

Concordia University
INSE 6230 - Total Quality Project Management
Final Project

Building a Community Centre in Montreal-Nord

Submitted by:
Group 14

Juman Al-Mashta
Awni Al-Nammari
Tianhao Ning
Gustavo Orna
Poojesh Reddy Mutra
Jashwanth Reddy earla

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Introduction

Montreal-Nord, one of the 19 boroughs on the island of Montreal, is in need of a community centre. A community centre is important to all residents, by providing a space for people of all ages to gather and attend educational, cultural, or recreational activities. Also, providing a place for the most vulnerable in the community, reducing social isolation and promoting a sense of belonging. It is especially paramount in the lives of the youth in the community. Depending on the economic circumstances of the neighbourhood, the opportunities for youth can be limited and they themselves can consequently fall by the wayside. A community centre can provide opportunities in education, sports and leadership; ultimately providing a way to a better life. The creation of a community centre is not just an investment in the residents of today but in the future of the community and in the city.

Building a community centre is a multifaceted venture that is not just about the construction of a building but about emphasizing inclusivity and community development. Creating a facility that meets the needs of the community involves several phases of planning, design, and construction encompassing architectural and structural consideration, landscaping, interior design and integration of facilities. Additionally, community feedback, and stakeholder involvement are key in ensuring the centre aligns with the needs and preferences of the local residents. All aspects of the project, from start to finish, must be managed to ensure the successful completion of the community centre.

Note: all currency values in this report are in Canadian Dollars (CAD).

1. Project Pre-initiation and Initiation Processes
 - 1.1. Project Selection

Before finalizing the community centre as the project to pursue, it is crucial to analyze other options and ensure the optimal choice is made. Comparing multiple options and criteria can be done objectively and systematically using a weighted decision matrix. A weighted decision matrix offers a method to rank multiple options based on multiple criteria. It works by assigning weights to each criteria based on their relative importance to the project and giving each option a rating of how well it meets the criteria. The option with the highest weighted score is the optimal choice.

The criteria to measure the efficacy of the project are: community impact, cost, location and sources of income with 35%, 30%, 25%, and 10% weight, respectively. Three options are considered: 1-Build community centre, 2-Renovate an existing centre, and 3-Invest in the creation of community initiatives. The ratings range from 1 (unacceptable) to 10 (ideal). The option with the highest total weighted score, the optimal choice, is Option 1, building a new community centre (see Table 1).

Table 1: Weighted decision matrix comparing the 3 options.

Criteria	Weight	Option 1	Option 2	Option 3
Community impact	35%	9	4	6
Cost	30%	4	6	8
Location	25%	9	2	5
Sources of income	10%	9	7	4
Total Weighted Score		7.5	4.4	6.15

Several assumptions were taken to calculate the financial viability of building a community centre in Montreal-Nord. The assumptions considered:

1. The community centre cost is as budgeted
2. Discount rate = current bank rate in Canada = 5.25%
3. The annual profit is based on 37% of community participation [1]
4. The income increases by 5% annually

The average participation of residents at the local community centre is considered to be 37%, referenced from a study done on the impact of a community centre on the local residents in South West of England [1].

The cost to build the community centre is \$75 million, the real-life cost of the project if it were to take place in Montreal-Nord [2]. The approximate annual income of a community centre is calculated to be \$3,207,426 (see Table 2). The discounted payback period is calculated to be 25 years and 5 months, rounding to 26 years. After 26 years, the NPV is \$1,924,892.41 and the ROI is 2.57% (see Table 3).

Table 2: Approximate annual income of the community centre in Montreal-Nord.

Sources of income	Approximate Income
Membership	\$401,713
Programs/Workshops	\$1,404,000
Fitness centre membership	\$401,713
Facility rental	\$500,000
Donations	\$500,000
Total	\$3,207,426

Table 3: Annual cash flow, NPV and ROI calculations for the first 26 years.

Year	Cash Flow	Net Cash Flow	Discounted Cash Flow	Net Discounted Cash Flow
0	\$-75,000,000.00	\$-75,000,000.00	\$-75,000,000.00	\$-75,000,000.00
1	\$3,207,426.00	\$-71,792,574.00	\$3,047,435.63	\$-71,952,564.37
2	\$3,367,797.30	\$-68,424,776.70	\$3,040,197.07	\$-68,912,367.31
3	\$3,536,187.17	\$-64,888,589.54	\$3,032,975.69	\$-65,879,391.61
4	\$3,712,996.52	\$-61,175,593.01	\$3,025,771.48	\$-62,853,620.13
5	\$3,898,646.35	\$-57,276,946.66	\$3,018,584.37	\$-59,835,035.76
6	\$4,093,578.67	\$-53,183,368.00	\$3,011,414.34	\$-56,823,621.43
7	\$4,298,257.60	\$-48,885,110.40	\$3,004,261.33	\$-53,819,360.09
8	\$4,513,170.48	\$-44,371,939.91	\$2,997,125.32	\$-50,822,234.77
9	\$4,738,829.00	\$-39,633,110.91	\$2,990,006.26	\$-47,832,228.51
10	\$4,975,770.45	\$-34,657,340.46	\$2,982,904.11	\$-44,849,324.41
11	\$5,224,558.98	\$-29,432,781.48	\$2,975,818.82	\$-41,873,505.59
12	\$5,485,786.93	\$-23,946,994.55	\$2,968,750.37	\$-38,904,755.22
13	\$5,760,076.27	\$-18,186,918.28	\$2,961,698.71	\$-35,943,056.51
14	\$6,048,080.09	\$-12,138,838.19	\$2,954,663.79	\$-32,988,392.72
15	\$6,350,484.09	\$-5,788,354.10	\$2,947,645.59	\$-30,040,747.13
16	\$6,668,008.29	\$879,654.19	\$2,940,644.05	\$-27,100,103.07
17	\$7,001,408.71	\$7,881,062.90	\$2,933,659.15	\$-24,166,443.92
18	\$7,351,479.14	\$15,232,542.04	\$2,926,690.84	\$-21,239,753.08
19	\$7,719,053.10	\$22,951,595.15	\$2,919,739.08	\$-18,320,014.00
20	\$8,105,005.76	\$31,056,600.90	\$2,912,803.83	\$-15,407,210.17
21	\$8,510,256.05	\$39,566,856.95	\$2,905,885.06	\$-12,501,325.11
22	\$8,935,768.85	\$48,502,625.80	\$2,898,982.72	\$-9,602,342.39
23	\$9,382,557.29	\$57,885,183.09	\$2,892,096.78	\$-6,710,245.61
24	\$9,851,685.15	\$67,736,868.24	\$2,885,227.19	\$-3,825,018.43
25	\$10,344,269.41	\$78,081,137.65	\$2,878,373.92	\$-946,644.51
26	\$10,861,482.88	\$88,942,620.54	\$2,871,536.92	\$1,924,892.41

1.2. Business Case

1.2.1. Background

Montreal-Nord is one of the poorest and most densely populated out of the 19 boroughs in Montreal (see Table 4) [3]. The youth is vulnerable to varying issues, such as: health issues, criminal activity and dropping out of school. A community centre can help curb these issues. Currently in Montreal-Nord, community centres are too far, over packed or both [4].

In Montreal, richer boroughs enjoy not only more recreational facilities, but parks too (see Figure 1). For example, the affluent borough of L'Île-Bizard–Saint-Geneviève compared to the poorer Côte-des-Neiges–Notre-Dame-de-Grâce, 53 to 13.2 facilities per 10,000 residents, respectively (see Figure 2) [4].

Table 4: Montreal boroughs by density. Montreal-Nord is the 5th most densely populated borough [3].

	Borough	Population	Area [km²]	Density [per km²]
1	Le Plateau–Mont-Royal	110,329	8.1	13,620.9
2	Rosemont–La Petite-Patrie	146,501	15.9	9,213.9
3	Villeray–Saint-Michel–Parc–Extension	144,814	16.5	8,776.6
4	Côte-des-Neiges–Notre-Dame-de-Grâce	173,729	21.4	8,118.2
5	Montréal-Nord	86,857	11.1	7,825.0
...
17	Lachine	46,971	17.7	2,653.7
18	Saint-Laurent	104,366	42.8	2,438.5
19	L'Île-Bizard–Saint-Geneviève	19,857	23.6	841.4

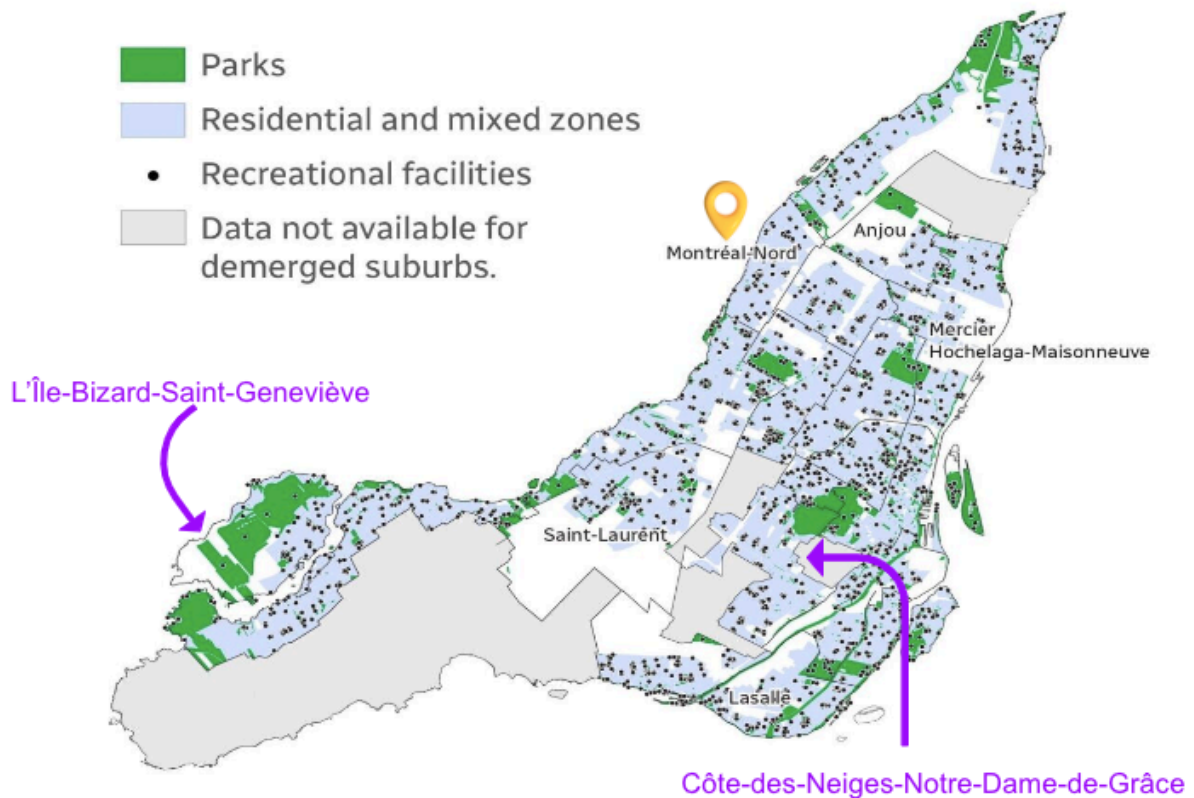


Figure 1: Distribution of parks and recreational facilities within each borough on the island of Montreal [4]. Montréal-Nord is indicated by the yellow pin.

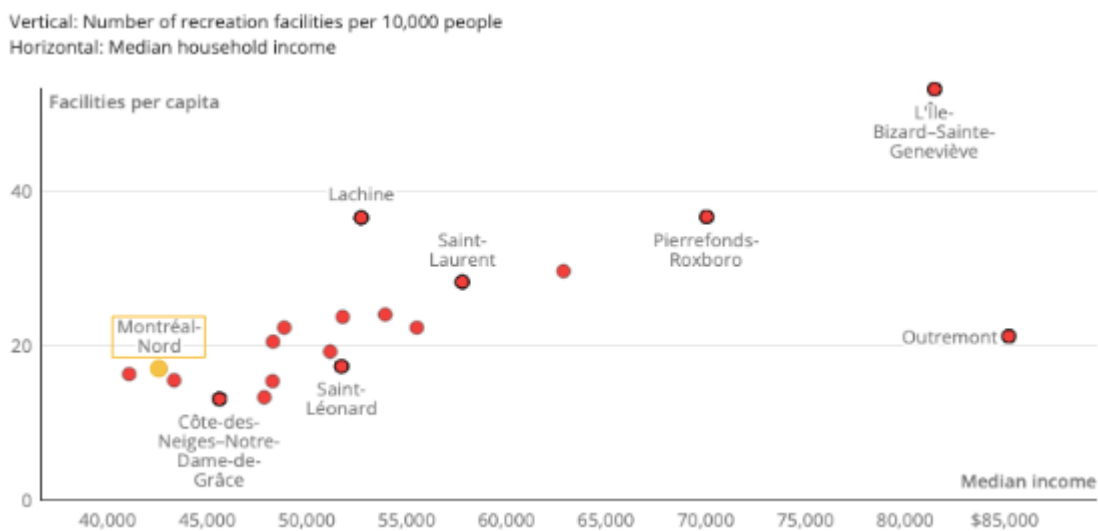


Figure 2: Number of recreational facilities per 10,000 residents versus the median income of the boroughs of Montreal [4]. Montréal-Nord is indicated by the yellow datapoint.

1.2.2. Business objective

The main objective is to build a community centre to aid all people in the community, especially the youth.

1.2.3. Opportunity statement

A community centre is an investment in today's youth and in the future of the community and city. This initiative can create a lasting impact on residents; promoting a stronger and more connected community for generations to come. Plus, it has, on average, an expected useful life in Canada of 56 years which is more than double than the calculated discounted payback period [5]. The project is worth the investment since its usefulness and functionality is much longer than its payback period.

1.2.4. Assumptions

For the business case the assumptions are: there are sufficient resources, the economic state is stable and the interest rate remains at the current rate of 5.25%.

1.2.5. Constraints

There are several constraints to be mentioned, such as: the project budget, the time to complete the project, the available and feasible land to build on, the resources required and any changes in zoning regulations.

1.2.6. Preliminary Project Requirements

The preliminary requirements of the project are:

1. Assess the needs of the community in regards to the community centre facilities
2. Define the objectives of the project and of the community centre
3. Select a feasible site for building
4. Check zoning regulations and obtain the required building permits
5. Estimate the project budget
6. Investigate and secure funding for the project

1.2.7. Analysis of Options and Recommendation

Three options were analyzed, build a new community centre, renovate existing centres, or invest in community engagement initiatives (see section 1 Project selection). Per the weighted decision matrix, building a new community centre is the best option.

The budget is estimated to be \$75 million with the NPV and ROI being \$1,924,892.41 and 2.57% respectively. The discounted payback period is calculated to be 26 years.

1.2.8. Potential Risks

The potential risks associated with a building a community centre in Montreal-Nord are:

1. Any delays or issues of funds
2. Community opposition to the project
3. Design issues of the building
4. Construction delays
5. Supplier issues
6. Technology/equipment issues
7. Scope creep
8. Low utilization of centre

1.2.9. Schedule Estimate

The project is estimated to start November 20th, 2023 and be complete on October 17th, 2024.

1.3. Project Stakeholders

The main stakeholders for building a community centre in Montreal-Nord are the residents of the borough and the funding bodies of the project; the governments of Canada, Quebec, Montreal, and the Montreal-Nord borough council. The Stakeholder Register provides a detailed (see Table 5).

Table 5: Stakeholder Register for project of building a community centre in Montreal-Nord

Stakeholder	Internal/External	Project Role
Government of Canada	External	Funding partner
Government of Quebec	External	Funding partner
City of Montreal	External	Funding partner
Montreal-Nord borough council	Internal	Organizer, overseer
Montreal-Nord residents	External	Needs assessment, fundraisers and donations
Construction companies	Internal	Advisors, infrastructure
Utility providers	External	Advisors, infrastructure
Engineers, Architects, Interior Designers	Internal	Advisors, designers
Instructors, teachers, coordinators	External	Employees
Social workers and counsellors	External	Employees
Local businesses	External	Employment, funding

1.4. Project Charter

PROJECT CHARTER

Project Title: Building a Community Centre in Montreal-Nord

Project Start Date: November 20th, 2023

Projected Finish Date: October 17th, 2024

Opportunity Statement

A community centre is an investment in today's youth and in the future of the community and city. This initiative can create a lasting impact on residents; promoting a stronger and more connected community for generations to come. Plus, it has, on average, an expected useful life in Canada of 56 years.

Problem Statement

Montreal-Nord is one of the poorest and most densely populated out of the 19 boroughs in Montreal. The youth is vulnerable to varying issues: health issues, criminal activity and dropping out of school. A community centre can help curb these issues. Currently in Montreal-Nord, community centres are too far, over packed or both.

Project Objective

Build a community centre in Montreal-Nord to serve as a hub for social, educational, and recreational activities for all residents in the community.
Complete project on time and on budget.

Scope

IN: Design and build all required and agreed upon facilities and infrastructure.
OUT: private facilities, large scale facilities, maintenance contracts

Main Project Success Criteria

The building must meet all zoning regulations, be thoroughly tested, and completed by the scheduled end date.
All agreed upon facilities must be built.

Key Stakeholders

Project Sponsor	Government of Canada
Project Sponsor	Government of Quebec
Project Sponsor	Government of Montreal
Project Organizer	Montreal-Nord council
Project Manager	Juman Al-Mashta
Project Lead	Montreal-Nord council
Subj. Matter Experts	Engineers & Architects
Other	Montreal-Nord residents

Key Schedule Milestones

	Due Date
1 Project Charter and Funding Secured	2023/12/27
2 Project Planning Complete	2024/05/02
3 Site Preparation Complete	2024/05/22
4 Foundation Complete	2024/07/12
5 Structure Complete	2024/09/05
6 Interior & Exterior Finishes Complete	2024/03/18
7 Operational Systems Installed	2023/12/29
8 Final Inspection and Handover	2024/06/21

Approval

Sponsor *Government of Montreal*

Date: December 27th, 2023

1.5. Project Objectives and Deliverables

The project objective is to first, build a community centre in Montreal-Nord that will serve as a hub for social, education and recreational activities for all residents in the area. Second, to complete the project on time and on budget. Lastly, to satisfy all stakeholders involved.

The project deliverables are to build the community centre with all the agreed upon and required facilities and features.

2. Project Planning Processes

2.1. Project Team and Defining Roles and Responsibilities

1. Project Manager

At the top of the project team will be the project manager, who will be responsible for overall project management and leadership. The manager will develop and maintain project plans, coordinate activities and resources, make sure activities are completed on time, and be on top of any change orders and make sure they are necessary and modify the project plan as necessary. The project manager is also responsible for risk management and resolution, as well as communicating all necessary updates to the stakeholders.

2. Project Coordinator

Just below the project manager will be the project coordinator, who will assist the project manager in day-to-day operations. The coordinator will be responsible for maintaining documentation and project records, in addition to scheduling and coordinating meetings. The coordinator will also support communication within the project team.

3. Construction Manager

The construction manager will oversee all construction work and ensure adherence to the project timeline and budget. The manager will also implement quality control measures and coordinate with subcontractors.

4. Architectural and Civil Engineering Team

The architecture team will be responsible for developing the architectural design based on project requirements. They must ensure that the proposed designs comply with zoning and building regulations. The civil engineering department will take it from there as they are responsible for conducting site assessments and evaluations. They are then required to design foundation and structural elements, and to collaborate with other engineers for utility connections.

5. Mechanical, Electrical and Plumbing (MEP) Manager

The MEP manager is responsible for overseeing the mechanical, electrical, and plumbing aspects of the project. They are responsible for being on site when these systems are installed, solving any issues that may arise, and to monitor the progress of installing these systems.

6. MEP Engineering Team

After the structure of the centre is complete, the mechanical and electrical engineering team will work on designing the HVAC systems, electrical wiring, and plumbing installations. They are also responsible for ensuring efficiency and sustainability in the systems they create.

7. IT and Technology Specialist Team

This team will be responsible for implementing the technology infrastructure in the facility. They will oversee the installation of audiovisual and IT systems and ensure the connectivity and functionality of technology.

8. Interior Design Team

The interior designers are responsible for developing interior design concepts that align with the budget and goals of the project. They should select furniture, fixtures and finishes. They should ensure the furniture they select is suitable for its intended purpose, and that it is well within the budget.

9. Quality Control Inspector

The quality control inspector will conduct regular inspections to ensure the project conforms to quality standards. The inspector will identify any defects or deviations that are taking place and report them to the project manager.

2.2. Kick-off Meeting

The table below highlights the agenda for the kick-off meeting, which is an important meeting that will align the project team, set expectations and establish a clear direction for the community centre project.

Agenda Item	Topic of Discussion	Duration [minutes]
1. Welcome and Introductions	<ul style="list-style-type: none">● Welcoming team members and stakeholders● Have participants introduce themselves, and explain their roles and responsibilities	10
2. Project Overview	<ul style="list-style-type: none">● Provide overview of community centre project● Discuss project goals, objectives and overall vision● Highlight importance of project	10
3. Project Scope and Deliverables	<ul style="list-style-type: none">● Review project scope and deliverables● Clarify the inclusions and what is excluded from the project● Discuss any potential challenges	20
4. Roles and Responsibilities	<ul style="list-style-type: none">● Present roles and responsibilities of each team member● Highlight key contact points for collaboration● Emphasize importance of teamwork	20
5. Project Timeline	<ul style="list-style-type: none">● Present project timeline, including milestones and deadlines● Discuss the critical path and dependencies	15
6. Communication Plan	<ul style="list-style-type: none">● Describe communication plan, including regular team meetings, reporting structure and channels of communication● Discuss how issues will be addressed and feedback will be given	10
7. Risk Management	<ul style="list-style-type: none">● Identify potential risks and uncertainties● Discuss risk management plan and mitigation strategies	10
8. Q&A Session	<ul style="list-style-type: none">● Open the floor for questions and answers● Encourage team members to seek clarification on any issues they find unclear	20
9. Next Steps and Closing	<ul style="list-style-type: none">● Outline the next steps● Express gratitude for team members' commitment and participation	10

2.3. Project Scope

1. Project Objectives

- Construct a modern and functional community centre that serves the diverse needs of the local community.
- Enhance the quality of life for community members through the provision of multipurpose facilities and services.

2. Project Deliverables

- Multipurpose courts
- Fitness centre
- Senior citizens' area
- Kids' play area
- Restaurant
- Cafeteria
- Learning centre
- Multipurpose Hall
- Outdoor spaces
- Technology infrastructure

3. Exclusions

- Ongoing operational activities post-construction.
- Any additional facilities or features not explicitly listed in the Work Breakdown Structure (WBS).

2.4. Work Breakdown Structure

1. Project Initiation
1.1 Define Project Scope
1.2 Conduct Feasibility Study
1.3 Develop Project Charter
1.4 Identify Funding Source
2. Project Planning
2.1 Assessment of Community Needs
2.2 Site Selection and Acquisition
2.3 Budget Estimation
2.4 Grant Application and Approval
2.5 Architectural Design
2.6 MEP Engineering Design
2.7 Environmental Impact Assessment
2.8 Zoning And Permit Acquisition
3. Site Preparation
3.1 Clearing and Demolition
3.2 Grading and Excavation
3.3 Utility Connections
4. Foundation Work
4.1 Excavate Foundation Trenches
4.2 Pour Foundation Footings
4.3 Install Foundation Walls
5. Construction Phases
5.1 Erect Structural Steel
5.2 Install Concrete Slabs
5.3 Construct Exterior Walls
5.4 Install Flooring
6. Roofing
6.1 Install Roof Trusses
6.2 Roof Sheathing
6.3 Roof Covering
7. Interior Construction
7.1 Framing Interior Walls
7.2 Install Windows and Doors
8. Facility Interior Setup
8.1 Multipurpose Courts Setup
8.2 Fitness centre Equipment Installation
8.3 Senior Citizens' Area Setup
8.4 Kids' Play Area Setup
8.5 Restaurant Interior Setup
8.6 Cafeteria Setup
8.7 Learning centre Setup
8.8 Multipurpose Hall Interior Setup

8.9 Technology Infrastructure Setup
9. Landscaping And Outdoor Setup
9.1 Landscaping And Greenery Setup
9.2 Outdoor Play Area Setup
9.3 Community Garden Setup
9.4 Pathways And Seating Areas
9.5 Siding Installation
9.6 Exterior Painting
10. Mechanical And Electrical Systems
10.1 HVAC System Installation
10.2 Electrical Wiring
10.3 Plumbing Installation
11. Interior Finishes
11.1 Drywall Installation
11.2 Flooring Installation
11.3 Interior Painting
11.4 Furniture Installation
11.5 Public Art Installations
11.6 Safety And Security Systems Installation
11.7 Signage Installation
12. Exterior Finishes
12.1 Siding Installation
12.2 Exterior Painting
12.3 Landscaping
12.4 Parking Lot Finalization
13. Control And Monitoring Phase
13.1 Project Progress Tracking
13.2 Budget Monitoring
13.3 Quality Control Inspections
13.4 Risk Management
13.5 Issue Resolution
13.6 Stakeholder Communication
14. Final Inspections and Testing
14.1 Building Inspections
14.2 System Testing
14.3 Punch List
15. Project Closeout
15.1 Final Documentation
15.2 Handover To Client
15.3 Post-Construction Review

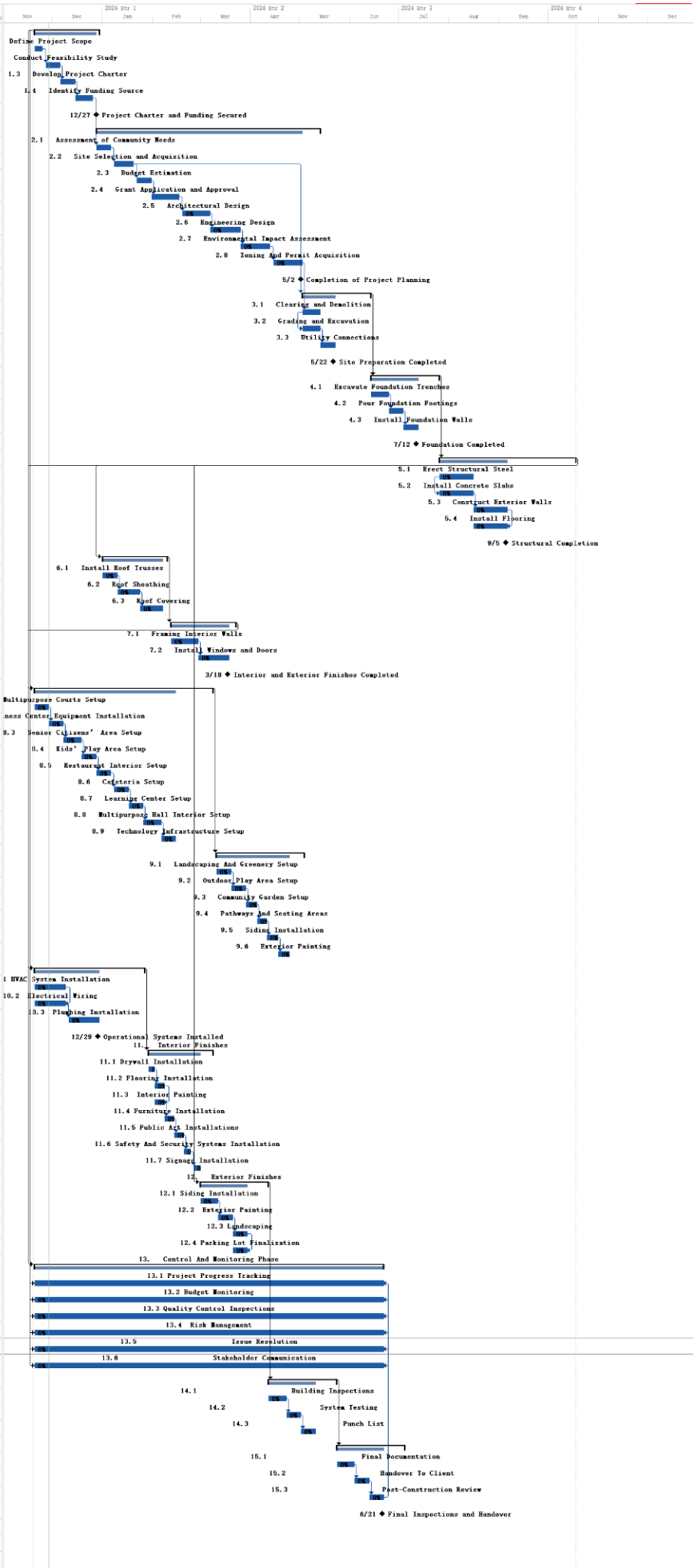
2.5. Project Schedule Development

Milestone identification

1. Project Charter and Funding Secured	5. Structural Completion
2. Completion of Project Planning	6. Interior and Exterior Finishes Completed
3. Site Preparation Completed	7. Operational Systems Installed
4. Foundation Completed	8. Final Inspections and Handover

Gantt Chart

Task Name	Duration	Start	Finish	Predecessors
1. Project Initiation	30 days	23 Nov 20	23 Dec 29	
1.1 Define Project Scope	5 days	23 Nov 20	23 Nov 24	
1.2 Conduct Feasibility Study	7 days	23 Nov 27	23 Dec 5	
1.3 Develop Project Charter	7 days	23 Dec 6	23 Dec 14	
1.4 Identify Funding Source	7 days	23 Dec 15	23 Dec 25	
Project Charter and Funding Secured	0 days	23 Dec 27	23 Dec 27	
2. Project Planning	98 days	23 Dec 28	24 May 13	
2.1 Assessment of Community Needs	7 days	23 Dec 28	24 Jan 5	
2.2 Site Selection and Acquisition	10 days	24 Jan 8	24 Jan 19	
2.3 Budget Estimation	7 days	24 Jan 22	24 Jan 30	
2.4 Grant Application and Approval	13 days	24 Jan 31	24 Feb 16	
2.5 Architectural Design	13 days	24 Feb 19	24 Mar 6	
2.6 Engineering Design	13 days	24 Mar 7	24 Mar 25	
2.7 Environmental Impact Assessment	14 days	24 Mar 26	24 Apr 12	
2.8 Zoning and Permit Acquisition	14 days	24 Apr 15	24 May 2	
Completion of Project Planning	0 days	24 May 2	24 May 2	
3. Site Preparation	30 days	24 May 3	24 Jun 13	
3.1 Clearing and Demolition	7 days	24 May 3	24 May 13	
3.2 Grading and Excavation	7 days	24 May 14	24 May 22	
3.3 Utility Connections	7 days	24 May 14	24 May 22	
Site Preparation Completed	0 days	24 May 22	24 May 22	
4. Foundation Work	30 days	24 Jun 14	24 Jul 25	
4.1 Excavate Foundation Trenches	7 days	24 Jun 14	24 Jun 24	
4.2 Pour Foundation Footings	7 days	24 Jun 25	24 Jul 3	
4.3 Install Foundation Walls	7 days	24 Jul 4	24 Jul 12	
Foundation Completed	0 days	24 Jul 12	24 Jul 12	
5. Construction Phases	60 days	24 Jul 26	24 Oct 17	
5.1 Erect Structural Steel	15 days	24 Jul 26	24 Aug 15	
5.2 Install Concrete Slabs	15 days	24 Jul 26	24 Aug 15	
5.3 Construct Exterior Walls	15 days	24 Aug 16	24 Sep 5	
5.4 Install Flooring	15 days	24 Aug 16	24 Sep 5	
Structural Completion	0 days	24 Sep 5	24 Sep 5	
6. Roofing	30 days	24 Jan 1	24 Feb 9	
6.1 Install Roof Trusses	7 days	24 Jan 1	24 Jan 9	
6.2 Roof Sheathing	10 days	24 Jan 10	24 Jan 23	
6.3 Roof Covering	10 days	24 Jan 24	24 Feb 6	
7. Interior Construction	30 days	24 Feb 12	24 Mar 23	
7.1 Framing Interior Walls	13 days	24 Feb 12	24 Feb 28	
7.2 Install Windows and Doors	13 days	24 Feb 29	24 Mar 18	
Interior and Exterior Finishes Completed	0 days	24 Mar 18	24 Mar 18	
8. Facility Interior Setup	80 days	23 Nov 20	24 Mar 8	
8.1 Multipurpose Courts Setup	7 days	23 Nov 20	23 Nov 28	
8.2 Fitness Center Equipment	7 days	23 Nov 29	23 Dec 7	
8.3 Senior Citizens' Area Setup	7 days	23 Dec 8	23 Dec 18	
8.4 Kids' Play Area Setup	7 days	23 Dec 19	23 Dec 27	
8.5 Restaurant Interior Setup	7 days	23 Dec 28	24 Jan 5	
8.6 Cafeteria Setup	7 days	24 Jan 8	24 Jan 16	
8.7 Learning Center Setup	7 days	24 Jan 17	24 Jan 25	
8.8 Multipurpose Hall Interior Setup	7 days	24 Jan 26	24 Feb 5	
8.9 Technology Infrastructure Setup	7 days	24 Feb 6	24 Feb 14	
9. Landscaping And Outdoor Setup	40 days	24 Mar 11	24 May 3	
9.1 Landscaping and Greenery Setup	7 days	24 Mar 11	24 Mar 19	
9.2 Outdoor Play Area Setup	7 days	24 Mar 20	24 Mar 28	
9.3 Community Garden Setup	5 days	24 Mar 29	24 Apr 4	
9.4 Pathways and Seating Areas	4 days	24 Apr 5	24 Apr 10	
9.5 Siding Installation	5 days	24 Apr 11	24 Apr 17	
9.6 Exterior Painting	5 days	24 Apr 18	24 Apr 24	
10. Mechanical And Electrical Systems	50 days	23 Nov 20	24 Jan 26	
10.1 HVAC System Installation	15 days	23 Nov 20	23 Dec 8	
10.2 Electrical Wiring	15 days	23 Nov 20	23 Dec 8	
10.3 Plumbing Installation	15 days	23 Dec 11	23 Dec 29	
Operational Systems Installed	0 days	23 Dec 29	23 Dec 29	
11. Interior Finishes	30 days	24 Jan 29	24 Mar 8	
11.1 Drywall Installation	4 days	24 Jan 29	24 Feb 1	
11.2 Flooring Installation	4 days	24 Feb 2	24 Feb 7	
11.3 Interior Painting	4 days	24 Feb 8	24 Feb 13	
11.4 Furniture Installation	4 days	24 Feb 14	24 Feb 19	
11.5 Public Art Installations	4 days	24 Feb 20	24 Feb 25	
11.6 Safety And Security Systems Installation	4 days	24 Feb 26	24 Feb 29	
11.7 Signage Installation	4 days	24 Feb 26	24 Feb 29	
12. Exterior Finishes	30 days	24 Mar 1	24 Apr 11	
12.1 Siding Installation	7 days	24 Mar 1	24 Mar 11	
12.2 Exterior Painting	7 days	24 Mar 12	24 Mar 20	
12.3 Landscaping	7 days	24 Mar 21	24 Mar 29	
12.4 Parking Lot Finalization	7 days	24 Mar 21	24 Mar 29	
13. Control And Monitoring Phase	155 days	23 Nov 20	24 Jun 21	
13.1 Project Progress Tracking	155 days	23 Nov 20	24 Jun 21	
13.2 Budget Monitoring	155 days	23 Nov 20	24 Jun 21	
13.3 Quality Control Inspections	155 days	23 Nov 20	24 Jun 21	
13.4 Risk Management	155 days	23 Nov 20	24 Jun 21	
13.5 Issue Resolution	155 days	23 Nov 20	24 Jun 21	
13.6 Stakeholder Communication	155 days	23 Nov 20	24 Jun 21	
14. Final Inspections and Testing	30 days	24 Apr 12	24 May 23	
14.1 Building Inspections	7 days	24 Apr 12	24 Apr 22	
14.2 System Testing	7 days	24 Apr 23	24 May 1	
14.3 Punch List	7 days	24 May 2	24 May 10	
15. Project Closeout	30 days	24 May 24	24 Jul 4	
15.1 Final Documentation	7 days	24 May 24	24 Jun 3	
15.2 Handover To Client	7 days	24 Jun 4	24 Jun 12	
15.3 Post-Construction Review	7 days	24 Jun 13	24 Jun 21	
Final Inspections and Handover	0 days	24 Jun 21	24 Jun 21	



2.6. Required resources

1. Project Initiation

- Personnel: Project managers, business analysts, financial analysts
- Tools & Software: Documentation tools, financial analysis software

2. Project Planning

- Personnel: Community researchers, real estate consultants, budget analysts, architects, engineers, legal experts
- Tools & Software: Planning and design software

3. Site Preparation

- Equipment: Demolition equipment, heavy machinery for grading and excavation
- Personnel: Labor for demolition, excavation, and utility installation

4. Foundation Work

- Materials: Concrete, formwork materials, concrete blocks
- Equipment: Excavation equipment
- Personnel: Construction labor

5. Construction Phases

- Materials: Steel, concrete, wall materials, flooring materials
- Equipment: Cranes, construction equipment
- Personnel: Construction workers

6. Roofing

- Materials: Roof trusses, sheathing materials, roof covering materials
- Equipment: Crane for truss installation
- Personnel: Carpenters, roofing professionals

7. Interior Construction

- Materials: Framing materials, windows, doors.
- Personnel: Carpenters, installation labor

8. Facility Interior Setup

- Equipment: Specific equipment for each area (courts, gym, etc.)
- Personnel: Installation labor, specialist consultants

9. Landscaping And Outdoor Setup

- Equipment: Landscaping equipment
- Materials: Plants, materials for pathways and seating areas
- Personnel: Landscapers, painters.

10. Mechanical And Electrical Systems

- Equipment: HVAC systems
- Materials: Electrical materials, plumbing materials
- Personnel: Installation technicians, electricians, plumbers.

11. Interior Finishes

- Materials: Drywall, flooring materials, paint, furniture, art, safety and security systems, signage
- Personnel: Interior designers, painters, carpenters

12. Exterior Finishes

- Materials: Siding materials, exterior paint, landscaping supplies
- Personnel: Labor for installation and finishing

13. Control And Monitoring Phase

- Tools & Software: Project management software, risk management tools
- Personnel: Quality control inspectors, project managers

14. Final Inspections and Testing

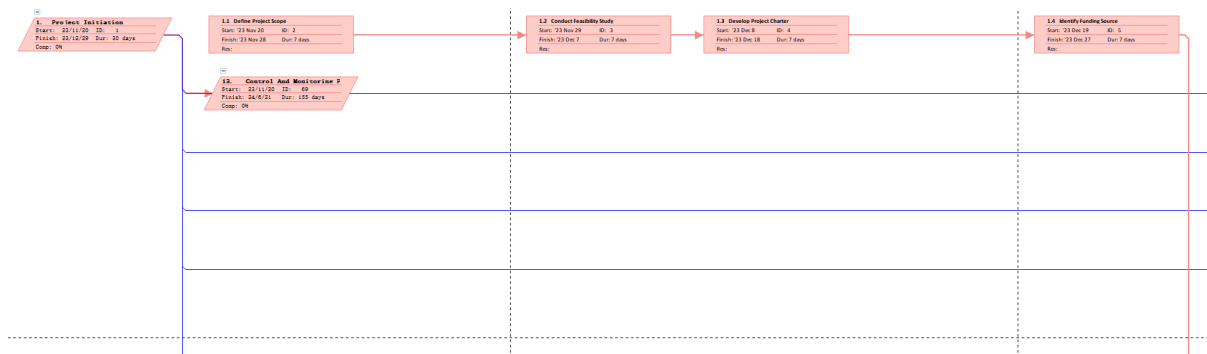
- Equipment: Testing equipment
- Personnel: Building inspectors, labour for adjustments

15. Project Closeout

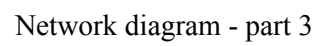
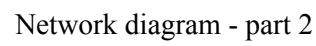
- Personnel: Administrative staff, project managers, legal advisors
- Tools & Software: Documentation tools

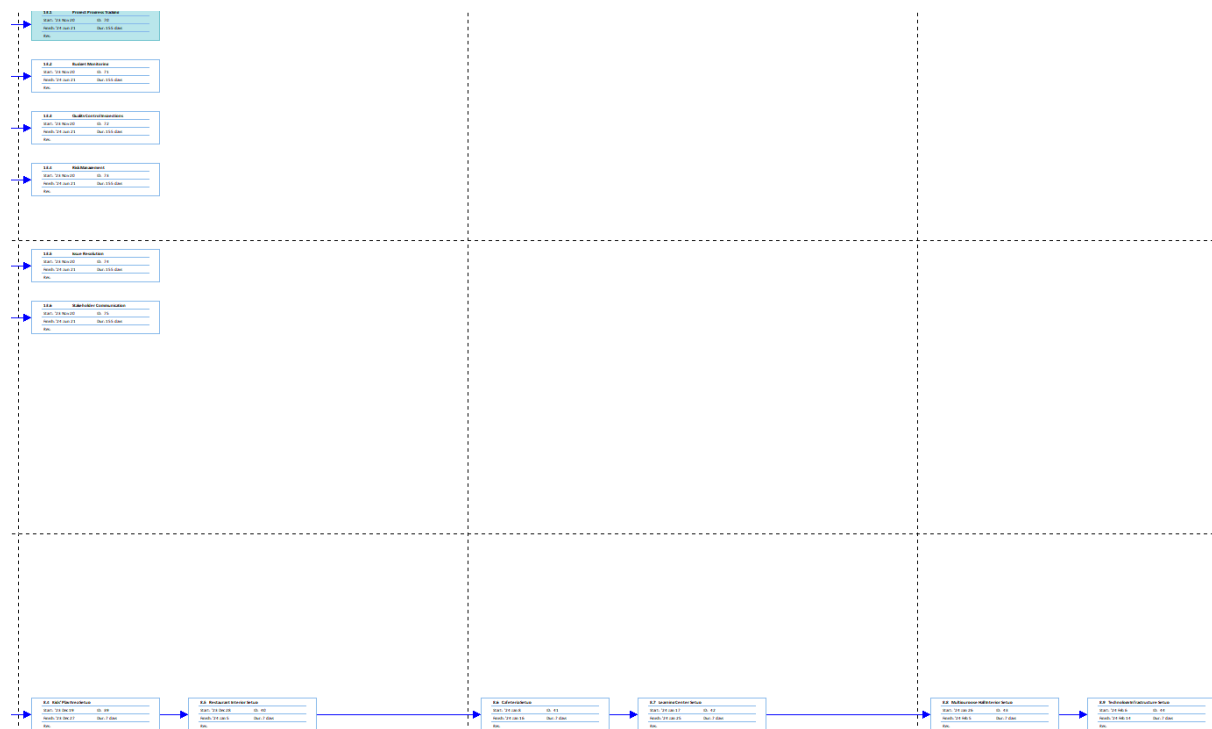
Network Diagram

The network diagram reveals a high degree of interconnectivity between components, which enhances overall system efficiency. Given the rapid pace of technological advancement, the network design should incorporate flexibility to accommodate future upgrades and integrations without requiring major overhauls.



Network diagram - part 1





Network diagram - part 4

2.7. Cost Estimation Plan

The cost estimation plan was done using the bottom-up method. This method involves breaking down a project into smaller tasks, estimating each task individually and aggregating to determine the overall project cost. This method allows for a more accurate and reliable estimate, and better management of costs since each task is estimated individually.

The total budget is \$75 million, the breakdown is below:

- 1. Project Initiation (budget = \$3.75M)**
 - 1.1 Define Project Scope: \$0.75M
 - 1.2 Conduct Feasibility Study: \$1M
 - 1.3 Develop Project Charter: \$0.75M
 - 1.4 Identify Funding Source: \$1.25M
- 2. Project Planning (budget = \$7.5M)**
 - 2.1 to 2.8 : Each subtask allocated around \$0.9375M
- 3. Site Preparation (budget = \$5.25M)**
 - 3.1 Clearing and Demolition: \$1.75M
 - 3.2 Grading and Excavation: \$1.75M
 - 3.3 Utility Connections: \$1.75M
- 4. Foundation Work (budget = \$6M)**
 - 4.1 Excavate Foundation Trenches: \$2M
 - 4.2 Pour Foundation Footings: \$2M
 - 4.3 Install Foundation Walls: \$2M
- 5. Construction Phases (budget = \$11.25M)**
 - 5.1 to 5.4 : Each subtask allocated around \$2.8125M

6. Roofing (budget = \$3.75M)

6.1 Install Roof Trusses: \$1.25M

6.2 Roof Sheathing: \$1.25M

6.3 Roof Covering: \$1.25M

7. Interior Construction (budget = \$3.75M)

7.1 Framing Interior Walls: \$1.875M

7.2 Install Windows and Doors: \$1.875M

8. Facility Interior Setup (budget = \$6M)

8.1 to 8.9: Each subtask allocated around \$0.6667M

9. Landscaping And Outdoor Setup (budget = \$4.5M)

9.1 to 9.6 : Each subtask allocated around \$0.75M

10. Mechanical And Electrical Systems (budget = \$7.5M)

10.1 HVAC System Installation: \$2.5M

10.2 Electrical Wiring: \$2.5M

10.3 Plumbing Installation: \$2.5M

11. Interior Finishes (budget = \$3M)

11.1 to 11.7 : Each subtask allocated around \$0.4286M

12. Exterior Finishes (budget = \$3M)

12.1 to 12.4 : Each subtask allocated around \$0.75M

13. Control And Monitoring Phase (budget = \$6M)

13.1 to 13.6 : Each subtask allocated around \$1M

14. Final Inspections and Testing (budget = \$2.25M)

14.1 to 14.3 Each subtask allocated around \$0.75M

15. Project Closeout (budget = \$1.5M)

15.1 to 15.3 : Each subtask allocated around \$0.5M

2.8. Risk Management Plan

2.8.1. Risk Register and Risk Response Planning

Risk ID	Risk	Description	Likelihood	Impact	Mitigation Strategy
R1	Funding Shortfall	The identified funding source may not materialize as expected, leading to a budget shortfall.	Moderate	High	Regularly communicate with the funding source, explore alternative funding options, and have contingency plans in place.
R2	Regulatory Approval Delays	Delays in obtaining necessary permits and regulatory approvals may impact the project timeline.	Low	Moderate	Initiate the approval process early, maintain open communication with regulatory authorities, and have a contingency plan for potential delays.
R3	Community Opposition	Strong opposition from the local community may lead to delays, protests, or legal challenges.	Low	High	Implement a robust community engagement plan, address concerns proactively, and adjust project plans based on community feedback.
R4	Weather and Environmental Conditions	Adverse weather conditions or unforeseen environmental challenges may impact construction progress.	Moderate	Moderate	Monitor weather forecasts, plan construction activities accordingly, and have contingency plans for weather-related delays.
R5	Supply Chain Disruptions	Disruptions in the supply chain for construction materials may lead to delays.	Low	High	Diversify suppliers, maintain buffer stock for critical materials, and establish relationships with reliable suppliers.
R6	Construction Contractor Issues	Issues with the construction contractor, such as financial problems or lack of expertise, may impact project quality and timeline.	Moderate	High	Conduct thorough contractor evaluations, have a clear contract with performance milestones, and monitor contractor progress closely.
R7	Design Changes	Changes in design requirements may arise during the construction phase, leading to additional costs and delays.	Low	Moderate	Establish a robust change management process, clearly communicate design expectations, and involve key stakeholders in design decisions.

R8	Safety Incidents	Safety incidents on the construction site may result in injuries, legal consequences, and project delays.	Low	High	Implement strict safety protocols, conduct regular safety training, and have emergency response plans in place.
R9	Technology Implementation Challenges	Difficulties in implementing technology infrastructure may lead to operational challenges.	Moderate	Moderate	Engage technology specialists early in the project, conduct thorough testing, and have contingency plans for technology-related issues.
R10	Market Fluctuations	Fluctuations in the construction market may impact material costs and contractor pricing.	Moderate	Low	Monitor market trends, lock in prices where possible, and include contingency allowances for market-related changes.

2.9. Define Risk Strategies

Likelihood	High			
	Moderate		R4 R9	R1 R6
	Low	R10	R2 R7	R3 R5 R8
		Low	Moderate	High
		Impact		

2.10. Techniques for Quality Planning

2.10.1. Quality Metrics

The quality of the project will be judged on multiple bases. The first basis is the quality of the construction work. For construction, the project will first be examined in terms of its ability to meet safety standards. The metric used will be the number of safety related incidents per month, keeping in mind that the goal should always be zero. The second metric related to construction is the actual work progress. For that, the goal should always be to have all milestones and major tasks completed according to the project timeline. The metric used is by comparing the actual cost with the earned value, and if the actual cost is greater than the earned value, then the project is behind schedule.

The quality of the construction work should also be judged by the material quality control. When using the materials in construction, there must be a material inspection process to make sure that all materials conform to the quality standards, and the goal is to have 100% of materials be of the desired quality. Another major quality metric for the construction process is the ability to comply with local regulations. The goal is to avoid any violations, and this can be done by staying up to date on all local regulations and conducting regular compliance audits.

The second basis for assessing the quality of the project is by examining the engineering and design work. The project must be executed according to the planned design, and any errors in planning must be reviewed and corrected. This will be done by conducting continuous design reviews, and implementing corrections as required.

Additional quality metrics will be implemented to determine the overall success of the project. The first of those metrics would be stakeholders' satisfaction, and this can be done by engaging with the stakeholders regularly and conducting satisfaction surveys at milestones. The second metric would be budget adherence, and this can be done by comparing the planned cost with the actual cost, to determine if the project is within budget or not. The variance between the planned and actual cost should not exceed 5%.

Quality Metric	Target	Action
1. Safety Performance	<ul style="list-style-type: none"> • Zero incidents 	<ul style="list-style-type: none"> • Regular safety drills • Ongoing safety training • Corrective action for any incidents
2. Construction Progress / Timely Project Completion	<ul style="list-style-type: none"> • Project to be completed on time 	<ul style="list-style-type: none"> • Regular monitoring and construction progress reports • Delays to be addressed and corrected to put project back on track
3. Material Quality Control	<ul style="list-style-type: none"> • All materials meet desired quality standards 	<ul style="list-style-type: none"> • Implement regular material inspection processes • Collaborate with suppliers to ensure quality
4. Compliance with Regulations	<ul style="list-style-type: none"> • Zero violations 	<ul style="list-style-type: none"> • Stay updated on local regulations • Conduct regular compliance audits • Implement corrective action in case of violations
5. Design Conformation	<ul style="list-style-type: none"> • Project is executed according to plan • Corrective action is taken for any design flaws 	<ul style="list-style-type: none"> • Engineering manager should verify work is going according to the plan • Conduct design reviews and make corrective action to any design flaws
6. Stakeholder Satisfaction	<ul style="list-style-type: none"> • Achieve high stakeholder satisfaction 	<ul style="list-style-type: none"> • Regular engagement with stakeholders • Satisfaction surveys
7. Budget Adherence	<ul style="list-style-type: none"> • Meeting budget requirements • Variance does not exceed 5% 	<ul style="list-style-type: none"> • Budget monitoring process by analyzing planned value, earned value and actual cost

2.10.2. Change Management Plan

If changes need to be made for the planned designs, then the changes should go through the proper procedure. First of all, the change request must be submitted through a change request form. The request should include the description of the change, the impact on scope, schedule and budget, the need for the change, identification of the affected stakeholders and finally the proposed action plan.

Before approving the change, the change request must be evaluated to determine whether it is appropriate or not. The change request will be assessed using a special Change Control Board that will examine the impact of the change request. The risks involved in approving the change request will be analyzed, and mitigation strategies will be developed. If the change still aligns with the scope

and budget requirements, and there is a need for the change, then the change request will be approved. If the change request is approved, the decision will be communicated through a meeting with all the affected stakeholders. The project plan must be updated, to reflect any changes in budget or schedule.

Fishbone Diagram

The Fishbone Diagram, also known as the Cause-and-Effect Diagram, will be used to solve any quality problems throughout the execution of the project. This strategy is based on identifying a problem resulting in poor quality and trying to eventually determine the root cause of that problem. This technique will be implemented by creating brainstorming sessions to determine any possible causes of the problem. From there, the sub-causes of these problems can be determined and can be narrowed down to the root causes. The benefits of this technique include visual representation, as the problem and possible causes will be represented on a visual diagram. In addition, this technique encourages collaboration and participation, as team members will be allowed to present their opinions, and they will be acknowledged by including them in this diagram.

- 3. Project Execution Processes
 - 3.1. Work Performance Information

The project must be performed according to the tasks described in the Work Breakdown Structure, and according to the timeline described in the Gantt Chart, and the budget mentioned in the project plan. Throughout the execution of the project, the actual project schedule must be monitored and regularly compared with the baseline. The status of each activity should be updated regularly, and any delays must be communicated and corrected. In addition, the project budget will be compared to the actual expenditure, and the status will be determined by calculating the earned value and actual cost against the planned value. Scope changes will also be monitored throughout the project, and all changes will be documented with their impact on budget and timeline. Safety performance will also be regularly monitored to assess the total number of incidents and provide additional safety training if necessary.

Throughout the execution of the project, updates on the identified risks will be issued regularly, and there will be details on how the risks are being mitigated and avoided. At the same time, stakeholders will be informed of all project updates, and will be notified of all major milestones related to the progress of the project.

- 3.2. Quality Assurance Plan
 - 3.2.1. Quality Checklist

Project Scope
<input type="checkbox"/> Clear and comprehensive project scope defined.
<input type="checkbox"/> Alignment with stakeholder expectations.
Feasibility Study
<input type="checkbox"/> Conducted to assess project viability.

<input type="checkbox"/> Feasibility study report documented.
Project Charter
<input type="checkbox"/> Developed to formally authorize the project.
<input type="checkbox"/> Approved and signed by relevant stakeholders.
Budget Estimation
<input type="checkbox"/> Detailed budget estimation prepared.
<input type="checkbox"/> Budget aligned with project requirements.
Grant Application and Approval
<input type="checkbox"/> Grant application submitted..
<input type="checkbox"/> Approval obtained from grant authorities.
Architectural Design
<input type="checkbox"/> Architectural drawings completed.
<input type="checkbox"/> Designs meet local building codes and regulations.
Engineering Design
<input type="checkbox"/> Engineering specifications documented.
<input type="checkbox"/> Designs reviewed and approved.
Environmental Impact Assessment
<input type="checkbox"/> Assessment conducted.
<input type="checkbox"/> Mitigation measures identified and implemented.
Safety Protocols
<input type="checkbox"/> Comprehensive safety plan developed.
<input type="checkbox"/> Safety protocols communicated to the project team.
Construction Progress
<input type="checkbox"/> Progress monitored against the project schedule.
<input type="checkbox"/> Milestones achieved according to the plan.
Material Quality Control

<input type="checkbox"/> Quality standards for materials established.
<input type="checkbox"/> Regular inspections conducted.
Regulatory Compliance
<input type="checkbox"/> Compliance with local regulations ensured.
<input type="checkbox"/> Required permits obtained.
Quality Inspections
<input type="checkbox"/> Regular quality inspections conducted.
<input type="checkbox"/> Compliance with project specifications verified.
System Testing
<input type="checkbox"/> Systems (HVAC, electrical, plumbing) tested thoroughly.
<input type="checkbox"/> Test results documented and reviewed.
Documentation
<input type="checkbox"/> Final documentation compiled.
<input type="checkbox"/> As-built drawings and specifications updated.
Handover to Client
<input type="checkbox"/> Smooth transition plan developed.
<input type="checkbox"/> Project handed over to the client as per the plan.
Post-Construction Review
<input type="checkbox"/> Review meeting conducted with the project team.
<input type="checkbox"/> Lessons learned documented for future projects.
Lessons Learned Implementation
<input type="checkbox"/> Lessons learned applied to future projects.
<input type="checkbox"/> Continuous improvement plan in place.
Process Improvement Initiatives
<input type="checkbox"/> Ongoing initiatives for process improvement.
<input type="checkbox"/> Feedback mechanisms established.

3.2.2. Quality Audits

While executing the project, quality audits will be performed to ensure all processes are going according to the plan. While auditing, several aspects of the project will be examined. First, the audit will assess compliance, by ensuring the project is within scope, and is adhering to the approved plans, specifications and desired quality standards. The quality audits will also try to determine any deviations from the approved plans and suggest corrective action wherever necessary. The audits will also examine the documentation related to the project, and ensure that all documents are up to date, and that they include all required plans, permits and inspection reports.

3.3. Milestone Report

Milestone reports will be created after achieving all major milestones as listed on the Gantt Chart. The report will discuss the progress of the project until the time of the milestone and will bring to attention all of the work that was completed up to that point. The report will also discuss changes to the scope, and will give an update on the timeline and budget, and indicate whether the project is moving according to the plan or not. The table below gives the list of milestones at which reports will be created, and provides an update on the status of each of these milestones.

Milestone	Date	Status	Responsible	Issues/Comments
1.Project Charter and Funding Secured	2023/12/27	Completed	Project Sponsor	Project charter is complete and funding is secured
2.Project Planning Complete	2024/05/02	Completed	Project Manager and Engineering Teams	Project planning is complete and all engineering plans are approved
3.Site Preparation Complete	2024/05/22	Completed	Civil Engineering Team	Site is prepared for the construction work
4.Foundation Complete	2024/07/12	Completed	Civil Engineering Team	The foundation for the community centre is complete
5.Structure Complete	2024/09/05	In progress	Civil Engineering Team	Building structure is underway
6.Interior & Exterior Finishes Complete	2024/03/18	Not initiated	Interior Design Team	N/A
7.Operational Systems Installed	2023/12/29	Not initiated	MEP Engineering Team and IT Experts	N/A
8.Final Inspection and Handover	2024/06/21	Not initiated	Quality Control Inspector and Project Manager	N/A

4. Monitoring and Controlling Processes
4.1. Measuring Project Performance

Project performance can be measured using the project management technique Earned Value Method (EVM). EVM assesses project performance by integrating cost, schedule and scope metrics by comparing the planned and the actual project metrics to determine the project's status and the projected performance.

The three main values used for the calculations are:

1. Planned Value (PV): value of the work planned to be completed at a specific point in time. Can also be seen as the budgeted cost at specific point in time during the project.

2. Earned Value (EV): value of the work actually performed or completed at a specific point in time.

3. Actual Cost (AC): value of the cost of the work actually performed at a specific point in time.

These values are used to calculate the following performance metrics:

- Schedule Variance (SV): measures variance between earned and scheduled work in dollars

$$SV = EV - PV$$

- Cost Variance (CV): measures variance between earned and actual work performed in dollars

$$CV = EV - AC$$

- Cost Performance Index (CPI): measures cost efficiency

$$CPI = \frac{EV}{AC}$$

- Schedule Performance Index (SPI): measures schedule efficiency

$$SPI = \frac{EV}{PV}$$

- Estimate at Completion (EAC): estimate of cost to complete project given project performance remains as they have been.

$$EAC = \frac{BAC^*}{CPI}$$

* BAC: Budget At Completion

- Variance at Completion (VAC): estimate of cost variance at project completion.

$$VAC = BAC - EAC$$

- Estimate to Complete (ETC): value of estimated cost to complete remaining work.

$$ETC = EAC - AC$$

These metrics can help identify potential issues early in the project, allowing for timely corrective actions to be taken. It is important to mention that one metric is not enough to assess the overall performance of a project. It is crucial to consider all or a combination of metrics to fully get an overview of the project performance. Below is an example of calculating these metrics at 2 weeks into the project of building a community centre in Montreal-Nord.

Measuring project performance after 2 weeks

The project is scheduled to last 228 days. After 2 weeks (10 business days), 4% of the work would be complete. The project budget is \$75 million.

Given information:

BAC = \$75,000,000 | Project duration: 228 days | Elapsed time: 4% of schedule | AC = \$3,000,000

$$PV = \text{Planned \% Complete} \times BAC$$

$$PV = 0.04 \times \$75,000,000$$

$$PV = \$3,000,000 \quad \leftarrow \text{The value of the work after 2 weeks of the project.}$$

Since, $\% \text{ planned complete} = \% \text{ actual complete}$,

$$AC = PV = \$3,000,000 \quad \leftarrow \text{Actual cost is equal to the planned value at this point in time.}$$

$$EV = \text{Actual \% Complete} \times BAC$$

$$EV = 0.04 \times \$75,000,000$$

$$EV = \$3,000,000 \quad \leftarrow \text{The value of the work actually completed after 2 weeks.}$$

$$SV = EV - PV$$

$$SV = \$3,000,000 - \$3,000,000$$

$$SV = 0 \quad \leftarrow \text{The project is exactly on schedule at this point in time.}$$

$$CV = EV - AC$$

$$CV = \$3,000,000 - \$3,000,000$$

$$CV = 0 \quad \leftarrow \text{Project is exactly on budget at this point in time.}$$

$$SPI = \frac{EV}{PV}$$

$$SPI = \frac{\$3,000,000}{\$3,000,000}$$

$$SPI = 1 \quad \leftarrow \text{Project is on schedule.}$$

$$CPI = \frac{EV}{AC}$$

$$CPI = \frac{\$3,000,000}{\$3,000,000}$$

$$CPI = 1 \quad \leftarrow \text{Project is on budget.}$$

Therefore, after 2 weeks after the project start date, all metrics indicate that the project is progressing as planned at and up to this specific point in time. There may have been issues, but they did not impact the budgeted cost or scheduled plan.

4.1.1. Status Reports

During the monitoring and control process, three key status reports are scheduled when 25%, 75% and 100% of the work is complete. These reports provide an update on the progress of the project and are given below:

Status Report I - Calculations

BAC = \$75,000,000 | project duration: 228 days | 25% of schedule = 57 days | AC = \$8,400,000

$$PV = \text{Planned \% Complete} \times BAC$$

$$PV = 0.25 \times \$75,000,000$$

$$PV = \$18,750,000 \quad \leftarrow \text{Value of the work at 25\% completion of the schedule.}$$

$$EV = \text{Actual \% Complete} \times BAC$$

$$EV = 0.25 \times \$75,000,000$$

$$EV = \$18,750,000 \quad \leftarrow \text{Value of the actual work completed.}$$

$$SV = EV - PV$$

$$SV = \$18,750,000 - \$18,750,000$$

$$SV = 0 \quad \leftarrow \text{Project is on schedule.}$$

$$CV = EV - AC$$

$$CV = \$18,750,000 - \$8,400,000$$

$$CV = \$10,350,000 \quad \leftarrow \text{Project is under budget.}$$

$$SPI = \frac{EV}{PV}$$

$$SPI = \frac{\$18,750,000}{\$18,750,000}$$

$$SPI = 1 \quad \leftarrow \text{Project is on schedule.}$$

$$CPI = \frac{EV}{AC}$$

$$CPI = \frac{\$18,750,000}{\$8,400,000}$$

$$CPI = 2.23 \quad \leftarrow \text{Project is under budget}$$

Status Report I

Project Name: Building a Community Centre in Montreal-Nord
Team Members Names: Gustavo, Tianhao, Juman, Awni, Poojesh, Jashwanth
Date: 2024-02-11
Reporting Period: 57 days
Work completed this reporting period: 25%
Work to complete next reporting period: 75%
What is going well and why: project is on schedule and under budget
What is not going well and why: N/A
Suggestions/Issues: N/A
Project changes: N/A

Status Report II - Calculations

BAC = \$75,000,000 | project duration: 228 days | 75% of schedule = 171 days | AC = \$55,000,000

$$PV = \text{Planned \% Complete} \times BAC$$

$$PV = 0.75 \times \$75,000,000$$

$$PV = \$56,250,000$$

← Value of the work at 75% completion of the schedule.

$$EV = \text{Actual \% Complete} \times BAC$$

$$EV = 0.75 \times \$75,000,000$$

$$EV = \$56,250,000$$

← Value of the actual work completed.

$$SV = EV - PV$$

$$SV = \$56,250,000 - \$56,250,000$$

$$SV = 0$$

← Project is on schedule.

$$CV = EV - AC$$

$$CV = \$56,250,000 - \$55,000,000$$

$$CV = \$1,250,000$$

← Project is under budget.

$$SPI = \frac{EV}{PV}$$

$$SPI = \frac{\$56,250,000}{\$56,250,000}$$

$$SPI = 1$$

← Project is on schedule.

$$CPI = \frac{EV}{AC}$$

$$CPI = \frac{\$56,250,000}{\$55,000,000}$$

$$CPI = 1.02$$

← Project is under budget.

Status Report II

Project Name: Building a Community Centre in Montreal-Nord
Team Member Names: Gustavo, Tianhao, Juman, Awni, Poojesh, Jashwanth
Date: 2024-07-26
Reporting Period: 171 days
Work completed this reporting period: 75%
Work to complete next reporting period: 100%
What is going well and why: project is on schedule and under budget.
What is not going well and why: Some changes have to be made to the project because Increased community interest in sustainable building practices and a desire to reduce the environmental impact of the community centre prompted the need for the addition of a green roof.
Suggestions/Issues: Upon approval, the construction and landscaping teams will collaboratively integrate the green roof into the current construction plan, maintaining transparency through regular stakeholder updates, reinforcing the commitment to sustainable development and meeting community expectations for an environmentally conscious and resilient community centre.
Project changes: There will be a slight change in project scope, cost and schedule.

Status Report III - Calculations

BAC = \$75,000,000 | project duration: 228 days | 100% of schedule = 228 days | AC = \$75,000,000

$$PV = \text{Planned \% Complete} \times BAC$$

$$PV = 1 \times \$75,000,000$$

$$PV = \$75,000,000 \quad \leftarrow \text{Value of the work at 100\% completion of the schedule.}$$

$$EV = \text{Actual \% Complete} \times BAC$$

$$EV = 1 \times \$75,000,000$$

$$EV = \$75,000,000 \quad \leftarrow \text{Value of the actual work completed.}$$

$$SV = EV - PV$$

$$SV = \$75,000,000 - \$75,000,000$$

$$SV = 0 \quad \leftarrow \text{Project is on schedule.}$$

$$CV = EV - AC$$

$$CV = \$75,000,000 - \$75,000,000$$

$$CV = 0 \quad \leftarrow \text{Project is under budget.}$$

$$SPI = \frac{EV}{PV}$$

$$SPI = \frac{\$75,000,000}{\$75,000,000}$$

$$SPI = 1 \quad \leftarrow \text{Project is on schedule.}$$

$$CPI = \frac{EV}{AC}$$

$$CPI = \frac{\$75,000,000}{\$75,000,000}$$

$$CPI = 1 \quad \leftarrow \text{Project is under budget.}$$

$$EAC = \frac{BAC}{CPI}$$

$$EAC = \frac{\$75,000,000}{1}$$

$$EAC = \$75,000,000 = \text{Project budget}$$

$$ETC = EAC - AC = 0 \quad \leftarrow \text{No additional costs}$$

$$VAC = BAC - EAC = 0 \quad \leftarrow \text{On budget at end}$$

Status Report III

Project Name: Building a Community Centre in Montreal-Nord
Team Member Names: Gustavo, Tianhao, Juman, Awni, Poojesh, Jashwanth
Date: 2024-10-17
Reporting Period: 228 days
Work completed this reporting period: 100%
Work to complete next reporting period: N/A
What is going well and why: The project was completed on time and on budget, even with the predicted changes.
What is not going well and why: Everything is under control, the schedule and the budget.
Suggestions/Issues: N/A

Project changes: N/A

The status reports summarize the overall project performance at different points throughout the schedule, highlighting both successes and areas for improvement. These reports collectively serve as critical tools for informed decision-making and ongoing project management.

4.2. Verifying and Managing Changes to the Project

Verifying and managing changes in this project is crucial for maintaining control and ensuring that alterations align with the project's goals. Here are two potential changes planned to do during the project, along with steps for verification and management:

Change Request Form-1

Project Name: Building a Community Centre in Montreal-Nord

Date Request Submitted: January 20, 2024

Title of Change Request: Modification to Exterior Design for Enhanced Accessibility

Change Order Number: CR-2024-001

Submitted by: Poojesh Reddy

Change Category: Scope

Description of change requested:

Modify the exterior design of the community centre to enhance accessibility, including the addition of ramps and handrails.

Events that made this change necessary or desirable:

After a thorough review of the initial design, it was observed the current plan may pose challenges for individuals with mobility impairments, necessitating adjustments to ensure inclusivity.

Justification for the change/why it is needed/desired to continue/complete the project:
--

The modification aligns with the commitment to creating an inclusive space for all community residents. It addresses potential accessibility issues and ensures the community centre is welcoming to individuals with diverse needs.
--

Impact of the proposed change on:
--

Scope: The scope of the project will expand to include the redesign and construction of ramps and handrails to improve accessibility.
--

Schedule: The project timeline will be extended by three weeks to accommodate the additional design work, approval processes, and construction.
--

Cost: An additional cost of \$25,000 is anticipated for the redesign, materials, and construction of the accessibility modifications.
--

Staffing: No additional staffing requirements are foreseen as the existing construction team can manage the proposed modifications.
--

Risk: The risk of potential delays and complications during the construction phase may increase due to the modification.

Other: No other significant impacts are foreseen.
--

Suggested implementation if the change request is approved: Upon approval, the architectural team will promptly initiate the redesign, with the construction team seamlessly incorporating the modifications into the ongoing plan. Regular updates will ensure transparency and address concerns, underscoring the dedication to community inclusivity in Montreal-Nord.
--

Change Request Form-2

Project Name: Building a Community Centre in Montreal-Nord

Date Request Submitted: June 24, 2024

Title of Change Request: Addition of Green Roof for Environmental Sustainability

Change Order Number: CR-2024-002

Submitted by: Poojesh Reddy

Change Category: Other

Description of change requested: Integrating a green roof system into the community centre building to enhance environmental sustainability and promote eco-friendly building practices.

Events that made this change necessary or desirable:

Increased community interest in sustainable building practices and a desire to reduce the environmental impact of the community centre prompted the need for the addition of a green roof.

Justification for the change/why it is needed/desired to continue/complete the project:

The green roof aligns with the commitment to environmental responsibility, offering benefits such as improved energy efficiency, stormwater management, and enhanced aesthetics for the community centre.

Impact of the proposed change on:

Scope: The project's scope will expand to include the design and implementation of a green roof, complementing the existing construction plans..

Schedule: An additional four weeks will be required to accommodate the green roof integration into the ongoing construction timeline.

Cost: An estimated cost increase of \$50,000 is anticipated for the procurement and installation of the green roof system.

Staffing: No additional staffing requirements are expected, as the existing construction and landscaping teams can manage the proposed modifications.

Risk: The risk of potential delays in the project schedule may increase due to the additional time required for the integration of the green roof.

Other: No other significant impacts are foreseen.

Suggested implementation if the change request is approved: Upon approval, the construction and landscaping teams will work in tandem to smoothly incorporate the green roof into the existing construction plan, ensuring ongoing transparency through regular stakeholder updates. This change request underscores the dedication to sustainable development, meeting community expectations for an environmentally conscious and resilient community centre in Montreal-Nord.

4.3. Quality Control Plan

Fishbone Diagram: The Fishbone Diagram allows exploring each category, to uncover the main causes behind potential quality problems to help in fixing issues at the source and prevent them from happening (see Figure 3).

Identification and Prioritization: Prioritize potential problems in order to focus on what is urgent and ensure efforts target the most crucial aspects of quality.

Continuous Improvement: The Fishbone Diagram is adjusted and updated regularly to learn from past experiences to improve quality control processes.

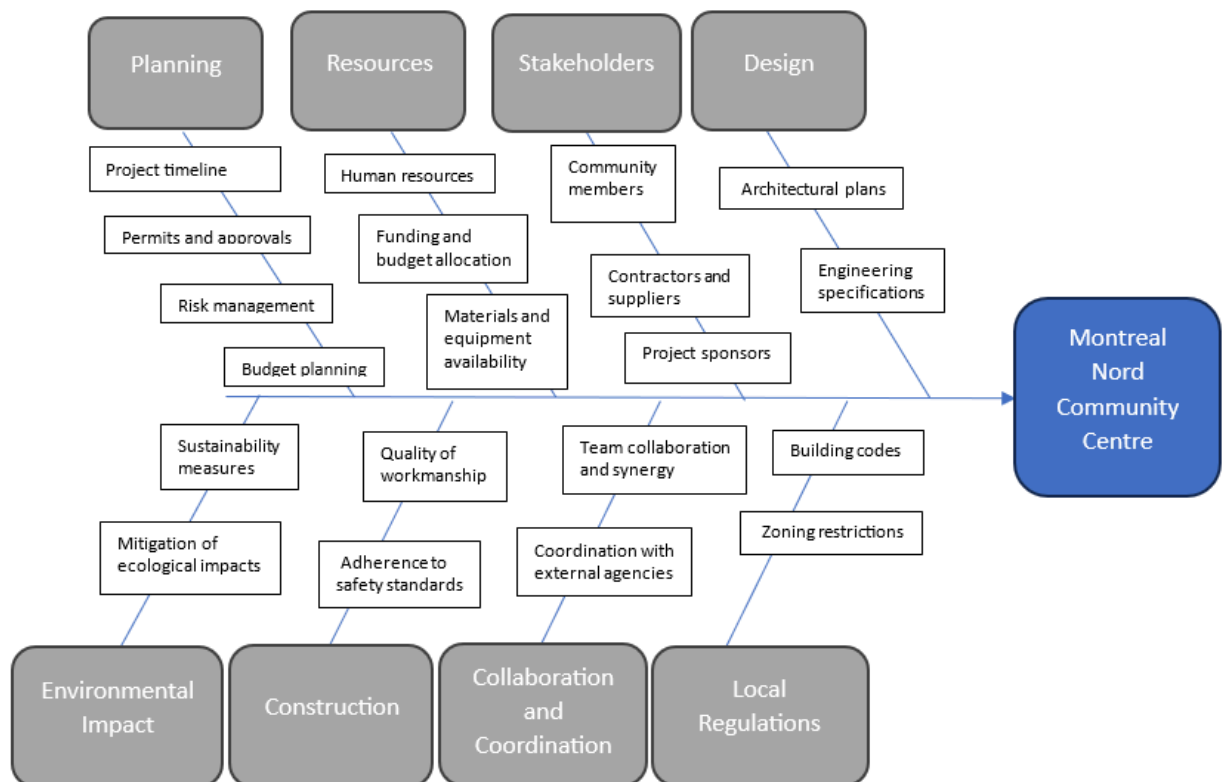


Figure 3: Fishbone diagram for the project of building a community centre in Montreal-Nord.

4.4. Monitoring Risks

Risk ID	Risk	Update
R1	Funding Shortfall	Regularly communicated with the funding sources and explored alternative funding options.
R2	Regulatory Approval Delays	No approval delays.
R3	Community Opposition	Actively listened to community concerns and made the necessary changes to meet their preferences.
R4	Weather and Environmental Conditions	Monitored weather forecasts and planned construction activities accordingly.
R5	Supply Chain Disruptions	One supplier withdrew from the contract. Certified back-up suppliers were contacted.
R6	Construction Contractor Issues	No issues.
R7	Design Changes	No design changes.
R8	Safety Incidents	No safety incidents occurred.
R9	Technology Implementation Challenges	No issues.
R10	Market Fluctuations	The cost of raw materials increased. Project sponsors were made aware of a budgetary augmentation.

5. Closing Processes
 - 5.1. Obtaining Final Acceptance and Perform Administrative Closure
 - 5.1.1. Project Closure Report

Customer Acceptance Form	
<p>Project Name: Building a Community Centre in Montreal-Nord</p> <p>Project Manager: Juman Al-Mashta</p>	
<p>1. Was this project completed to your satisfaction?</p>	<p>Yes No</p>
<p>2. Please provide the main reasons for your satisfaction or dissatisfaction with this project.</p> <p>The project was completed successfully, meeting the project objectives set at the start of the project and it took the amount of time estimated and cost budgeted. Also, the potential risks were monitored and mitigated throughout the project.</p>	
<p>3. Please provide suggestions on how our organisation could improve its project delivery capability in the future.</p> <p>Cover all the objectives and deliverables that were meant to be fulfilled by the end of the project along with the challenges that the team faced during the development of the project to learn from them and be more prepared for future projects.</p>	

I (We), the undersigned, acknowledge and accept delivery of the work completed for this project on behalf of our organization. My (Our) signature(s) attest to my (our) agreement that this project has been completed. No further work should be done on this project.

Name	Title	Signature	Date
Juman Al-Mashta	Project Manager	<i>Juman Al-Mashta</i>	06/13/2024
Awni Al-Nammari	Project Coordinator	<i>Awni Al-Nammari</i>	06/13/2024
Tianhao Ning	Construction Manager	<i>Tianhao Ning</i>	06/13/2024
Gustavo Orna	Mechanical, Electrical and Plumbing Manager	<i>Gustavo Orna</i>	06/13/2024
Poojesh Reddy	Quality Control Inspector	<i>Poojesh Reddy</i>	06/13/2024
Jashwanth Reddy	Quality Control Inspector	<i>Jashwanth Reddy</i>	06/13/2024

5.1.2. Project Closure Report Goals

Project Closure Report Goals

This Project Closure Report is created to accomplish the following goals:

- All the milestones proposed were achieved at the right moment during the project, ensuring the project advanced through its steps properly and on time.
- Some risks and issues were encountered during the realization of the project but were mitigated accordingly, like the supplier issue was resolved by using one of the back-up suppliers and the risk of shortfall funding was mitigated by exploring new funding options for the project.
- Have a final meeting to hand out all the documentation and finish the construction of all the deliverables to complete the closure of the project.
- Good planification and communication led to a good management of the overall project and to deal with emerging issues.

5.1.3. Project Closure Report Summary

Project Background Overview

- Montreal-Nord is one of the poorest and most densely populated out of the 19 boroughs in Montreal. The youth are vulnerable to varying issues:
 - Health issues, criminal activity and dropping out of school
- A community centre can help curb these issues.
- Currently in Montreal-Nord, community centres are too far, over packed or both.
- In Montreal, richer boroughs enjoy not only more recreational facilities, but parks too.

The original objectives of the project were:

- Construct a modern and functional community centre that serves the diverse needs of the local community.
- Enhance the quality of life for community members through the provision of multipurpose facilities and services.

Project Highlights and Best Practices

Project Highlights:

- The activities of the project were completed on schedule.
- The actual cost did not exceed the planned budget.
- All risks and issues were successfully managed.

Best Practices:

- Tasks and responsibilities between the team members were divided efficiently.
- The work breakdown structure helped to guide and maintain the development of the project on schedule.
- Good planification of quality metrics and risk management allowed the team to be prepared for difficult situations beforehand.
- Good change management plan to adapt to any modifications in the project.

Project Closure Synopsis

- The project is closed since all project objectives and deliverables were achieved.
- All facilities were built as agreed upon and functioned as intended.
- All project tasks were completed on time.
- The project was finished in a satisfactory manner and community residents enjoy and benefit from the services provided at the centre.

5.1.4. Project Metrics Performance

Goals and Objectives Performance

The actual project performance metrics show that the project lasted for 228 days with a budget of \$75 million, which was exactly what was estimated for the project to last and cost from the objectives defined before the start of the project.

Success Criteria Performance

- The quality metrics along with the specifications for the deliverable structures were achieved and indicate that the project was a success.
- The Quality Control inspectors along with the Project Coordinator were responsible for assessing continued progress throughout the project development.

Milestones and Deliverables Performance

- All project deliverables were successfully achieved and residents were satisfied with the result.
- All project milestones scheduled were achieved on time, as initially planned.

Schedule Performance

The initial schedule was to begin the project on November 20th, 2023, and finish operations on October 17th, 2024. At the end, the project ended on the same date it was scheduled to with a few setbacks that did not impact the project end date.

Project Schedule Overview:

The project was scheduled and lasted for 228 days, achieving all the milestones proposed in the process.

Project Schedule Control Process:

The control process for the schedule was the monitoring of the Gantt chart with its milestones of the project along with the monitoring of the risks that could potentially affect a delay on the schedule proposed.

Project Schedule Corrective Actions:

A scheduled corrective action to an activity that took longer than expected was adding more manpower temporarily to the next activity to be completed early and get the project back on track.

Project Schedule Integration with Managing Project:

The project management included the monitoring of the scheduled activities of the project to make sure all tasks were being done properly and done on time to guarantee the project was on schedule.

Budget Performance

The initial budget of the project was estimated to be \$75 million, which was the exact same as the cost at the end, after the project was finished and deliverables were achieved.

Project Budget Overview:

The total cost of the project of \$75 million was spent on the complete construction of the facilities in the community centre. The budget and costs were monitored continuously throughout the project to avoid overspending.

Project Budget Corrective Actions:

One corrective action to a problem of insufficient funding was to stay in communication with the funding source. In order to explore alternative options for funding and help stay on track.

Another problem of supply chain disruption, the corrective action was to get in contact with a verified back-up supplier to keep the same quality and remain in good project performance.

Metrics Performance Recommendations

- Good safety performance to minimize incidents to a minimum.
- Compliance with regulations to ensure the project has no violations.
- Good control of material quality to ensure all materials meet quality standards.
- Achieve a high stakeholder satisfaction to ensure the project is well received by everyone involved.

5.2. Identifying and Documenting Lessons Learned

5.2.1. Lessons Learned Document

Lessons Learned
<ol style="list-style-type: none">1. The project meets the initial project scope including all stipulated deliverables. The project was also completed on time and on budget.2. The success criteria for this project were to finish the construction of a modern and functional community centre that serves the needs of the local community within schedule and the cost estimated.3. The project success criteria were achieved since all the deliverables were completed within schedule and there was no going over the budget proposed.4. The main lessons learned are:<ul style="list-style-type: none">○ Collaboration among the team members enhanced the ability to solve problems as they came up and creativity for the completion of tasks.○ A good planification and identification of risks helped to minimize their impact on the project.○ Keeping track of project milestones to ensure all the activities are on schedule.○ In a project that is directly serving community residents, it is important to stay involved with the local community to help address concerns and build a positive relationship with the community.5. An example of what went right with the project was the good planification of all tasks and activities to do during the project, so the management of the project was easy to control.6. One example of what went wrong was the estimation of the cost of raw materials. Cost of materials tends to vary and it was difficult to prepare for that type of variance in the budget of the project.7. What could be done differently on the next project would be to explore beforehand other funding options and dedicate some of the budget for unpredictable issues.

5.3. Release Project Resources

Release of the project resources involves delivering all the project documentation including all the information covered in the realization of the project and all the steps taken to ensure the correct implementation of what was planned in the beginning of the project. Also, give the project deliverables and customer acceptance form to the person responsible to signify project completion.

The final presentation of the project covering all the mandatory objectives along with the final status of the project and lessons learned was completed.

References:

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- [3]“Population des municipalités du Québec, décret de 2023,” GAZETTE OFFICIELLE DU QUÉBEC, Montreal, Dec. 2022. Accessed: Nov. 20, 2023. [Online]. Available: https://www.publicationsduquebec.gouv.qc.ca/fileadmin/gazette/pdf_encrypte/lois_reglements/2022F/78695.pdf
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Table of Contribution

Objective	Author
1.	Juman
2.	Juman
3.	Juman
4.	Juman
5.	Juman
6.	Awni
7.	Awni
8.	Awni
9.	Awni
10.	Tianhao
11.	Tianhao
12.	Tianhao
13.	Awni
14.	Awni
15.	Awni
16.	Awni
17.	Awni
18.	Awni
19.	Poojesh
20.	Poojesh
21.	Jashwanth
22.	Jashwanth
23.	Gustavo
24.	Gustavo
25.	Gustavo