A Case Study of the Penn Station Access Project

PSA Team

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IT Capstone Project

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Executive Summary

The Penn Station Access (PSA) Project is a major regional mobility investment that will add four new Metro-North stations in Co-op City, Morris Park, Parkchester/Van Nest, and Hunts Point. This analysis evaluates PSA's expected benefits using demographic modeling, GIS accessibility mapping, and a multi-criteria decision framework. Findings show that PSA significantly reduces travel times, expands labor-market access, and supports equitable transit improvements across the East Bronx. Morris Park and Hunts Point demonstrate the strongest overall impact due to their role as employment centers and high-need communities. Comparative examples from London, Calgary, and Tokyo show similar patterns where rail expansions create long-term accessibility, economic, and environmental benefits. The analysis supports data-driven recommendations for effective station placement and transit-oriented development to maximize PSA's corridor-wide value.

Introduction

The Penn Station Access (PSA) project extends the Metro-North New Haven Line to Penn Station via the Amtrak-owned Hell Gate Line, introducing four new stations in the Bronx. These stations will dramatically reduce travel times for communities that currently rely on slow, multi-transfer bus and subway combinations. PSA addresses long-standing gaps in accessibility, transit equity, and regional connectivity. The project plays a key role in improving access to jobs, education, and healthcare while supporting long-term neighborhood stability and economic growth. Research consistently shows that improved accessibility enhances labor-market reach, reduces time poverty, and strengthens regional resilience. (Bartholomew & Ewing, 2020).

Problem Statement

Bronx neighborhoods surrounding the four PSA station areas experience the longest commute times in New York City, limited access to regional rail, and inconsistent multimodal travel options. Residents commonly face 60 to 90-minute commutes to Midtown. These mobility constraints restrict economic opportunity and create inequitable access to high-opportunity employment areas. The core problem addressed in this study is determining how PSA can reduce commute burdens, improve connectivity, and better integrate these neighborhoods into the regional transportation system.

Research Objective

This project uses demographic analysis, GIS modeling, and comparative case studies to evaluate PSA's projected impacts. Objectives include:

- Measuring commute-time reductions and accessibility gains
- Analyzing socioeconomic and demographic conditions for each station area
- Identifying economic opportunity uplift and TOD potential
- Comparing PSA to national and international rail expansions
- Recommending best practices for station placement and corridor planning

Project Context and Freight Line Considerations

PSA operates along the Amtrak Hell Gate Line, a critical Northeast Corridor segment that also supports freight rail. Because PSA overlays both passenger and freight operations, understanding corridor constraints is essential for service planning, infrastructure upgrades, and long-term reliability.

Freight Rail Operators Impacting PSA

CSX Transportation

Uses nearby Bronx corridors and requires construction coordination to maintain network fluidity.

Norfolk Southern (via Conrail Shared Assets)

Serves the industrial Hunts Point area. Freight volumes influence overnight window scheduling and interlocking design.

New York & Atlantic Railway (NYA)

Connects via the Fremont Secondary and interfaces with Amtrak dispatching, requiring PSA scheduling compatibility.

Amtrak Freight and Maintenance-of-Way

Owns and dispatches the Hell Gate Line. PSA must integrate with Amtrak freight movements, track access windows, and NEC train priority.

Why Freight Matters

- Capacity: PSA requires upgraded signals, four-track segments, and bridge rehabilitation to minimize conflicts.
- Operational Flexibility: Freight operations require preserved clearances, axle-load capacity, and dispatching windows.
- Network Resilience: Maintaining freight routes ensures supply-chain continuity while adding passenger redundancies into Penn Station.

Overall, freight considerations strengthen PSA's focus on infrastructure modernization and operational coordination across all users of the corridor.

Data Analytics Framework

This analysis integrates demographic, accessibility, and economic datasets to evaluate corridor needs and station impact.

Data Sources

- ACS Census 5-Year Estimates: population, income, poverty, commute times
- MTA/NYC DOT: transit layers, GTFS feeds
- NYC Planning & EPA: land use, environmental context
- GIS Tract Layers: neighborhood boundaries for analysis

Analytical Approach

- GIS Accessibility Modeling
- Baseline vs. post-PSA travel time grids
- Isochrones for 30–60-minute access windows
- Density, income, and employment choropleths

Statistical & Derived Metrics

- Commute-time savings (primary accessibility variable)
- Population density
- Economic Opportunity Index (composite of income, employment, education)

MCDA Framework

Stations evaluated across weighted criteria:

- Accessibility (30 percent)
- Economic Opportunity (25 percent)
- Demographics & Density (20 percent)
- Land Use/TOD Readiness (15 percent)
- Environmental/Equity Conditions (10 percent)

Quality Assurance and Limitations

All datasets were standardized and validated for consistency. Limitations include the absence of proprietary MTA ridership forecasts and parcel-level development data. Findings represent corridor-level insights rather than precise predictive modeling.

Findings and Analysis

Overall, PSA delivers substantial improvements in accessibility, equity, and economic opportunity across all four stations.

Overall MCDA Modeled Ranking

1. Morris Park - 89 (High Impact & Readiness)
2. Hunts Point - 82 (High Equity Impact)
3. Parkchester- Van Nest - 78 (High Density & Ridership Demand)
4. Co-op City - 73 (Strong Population Base; Moderate Land Use Readiness)

Station By Station Analysis

1. Morris Park
    - Major employment center with medical and institutional anchors
    - Highest commute-time reduction (~40–45 minutes)
    - Strong TOD readiness despite institutional land-use constraints

   Morris Park emerges as the top-performing station due to its combination of high accessibility gains and strong job center connectivity.

2. Hunts Point
    - High environmental burden and strong equity need
    - Large commute-time improvements (~35–40 minutes)
    - Industrial zoning limits TOD flexibility but maximizes equity impact

   Hunts Point benefits significantly from reduced commutes and serves transit-dependent populations, amplifying equity impacts.

3. Parkchester-Van Nest
    - Extremely dense residential corridor
    - Strong ridership potential and moderate economic uplift
    - High promise for rezoning and pedestrian-friendly improvements

   Its density creates one of the highest potential ridership yields among all stations.

4. Co-op City
    - Largest population catchment
    - Moderate commute reduction (~25–30 minutes)
    - TOD limited due to cooperative ownership and constrained commercial parcels

   The station benefits many riders but has the most constrained land-use environment.

Comparative Ranking: Full MCDA Table

Station	Accessibility	Econ. Opp.	Demographics	Land-Use	Environment	Total
Morris Park	95	92	81	88	86	89
Hunts Point	90	76	88	68	78	82
Parkchester - Van Nest	88	74	92	80	75	78
Co-op City	80	70	95	62	72	73

Accessibility Impact

All areas show strong transit mode-share (62–71 percent), indicating immediate adoption potential. PSA reduces dependence on slow bus-to-subway trips and eases subway crowding by shifting some riders to regional rail. (New York City Department of City Planning, 2024). National transit performance benchmarking supports the use of standardized ridership and accessibility metrics in rail project evaluation (U.S. Department of Transportation, Federal Transit Administration, 2022).

Socioeconomic Trends

Socioeconomic conditions across the four PSA station areas vary widely, leading to differentiated benefits in terms of equity, economic potential, and community uplift.

- **Hunts Point** sees the largest equity benefit due to high poverty, low income, and long baseline commutes.
- **Morris Park** shows highest economic uplift due to strong job density and university/medical clusters.
- All four stations help rebalance regional access for underserved Bronx neighborhoods.

Environmental Benefits

Though environmental datasets were limited, PSA is expected to reduce vehicle miles traveled, improve air quality, and mitigate localized burdens, particularly in Hunts Point, which experiences the Bronx’s highest asthma rates due to truck traffic and industrial land uses. (New York City Department of City Planning, 2024). Similar environmental justice conditions have been documented across heavily freight-served urban corridors, where increased diesel exposure contributes directly to disproportionate respiratory illness rates (Bedrosian, 2023).

Comparative Analysis: Application Beyond New York

International rail expansion case studies show consistent accessibility-driven economic uplift across metropolitan regions (Taylor & Morichi, 2022). PSA follows the same patterns as other expansions:

Calgary Green Line

- Demonstrates TOD-driven planning and shows how station placement aligned with redevelopment potential yields long-term corridor value.
- Highlights relevance of balancing operational constraints (freight corridors) with accessibility goals, like PSA.

Calgary’s Green Line corridor illustrates how TOD-aligned station placement enhances property values and encourages intensified land use diversity near rail investments (Choi, Park, & Uribe, 2022).

London Crossrail (Elizabeth Line)

- Reduced travel times and generated significant economic uplift.
- Offers evidence of property-value growth and concentrated development near new stations, which is important for Bronx land-use planning.

The Elizabeth Line further demonstrates that large-scale rail investments generate long-term regeneration effects through accessibility-based value capture and station-area redevelopment (Peters & Novy, 2023).

Tokyo Suburban Rail

- Illustrates how integrating land with rail access sustains ridership and healthy neighborhoods.
- Reinforces importance of mixed-use, walkable station areas for PSA's long-term viability.

General Recommendations for Effective Railroad Station Placement

Rail station placement must balance operational efficiency, accessibility, community benefits, and long-term economic value. The following recommendations provide a scalable framework that can be applied to a wide range of rail planning contexts, including intercity, commuter, and regional rail projects.

1. **Use MCDA-Based Evaluation Tools**

   Ensure station choices incorporate accessibility, TOD potential, environmental conditions, and operational feasibility.

2. **Prioritize Through-Running Where Possible**

   Through-running reduces bottlenecks and increases network flexibility compared to terminus models.

3. **Strengthen Multimodal Connections**

   High-frequency buses, pedestrian improvements, and protected cycling routes expand station access and support ridership.

4. **Target Areas With Strong Redevelopment Potential**

   Land parcels near Parkchester/Van Nest and Morris Park present opportunities for TOD-driven growth. Transit-oriented development research consistently shows that mixed land use, density, and pedestrian infrastructure near rail stations significantly increase ridership and long-term economic performance (Dittmar & Ohland, 2012).

5. **Use Predictive Modeling for Corridor Constraints**

   Simulate interactions between passenger and freight traffic to ensure reliable headways and dispatching.

6. **Align Station Planning With Long-Term Economic Objectives**

   Station placement should reinforce labor-market access, employment clusters, and equitable mobility.

7. **Integrate Value-Capture Tools**

   Joint development, zoning incentives, and public–private partnerships can support project funding and economic uplift.

Conclusion

PSA shows how data analytics can guide equitable and effective transportation investments. By reducing travel times, improving access to employment, and strengthening regional connectivity, PSA delivers substantial corridor-wide benefits across the East Bronx. Comparative examples from Calgary, London, and Tokyo reinforce the importance of pairing rail improvements with strong land-use planning and multimodal connectivity.

Looking ahead, predictive analytics, AI-driven transit modeling, and open data platforms will further enhance transportation planning. PSA demonstrates the value of integrating demographic data, GIS modeling, and economic analysis to support informed decision-making and long-term regional resilience.

References

Bartholomew, K., & Ewing, R. (2020). *Integrating transportation and land use planning*. Journal of the American Planning Association, 86(1), 25–39.

City of Calgary. (2023). *Green Line LRT project overview.* City of Calgary. https://www.calgary.ca/green-line.html

Crossrail Limited, & Wolstenholme, A. (2018). *Crossrail Property Impact & Regeneration Study 2012 – 2026* [Report]. https://learninglegacy.crossrail.co.uk/wp-content/uploads/2018/07/4D-003-crossrail_property_impact_regeneration_study.pdf

Dittmar, H., & Ohland, G. (2012). *The new transit town: Best practices in transit-oriented development*. Island Press.

Choi, Kwangyul & Park, Han & Uribe, Francisco. (2022). The Impact of Light Rail Transit Station Area Development on Residential Property Values in Calgary, Canada: Focus on land use diversity and activity opportunities. Case Studies on Transport Policy. 10.1016/j.cstp.2022.11.008.

Metropolitan Transportation Authority. (n.d.). *Penn Station Access project.* MTA. https://www.mta.info/project/penn-station-access

New York City Department of City Planning. (2024). BRONX BOROUGH PRESIDENT'S RECOMMENDATION BRONX METRO NORTH STATION AREA STUDY AND RELATED ACTIONS. In *New York City Department of City Planning*. https://zap.planning.nyc.gov/projects/2022X0431

NYC Open Data. (n.d.). *NYC open datasets.* City of New York. https://opendata.cityofnewyork.us

Peters, D., & Novy, J. (2023). *Megaprojects and the city: Crossrail and the politics of contemporary infrastructure planning*. Urban Studies, 60(11), 2198–2215.

Taylor, J., & Morichi, S. (2022). *Rail expansion and metropolitan accessibility: Lessons from international case studies*. Transportation Research Part A, 161, 93–108.

U.S. Census Bureau. (2023). *American Community Survey (ACS) 5-year estimates.* https://data.census.gov

U.S. Department of Transportation, Federal Transit Administration. (2022). *National Transit Database.* https://www.transit.dot.gov/ntd

Wang, X., & Goodchild, M. (2019). *GIS-based models in transportation accessibility research*. International Journal of Geographical Information Science, 33(3), 432–455.

Appendix

Team Charter

IT4997-RailwayTeamCharter.pdf

Project Plan

Project Objectives: The deliverables for the Integrated.Travel Research and Development project include a comprehensive analytical report and an accompanying presentation that outline the factors influencing passenger rail station locations, using the MTA's Penn Station Access project.

This real-world project by the Metropolitan Transportation Authority (MTA) will extend the Metro-North Railroad's New Haven Line to Penn Station, introducing four new accessible stations in the Bronx, upgrading existing tracks and bridges, and reducing travel times between the Bronx and Manhattan by up to 50 minutes**.**

The analysis will explore how factors such as population density, accessibility, economic opportunity, and environmental considerations inform major infrastructure decisions like this. Deliverables will provide actionable insights that can support ongoing and future planning for rail station placement and transportation network efficiency.

Deliverables include:

· Detailed analytical report with GIS-based visualizations illustrating demographic, economic, and environmental influences on station sighting.

· Presentation summarizing findings and recommendations, with specific reference to the Penn Station Access project's relevance.

· Actionable insights for optimizing future passenger rail station placement and accessibility.

· Supporting documentation detailing data sources, analysis methods, and visual results.

· Follow-up briefing with Integrated.Travel Research and Development to discuss findings and implementation opportunities

Approach: The project objectives will be accomplished through a structured research and analysis process combining data analytics, GIS mapping, and urban planning methodologies, with focused application to the Penn Station Access initiative.

- **Define Research Scope and Data Needs:** Identify key variables impacting optimal station placement, population distribution, accessibility, travel demand, economic activity, and environmental constraints; particularly within the Bronx-Manhattan corridor affected by the Penn Station Access project
- **Collect and Prepare Data:** Gather and preprocess demographic, economic, and geographic datasets (e.g., Census data, transportation usage, environmental overlays) relevant to the Penn Station Access corridor. Prepare data for integration into GIS and statistical models.

- **Perform GIS and Statistical Analysis:** Use GIS tools to map proposed station locations and surrounding service areas. Conduct statistical analyses to identify patterns and correlations between population density, accessibility, and travel time improvements.
- **Interpret Results and Generate Insights:** Analyze how the new Metro-North extension enhances regional connectivity, reduces commute times, and stimulates economic growth. Evaluate environmental and social impacts of new station placements.
- **Develop Final Deliverables:** Compile results into a comprehensive analytical report and create a client presentation summarizing key findings, visualizations, and strategic recommendations that mirror the benefits demonstrated in the Penn Station Access project.

SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats)

Strengths

- Strong interdisciplinary team with defined roles in project management, research, data analysis, GIS mapping, and documentation.
- Access to high-quality public datasets from U.S. Census, NYC planning agencies, and transit authorities.
- Proven sprint-based workflow with successful completion of data collection, GIS mapping, and mid-point reporting.
- Strong client communication structure using weekly updates, sprint reviews, and professional documentation.
- Use of GIS and economic modeling provides high-impact, visual, and data-driven insights.

Weaknesses

- Reliance on publicly available data limits access to proprietary ridership, cost, and operational metrics.
- Academic timeframe limits the depth of long-term forecasting and scenario modeling.
- Data inconsistencies across demographic sources required extra standardization effort.
- Limited ability to validate real-world economic projections beyond academic assumptions.

Opportunities

- Findings can directly inform real-world transit planning and station placement decisions.
- Supports equitable transportation development in underserved Bronx communities.

- Demonstrates applied skills in GIS, analytics, project management, and consulting.
- Potential for the client to use the model framework on future station planning efforts.
- Strong alignment with smart city initiatives, sustainability goals, and transit accessibility programs.

Threats

- Delays in client feedback could impact on the refinement of recommendations.
- Data quality issues or missing datasets could weaken final projections.
- Changes in public transportation funding priorities could affect real-world implementation relevance.
- External economic shifts could impact assumptions used in forecasting models.

Known Project Risks, Constraints, and Assumptions

Risks

- Delayed client feedback. Mitigation: Advance scheduling and reminder communications.
- Misalignment between team members. Mitigation: Weekly check-ins and shared documentation.
- Version control errors. Mitigation: Centralized storage and document naming standards.

Constraints

- Time Constraints
  - Fixed 10-week academic project schedule with no timeline extensions.
  - Final report and presentation delivery tied to course deadlines.
- Data Constraints
  - Reliance on publicly available datasets only.
  - Some datasets have limited geographic resolution or outdated values.
  - Inconsistencies across Census, transit, and economic sources.
- Resource Constraints
  - Limited team size with defined academic workload hours.

  - No access to proprietary MTA or internal ridership databases.
  - GIS and modeling are limited to the tools available through the university.
- Scope Constraints
  - Analysis only. No physical engineering, construction planning, or permitting.
  - Economic modeling is limited to academic forecasting methods.
- Client Interaction Constraints
  - Client availability limited to scheduled sprint reviews and email feedback.
  - Feedback turnaround time may delay revisions.

Assumptions

- Data Assumptions
  - Public datasets from Census, MTA, and NYC agencies are accurate and reliable.
  - Available data is representative of current demographic and economic conditions.
  - No major data gaps will prevent completion of core analysis.
- Client Assumptions
  - The client will provide feedback within a reasonable timeframe after each sprint.
  - Client expectations will remain consistent with the approved project scope.
  - No major changes will be introduced later in the project.
- Team Assumptions
  - All team members will remain available throughout the 10-week project.
  - Team members will complete assigned tasks on schedule.
  - Technical skill levels are sufficient to perform GIS, statistical, and economic analysis.
- Technology Assumptions
  - GIS software, statistical tools, and shared collaboration platforms will remain accessible.
  - No major system outages will occur during key delivery weeks.
- Academic Assumptions
  - Grading rubrics and academic expectations will remain unchanged.
  - Course deadlines define final delivery requirements.

Project Overview

The Penn Station Access (PSA) initiative is a significant expansion project led by the Metropolitan Transportation Authority (MTA) to connect Metro-North's New Haven Line to Penn Station in Manhattan. This effort will add four new stations across the East Bronx-Co-op City, Morris Park, Parkchester/Van Nest, and Hunts Point, significantly reducing commute times to Manhattan and improving transit equity in historically underserved neighborhoods. The project aims to enhance connectivity, drive local economic growth, and provide a sustainable transportation alternative that reduces regional congestion.

Our Capstone team, acting as IT consultants, will support this initiative by conducting a data-driven spatial and economic analysis to optimize station planning, assess community impact, and recommend evidence-based enhancements for accessibility, efficiency, and equity. The research findings will directly inform planning decisions, ridership expectations, and socioeconomic forecasts for the PSA project.

Project Scope

The scope of this project defines the specific boundaries of the team's analysis and deliverables. The focus is on data analytics, visualization, and research, not on infrastructure design or construction.

In Scope

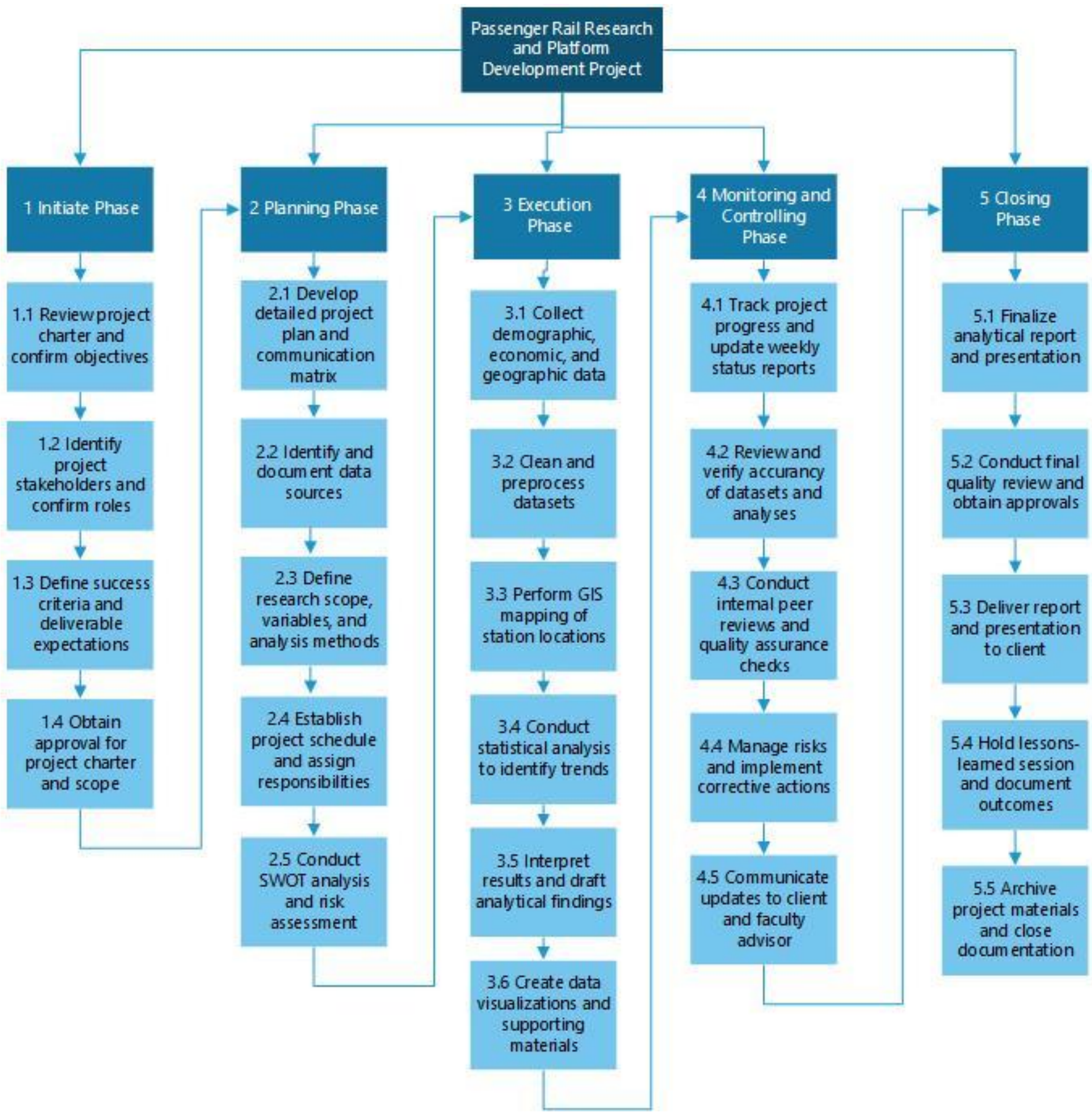
- Development of a data analytics framework to assess potential benefits of new rail stations based on population density, accessibility, and economic factors.
- Integration and analysis of public datasets (e.g., U.S. Census Bureau, MTA ridership, NYC Department of City Planning, and DOT data).
- Creation of GIS-based maps and visualizations showing demographic and economic trends near proposed station locations.

- Conducting statistical correlation and spatial regression analyses to identify relationships between transit access, income levels, and employment density.
- Providing a written research report and presentation deck summarizing findings, visual insights, and recommendations.
- Alignment with client (Integrated Travel) and academic requirements through weekly updates, sprint reviews, and QA documentation.

Out of Scope

- Development of a data analytics framework to assess potential benefits of new rail stations based on population density, accessibility, and economic factors.

Work Breakdown Structure (WBS)



The second view is a list view or outline of the WBS.

Project: Case Study on Penn Station Access Project

1.0 Initiate.
- 1.1 Review project charter and confirm objectives
- 1.2 Identify project stakeholders and confirm roles
- 1.3 Define success criteria and deliverable expectations

- 1.4 Obtain approval for project charter and scope

2.0 Plan
- 2.1 Develop detailed project plan and communication matrix
- 2.2 Identify and document data sources
- 2.3 Define research scope, variables, and analysis methods
- 2.4 Establish project schedule and assign responsibilities
- 2.5 Conduct SWOT analysis and risk assessment

3.0 Execute
- 3.1 Collect demographic, economic, and geographic data
- 3.2 Clean and preprocess datasets
- 3.3 Perform GIS mapping of proposed and existing station locations
- 3.4 Conduct statistical analysis to identify trends and correlations
- 3.5 Interpret results and draft analytical findings
- 3.6 Create data visualizations and supporting materials

4.0 Monitor and Control
- 4.1 Track project progress and update weekly status reports
- 4.2 Review and verify accuracy of datasets and analyses
- 4.3 Conduct internal peer reviews and quality assurance checks
- 4.4 Manage risks and implement corrective actions
- 4.5 Communicate updates to client and faculty advisor

5.0 Close
- 5.1 Finalize analytical report and presentation
- 5.2 Conduct final quality review and obtain approvals
- 5.3 Deliver report and presentation to client
- 5.4 Hold lessons-learned session and document outcomes
- 5.5 Archive project materials and close documentation

Communications Matrix

The Communications Matrix defines how project information is created, distributed, tracked, and stored throughout the Penn Station Access (PSA) Capstone Project. This structure ensures consistent stakeholder engagement, transparency, and accountability across all project phases including Initiate, Plan, Execute, Monitor and Control, and Close.

Information Type	Provider	Recipient	Frequency	Medium	Storage / Location
Project Charter	Project Manager	Client, Team	Once (Initiation)	Email / SharePoint	Project Repository

Weekly Status Reports	Project Manager	Client, Team	Weekly	Email	Project Repository
Sprint Review Reports	Team Leads	Client, Team	Bi-weekly	Email / Meeting	Project Repository
Data Validation Updates	Data Analyst Lead	Project Manager, Team	As Needed	Teams / Email	Shared Data Folder
Mid-Point Report	Project Manager	Client	Once	Email / Meeting	Project Repository
Final Report & Presentation	Project Manager	Client	Once	Live Meeting / Email	Project Archive
Risk & Issue Log	Project Manager	Team	Weekly	Teams	Risk Register
Lessons Learned	Project Manager	Team	Once (Closure)	Meeting / Document	Project Archive

Stakeholder Communication Analysis

- Client: Requires executive-level status, milestone reports, and final recommendations.
- Project Team: Requires detailed task-level communication, sprint updates, and QA coordination.
- Academic Stakeholders: Require formal documentation aligned to grading rubrics and academic deadlines.

Media Choice Table

Communication Type	**Ideal Medium**	**Reason**	**Backup Medium**
Weekly Updates	Email	Creates formal record	Teams

Sprint Reviews	Live Meeting	Immediate feedback & discussion	Videos
Urgent Issues	Teams Chat	Immediate response	Text Message
Deliverable Submission	Email + Slack	Formal documentation control	Text Message

PSA Project Product Backlog

Completed Tasks

- Stakeholder Identification
- Census and GIS Data Collection
- Data Cleaning and Standardization
- GIS Mapping
- Mid-point Report
- Preliminary Economic Impact Modeling
- Draft Final Recommendations
- Initial Client Presentation Slides

Remaining Tasks

- Archive Project Materials