug-20
i. Procurement Management Plan	18-Aug-20	20-Aug-20
j. Stakeholder Management Plan	21-Aug-20	23-Aug-20
Chapter V: Conclusions	24-Aug-20	24-Aug-20
Chapter VI: Recommendations	24-Aug-20	24-Aug-20
Tutor Approval	25-Aug-20	25-Aug-20
FGP Submission to Reviewers	08-Sep-20	08-Sep-20
Review	08-Sep-20	15-Sep-20
Adjustments	15-Sep-20	20-Sep-20
Presentation to Board	21-Sep-20	21-Sep-20
Relevant historical information:		
Moorjani Caribbean Ltd. Is an experienced contractor in the construction industry. They continue to be awarded many contracts for the construction and renovation of various types of buildings. The current owner of the company inherited the company from his father who started it 40 years ago. During that time, Moorjani Caribbean Ltd. has been able to employ many people and keep them employed despite the harsh economic conditions in Barbados.		

Stakeholders:	
Direct stakeholders: FGP Facilitator - Carlos Brenes Project Manager - Tyrell Forde **Indirect stakeholders:** Academic Assistant - Gabriela Zúñiga	
Approval:	
Project Manager: Tyrell Forde	Signature:
Authorized by:	Signature:

8.2 Appendix 2: FGP WBS

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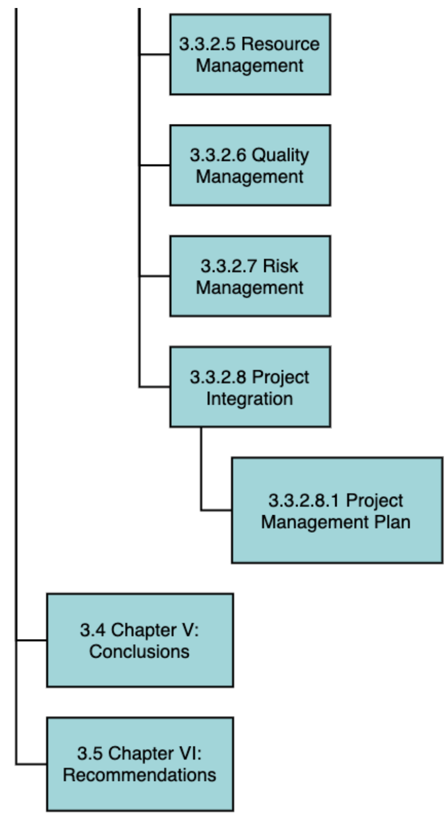
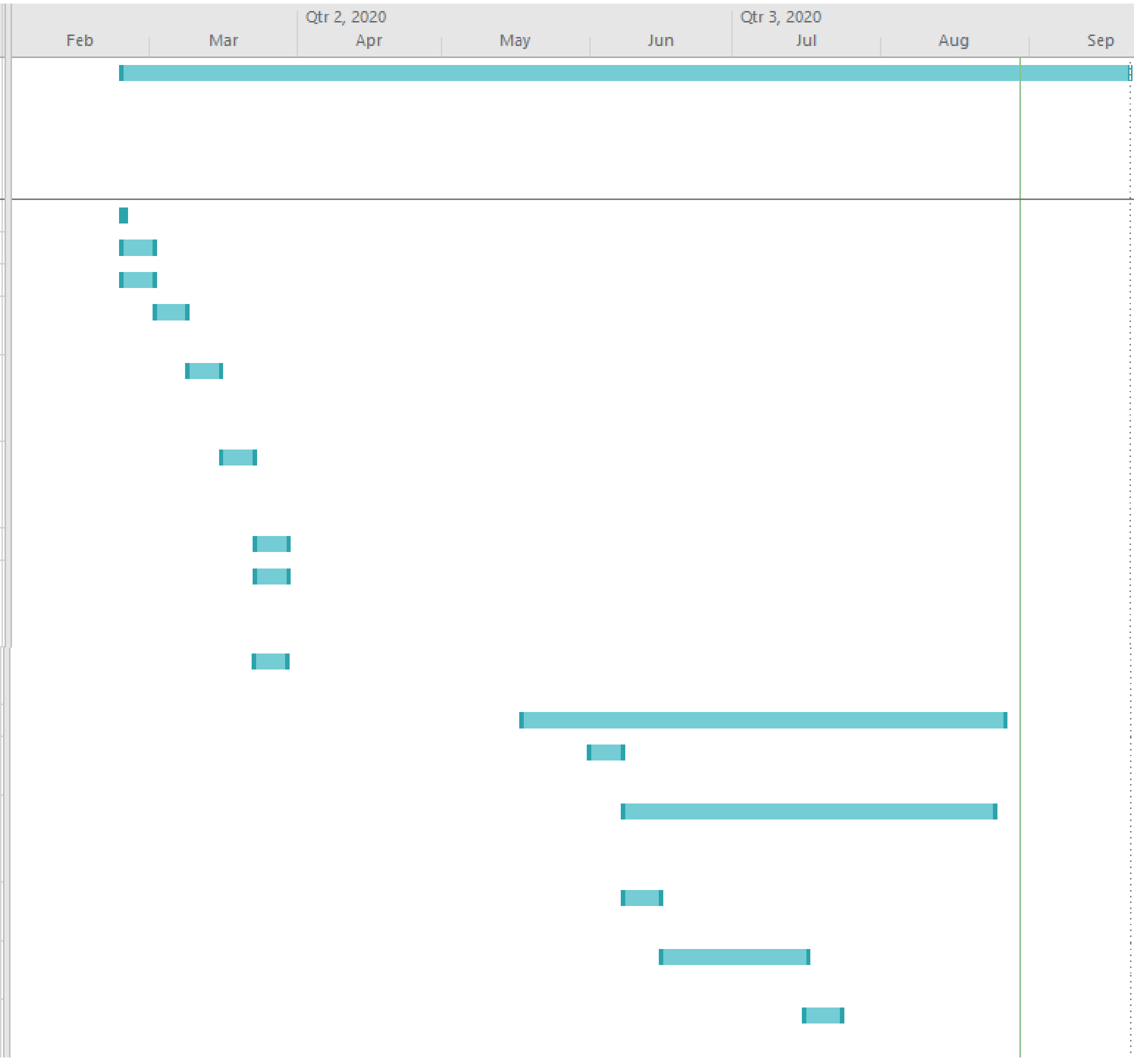
2.1.6 Chapter III: Methodological Framework
2.1.7 Executive Summary
2.1.8 Annexes - Bibliography, Indexes
2.2 Graduation Project Approval
2.3 Signed Charter
3.3.1 Initiating Phase
3.3.1.1 Project Charter
3.3.1.2 Stakeholder Management
3.3.2 Planning Phase
3.3.2.1 Scope Management
3.3.2.2 Schedule Management
3.3.2.3 Cost Management
3.3.2.4 Procurement Management
4.2.1 Reviewer 1
4.2.1.1 FGP Reading
4.2.1.2 Reader 1 Report
4.2.2 Reviewer 2
4.2.2.1 FGP Reading
4.2.2.2 Reader 2 Report

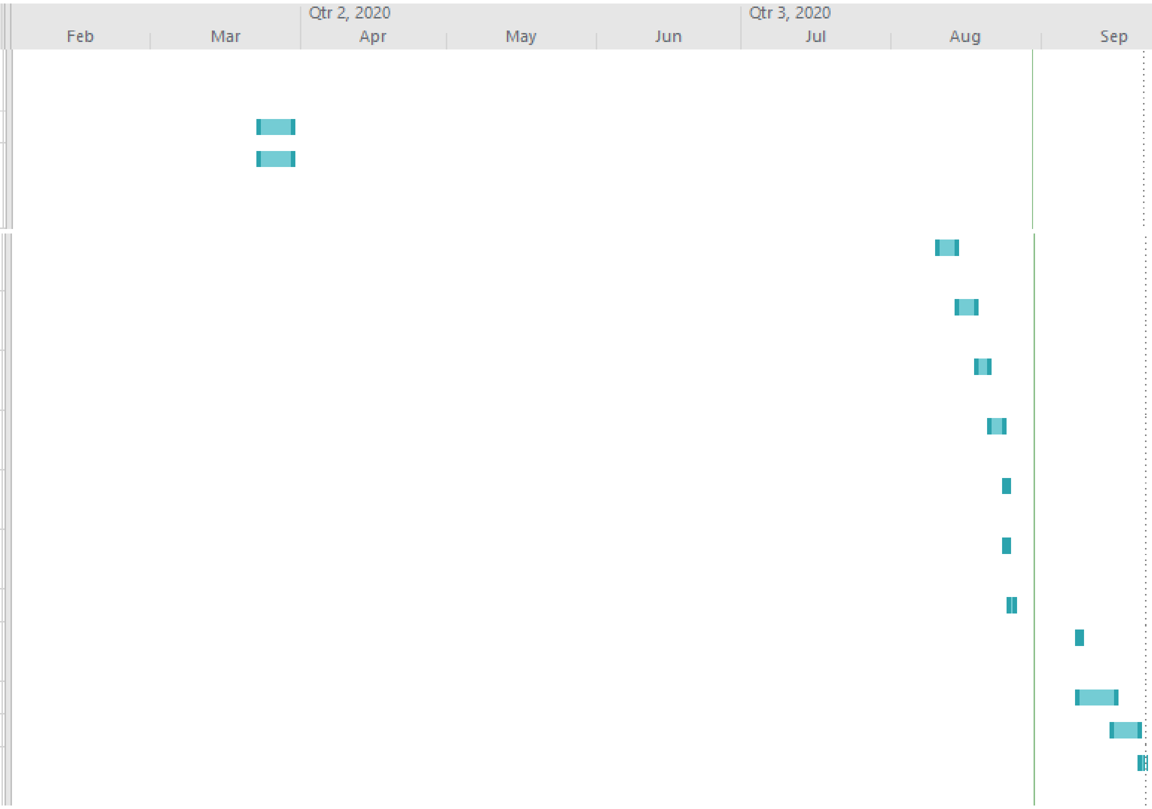

3.3.2.5 Resource Management
3.3.2.6 Quality Management
3.3.2.7 Risk Management
3.3.2.8 Project Integration
3.3.2.8.1 Project Management Plan
3.4 Chapter V: Conclusions
3.5 Chapter VI: Recommendations

8.3 Appendix 3: FGP Schedule

Task Mode	Task Name	Duration	Start	Finish
	Project Management Plan for the Construction of an Ice Cream Plant Project	151 days	Mon 2/24/20	Mon 9/21/20
	Project Start	1 day	Mon 2/24/20	Mon 2/24/20
	Project Charter	6 days	Mon 2/24/20	Sun 3/1/20
	WBS	6 days	Mon 2/24/20	Sun 3/1/20
	Chapter I: Introduction	6 days	Mon 3/2/20	Sun 3/8/20
	Chapter II: Theoretical Framework	6 days	Mon 3/9/20	Sun 3/15/20
	Chapter III: Methodological Framework	6 days	Mon 3/16/20	Sun 3/22/20
	Executive Summary	6 days	Mon 3/23/20	Sun 3/29/20
	Annexes - Bibliography, Indexes	6 days	Mon 3/23/20	Sun 3/29/20
	Signed Charter - Approval	6 days	Mon 3/23/20	Sun 3/29/20
	Tutoring	73 days	Mon 5/18/20	Wed 8/26/20
	Previous Chapter Adjustments	6 days	Mon 6/1/20	Sun 6/7/20
	Chapter IV: Development (Results)	56 days	Mon 6/8/20	Mon 8/24/20
	Integration Management Plan	6 days	Mon 6/8/20	Mon 6/15/20
	Scope Management Plan	23 days	Tue 6/16/20	Thu 7/16/20
	Schedule Management Plan	6 days	Thu 7/16/20	Thu 7/23/20



Task Mode	Task Name	Duration	Start	Finish
	Methodological Framework			
	Executive Summary	6 days	Mon 3/23/20	Sun 3/29/20
	Annexes - Bibliography, Indexes	6 days	Mon 3/23/20	Sun 3/29/20
	Communications Management Plan	4 days	Mon 8/10/20	Thu 8/13/20
	Risk Management Plan	2 days	Fri 8/14/20	Mon 8/17/20
	Procurement Management Plan	3 days	Tue 8/18/20	Thu 8/20/20
	Stakeholder Management Plan	2 days	Fri 8/21/20	Sun 8/23/20
	Chapter V: Conclusions	1 day	Mon 8/24/20	Mon 8/24/20
	Chapter VI: Recommendations	1 day	Mon 8/24/20	Mon 8/24/20
	Tutor Approval	1 day	Tue 8/25/20	Tue 8/25/20
	FGP Submission to Reviewers	1 day	Tue 9/8/20	Tue 9/8/20
	Review	6 days	Tue 9/8/20	Tue 9/15/20
	Adjustments	5 days	Tue 9/15/20	Sun 9/20/20
	Presentation to Board	1 day	Mon 9/21/20	Mon 9/21/20



8.4 Appendix 4: Change Request Form

PROJECT NAME			
LOCATION OF WORK			
PROJECT MANAGER		CLIENT	
REQUESTING PARTY		DATE OF REQUEST	

CHANGE REQUEST OVERVIEW

Description of Changes Needed	
Reason For Change	
Support & Justification Documents	
Specifications	
Additional Information	

CHANGE IN CONTRACT PRICE

Original Price	
Net Changes Of Previous Change Orders	
Net Increase / Decrease	
Total Contract Price With Approved Changes	

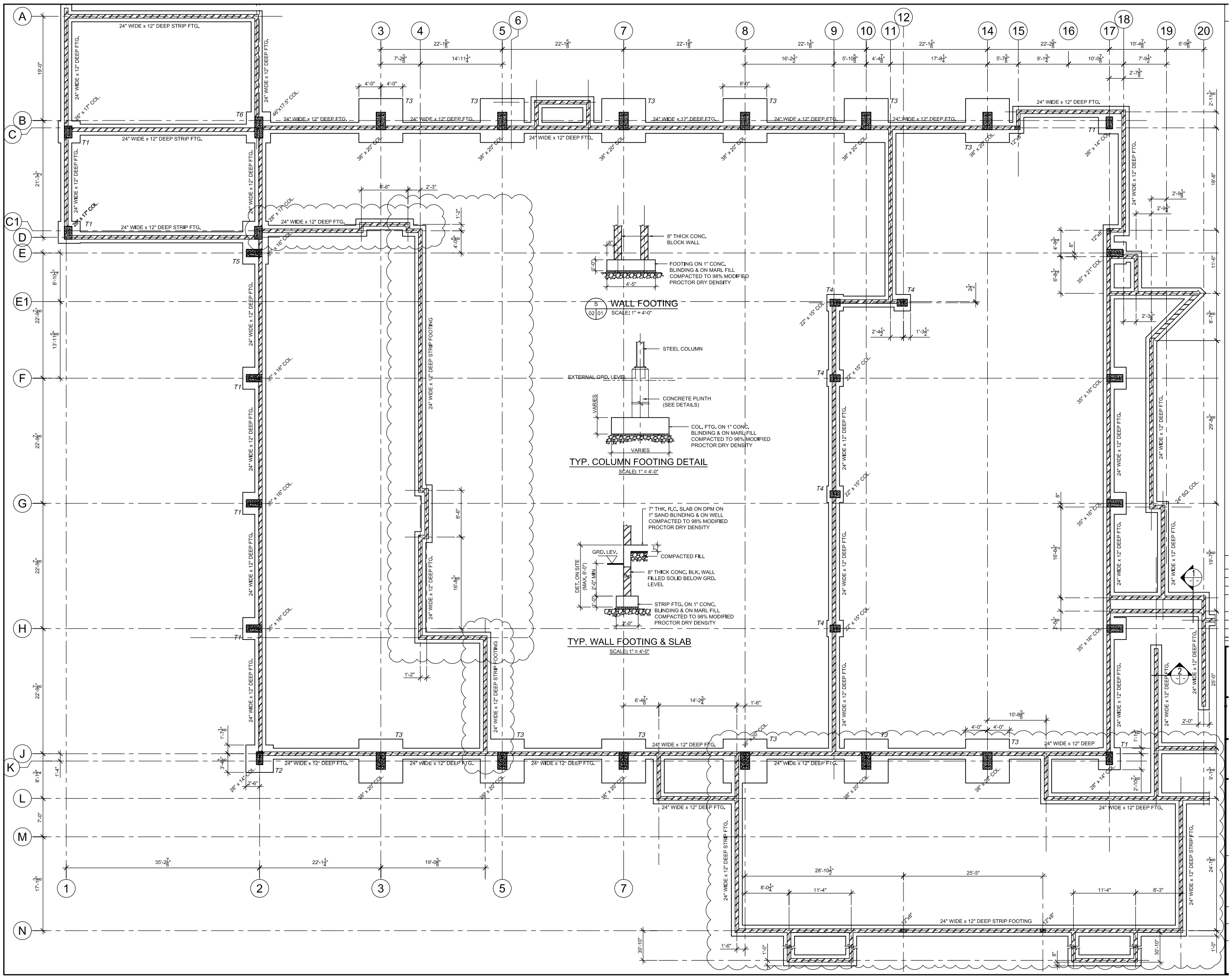
CHANGE IN CONTRACT TIMES

Original Times	
Net Changes Of Previous Change Orders In Days	
Net Increase / Decrease	
Total Contract Time With Approved Changes	

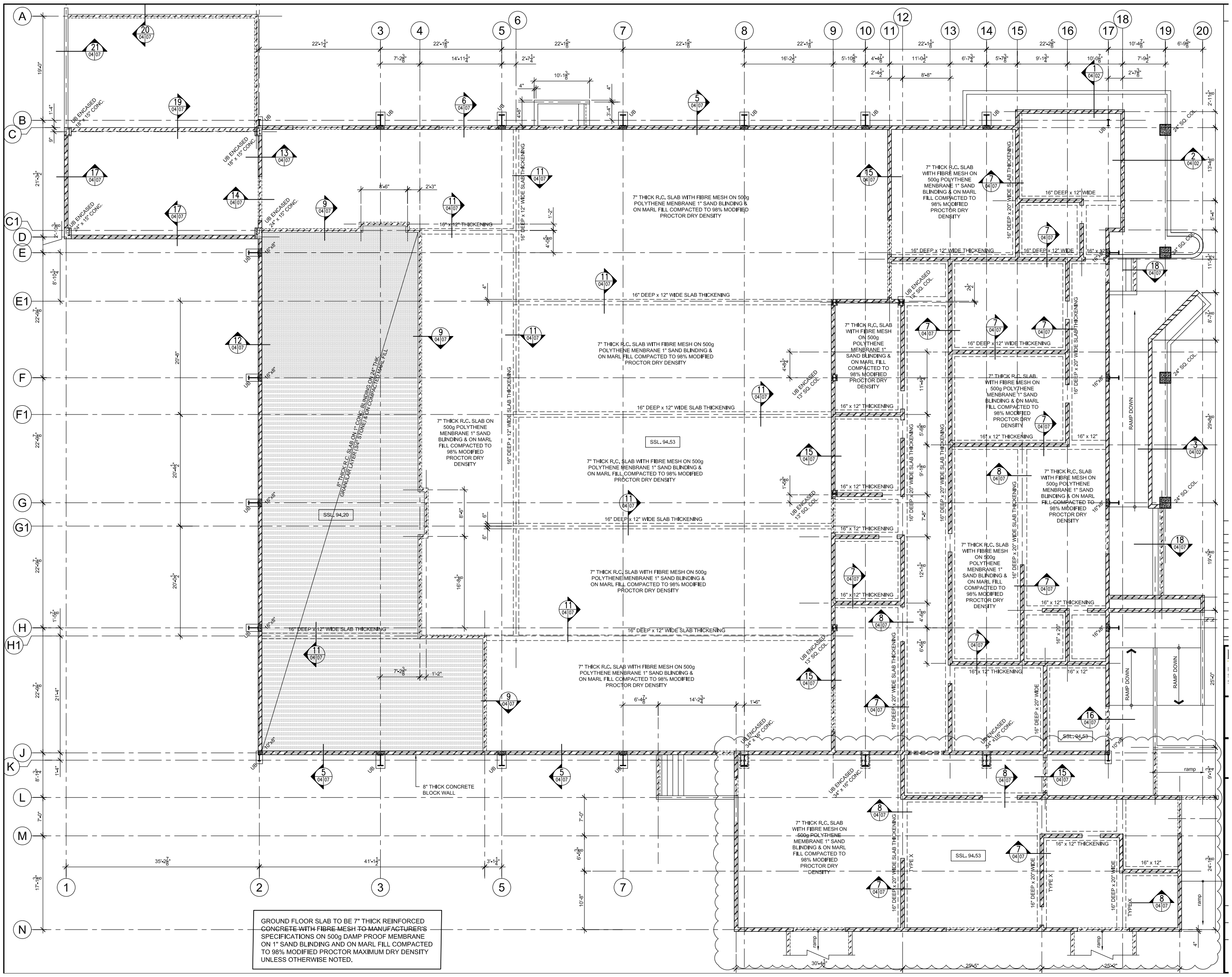
Accepted By *Signature*	
Name & Title	
Date	

Approved By *Signature*	
Name & Title	
Date	

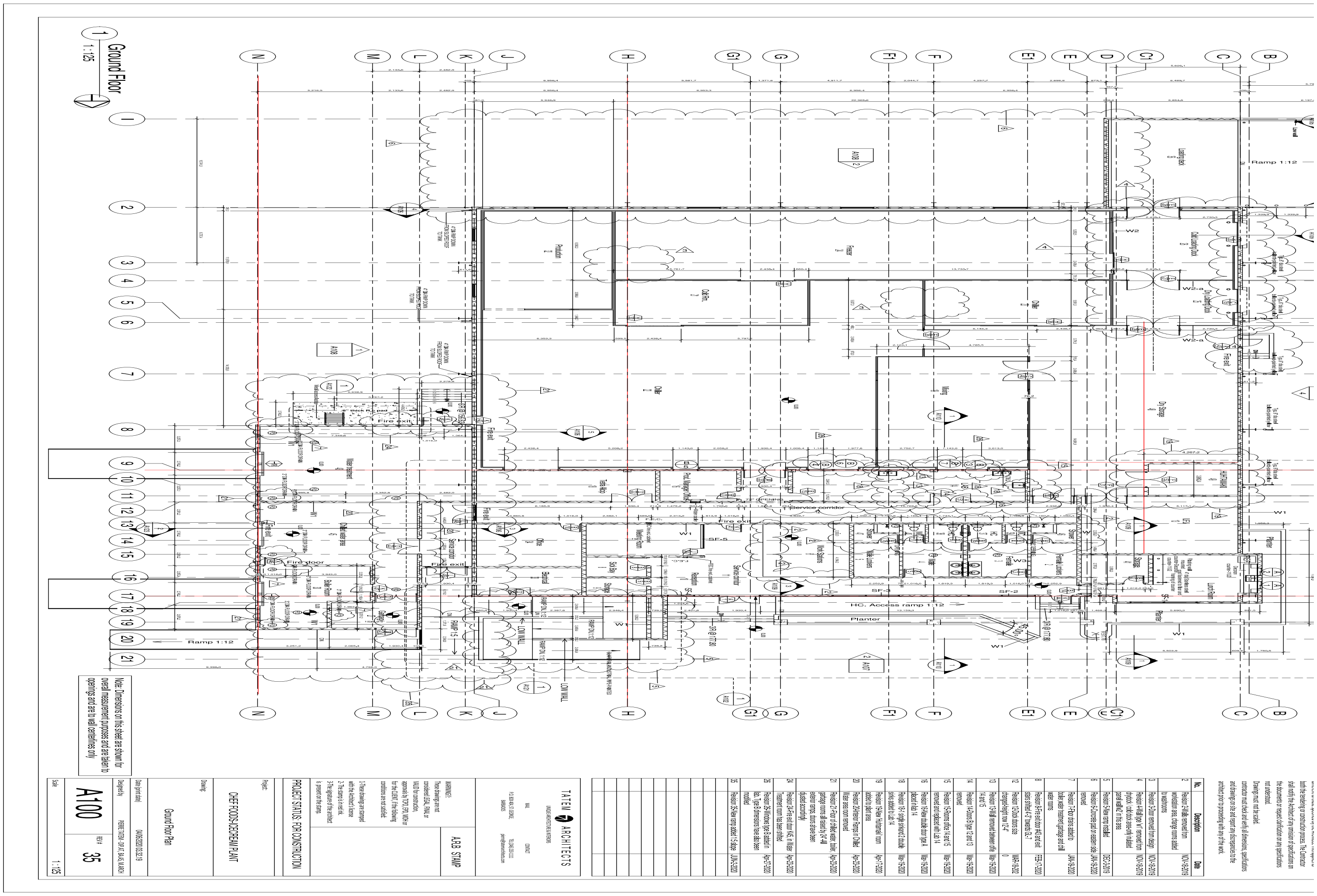
8.5 Appendix 5: Ice Cream Plant Design



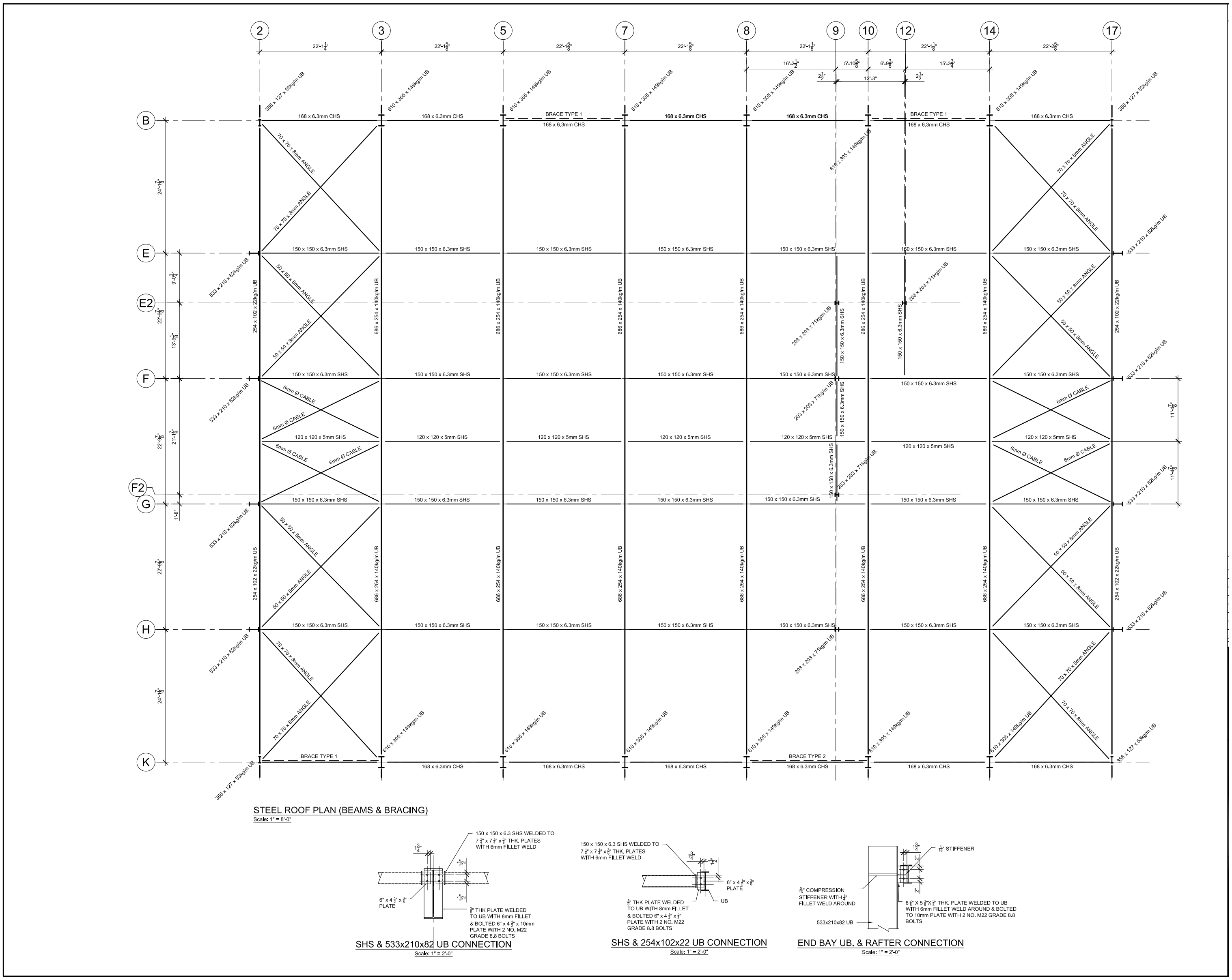
Structural Foundation Drawing



Structural Ground Floor Drawing



Architectural Ground Floor Drawing



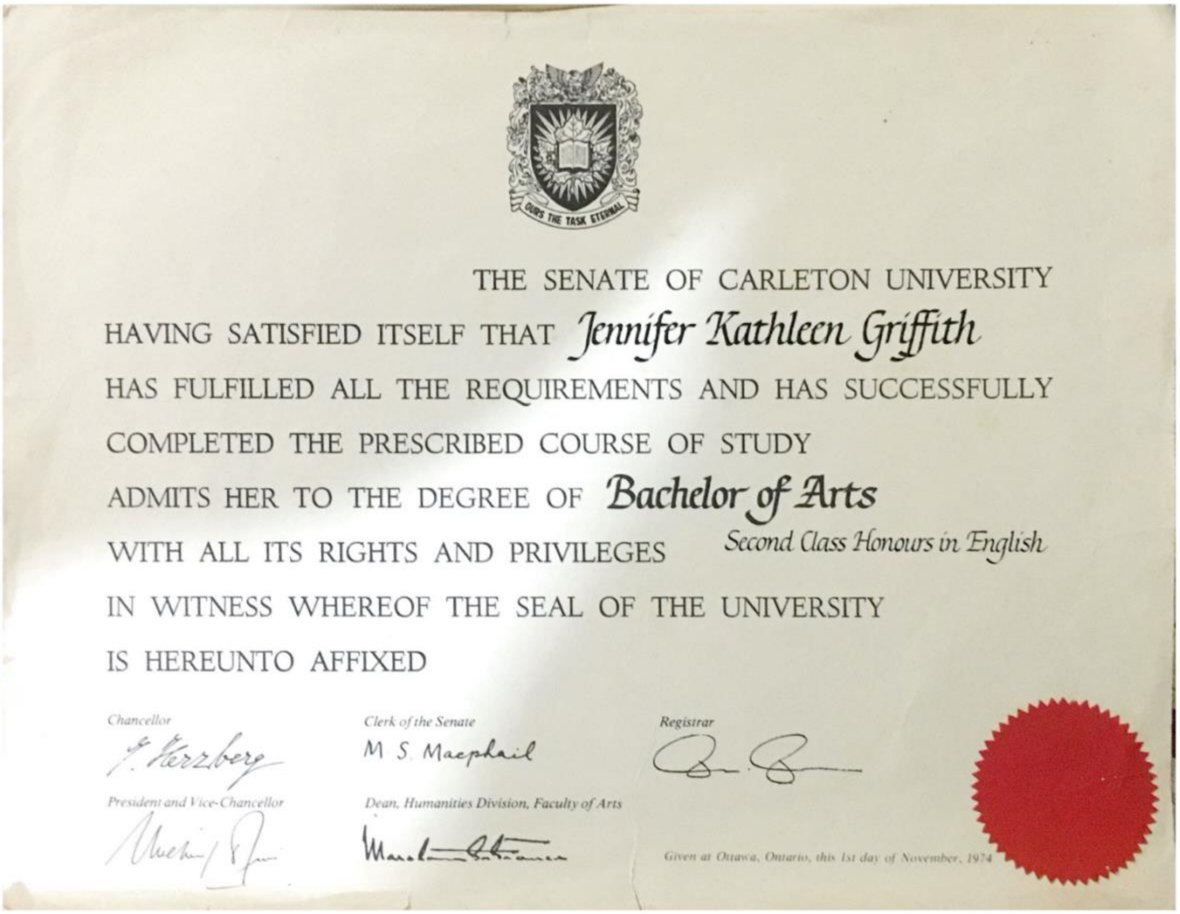
Structural Drawing of Roof Framing

8.6 Appendix 6: Lessons Learned Template

Lessons Learned

What Went Well	What Did Not Go Well	Other Lessons	Action Steps	Responsibility	Due Date
✓	✗	?			

8.7 Appendix 7: Philologist Credentials



8.8 Appendix 8: Revision Dictum

Jennifer Cruickshank
124 Lodge Terrace
St. Michael
Barbados

September 6, 2019

Ms Karolina Jiménez
University for International Cooperation

Re: Philologist Approval for Final Graduation Project Review and Correction

Dear Ms Karolina Jiménez,

I, Jennifer Cruickshank (formerly Griffith), with a Bachelor of Arts with 2nd class honours in English graduating in 1974 and work experience as a full-time Graduate teacher at Mapps College in Barbados teaching English and History from 1975, declare that I have reviewed and corrected the Final Graduation Project (FGP) of Mr. Tyrell Forde, entitled 'Project Management Plan for the Construction of An Ice Cream Plant', dated September 2020.

The FGP document now meets the proper philological quality in terms of proper writing, spelling, and grammar, as stipulated by the University and is corresponding to a master's level work.

Yours sincerely,

Jennifer Cruickshank

Jennifer Cruickshank