Improving Emergency Shelter Utilization Through Time Series Forecasting

Course: MNGT-257 Business Certificate Capstone

Instructor: Chantelle Lamotte

Mentor: Randy Thornhill, Director of Organizational Impact, YW Calgary

Date: 16-04-2025

A data-driven solution to support vulnerable Calgarians during shelter surges

Meet Our Team Members

We are a group of dedicated business students from SAIT collaborating to deliver a comprehensive pitch for our project.

01 **Saran Poocharoen**

02 **Deanna Rose Quiambao**

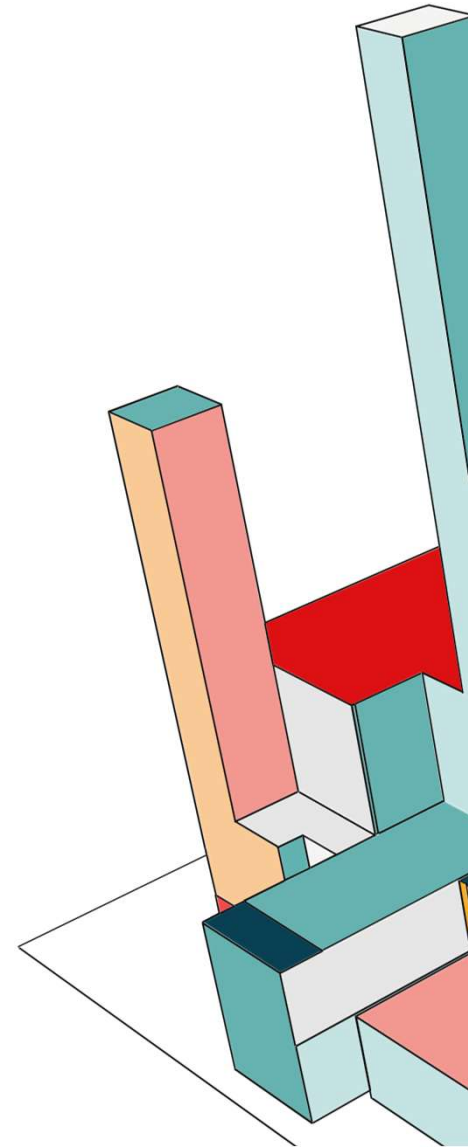03 **Prajwal Nagaraj**

04 **Thi Hanh Nguyen Phan**

05 **Genevieve Ababa**

AGENDA

❑ Pitch Purpose

❑ The Problem & Solution

❑ Project Scope

❑ Competitive Analysis

❑ Methodology

❑ Final Products

❑ Conclusion

Pitch Purpose

"Meet Maya. Last December, she walked 5 km in -30°C to find a shelter, only to be told it was full."

What if we could have predicted that, and guided her somewhere with space?
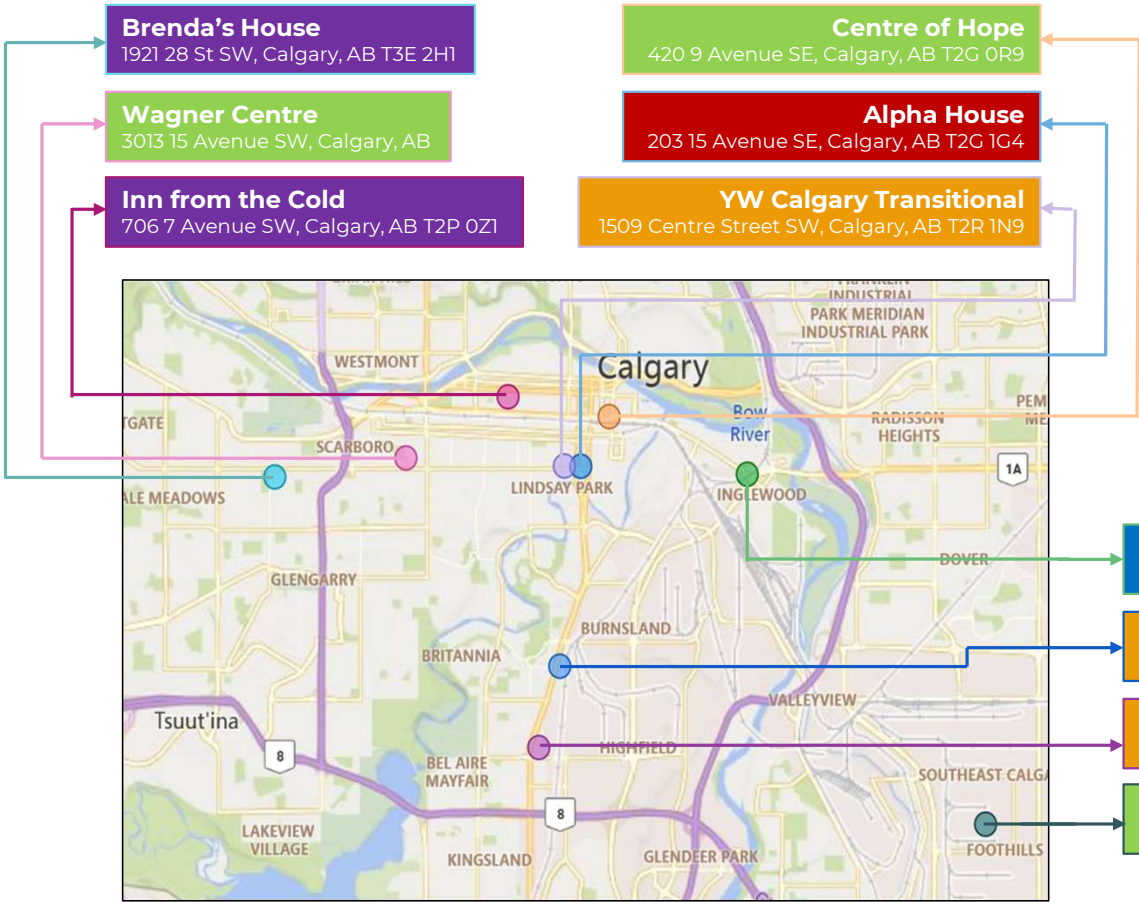
The Problem & Our Solution

- Calgary shelters face overcrowding and/or under-utilization due to demand fluctuations.
- Current platforms provides real-time data but lacks forecasting.
- Vulnerable populations may be turned away during high-demand periods.

- We built a simple, intuitive platform that forecasts shelter occupancy in advance.
- Predict shelter occupancy trends for the next 2 years.
- It helps staff act early, plan better, and prevent people from being turned away.

Project Scope

Brenda's House
1921 28 St SW, Calgary, AB T3E 2H1

Wagner Centre
3013 15 Avenue SW, Calgary, AB

Inn from the Cold
706 7 Avenue SW, Calgary, AB T2P 0Z1

Centre of Hope
420 9 Avenue SE, Calgary, AB T2G 0R9

Alpha House
203 15 Avenue SE, Calgary, AB T2G 1G4

YW Calgary Transitional
1509 Centre Street SW, Calgary, AB T2R 1N9

YW Calgary Emergency
1715 17 Avenue SE, Calgary, AB T2G 5J1

Calgary Dream Centre – Short Term Supportive
4510 Macleod Trl SW, Calgary, AB T2G 0A4

Peter Coyle Place – Short Term Supportive
5700 3 St SW, Calgary, AB T2H 3B4

Mustard Seed
7025 44 Street SE, Calgary, AB T2C 4E8

Data source:
Open Data Alberta

Shelters Daily Occupancy
Year 2013 – 2024

10 Shelters in Calgary, AB
- **1 Intoxicated**
- **3 Transitional**
- **3 Adult Emergency**
- **1 Women Emergency**
- **2 Family Emergency**

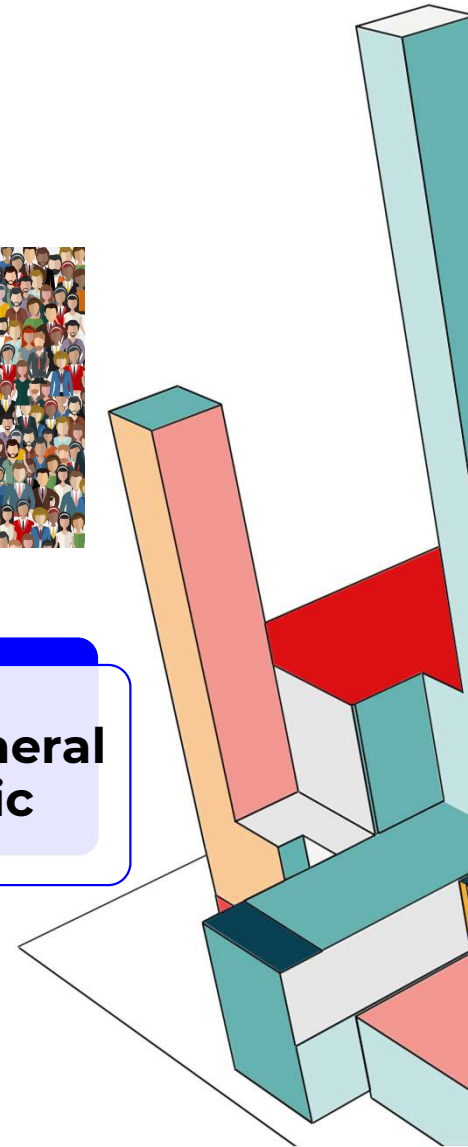Alberta Government
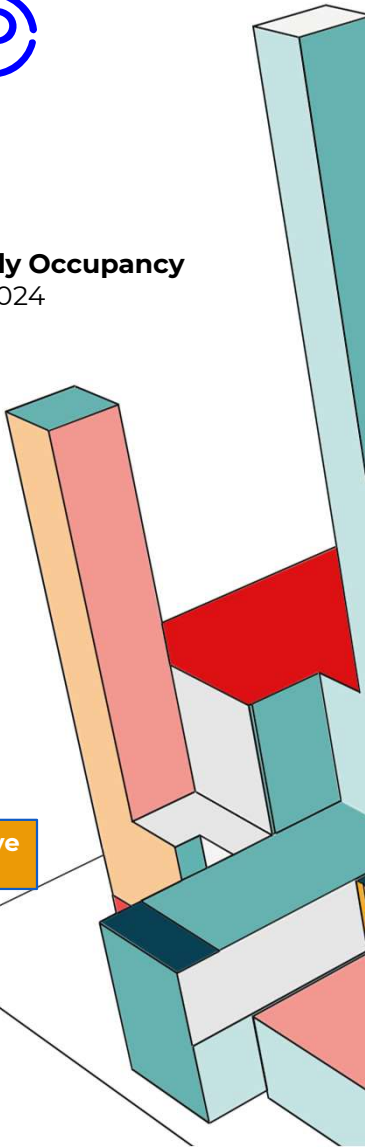
Target Market
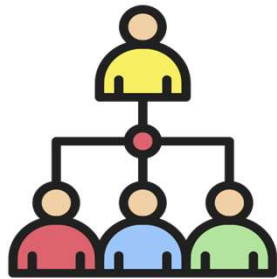
Frontline Workers & Caseworkers

Shelter Management & Staff

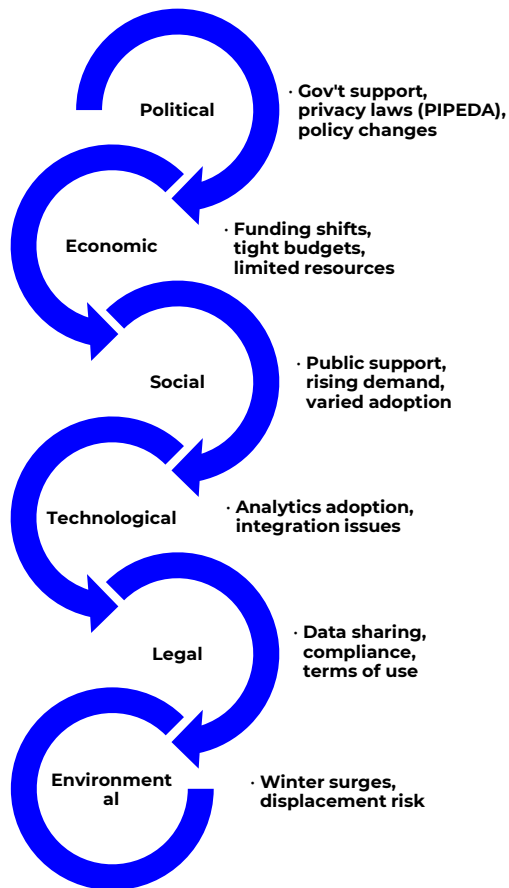**Government Agencies & Public Services**

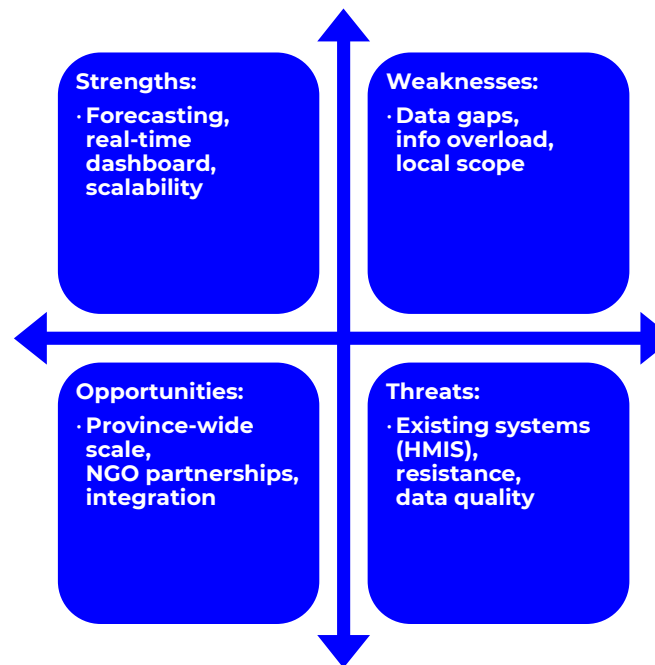**The General Public**

Competitors

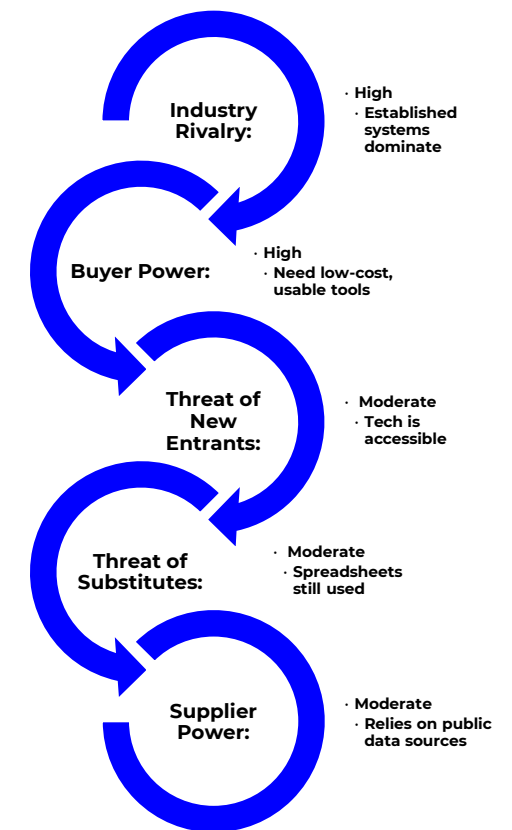| Existing Shelter Systems	Strengths	Weaknesses
Shelterlink App	Real-time bed tracking; expansion potential	No predictive analytics; data consistency issues
Homelessness Management Information System (HMIS)	Tracks performance; privacy compliant	No predictive analytics; limited participation
Coordinated Access and Assessment (CAA) systems	Real-time matching; service integration	No predictive analytics; inconsistent data systems
ShelterSafe	User-friendly; 24-hour helpline	No real-time tracking; limited to domestic violence shelters
DomesticShelters.org	Multilingual; lists shelter needs	No predictive analytics; no real-time updates
My Sister's Keeper	Women's homelessness focus; local engagement	Small capacity; no real-time tracking
Find Shelter	Lists shelters by location; offers extra services	No predictive analytics; no real-time updates
iHEAL App	Links to resources; safety planning for women	No real-time tracking; focused on safety, not housing

Competitive Analysis

PESTLE – EXTERNAL FACTORS

Political
· Gov't support, privacy laws (PIPEDA), policy changes

Economic
· Funding shifts, tight budgets, limited resources

Social
· Public support, rising demand, varied adoption

Technological
· Analytics adoption, integration issues

Legal
· Data sharing, compliance, terms of use

Environmental
· Winter surges, displacement risk

SWOT – Strategic Scan

Strengths:
· Forecasting, real-time dashboard, scalability

Weaknesses:
· Data gaps, info overload, local scope

Opportunities:
· Province-wide scale, NGO partnerships, integration

Threats:
· Existing systems (HMIS), resistance, data quality

Porter's Five Forces Market Dynamics

Industry Rivalry:
· High
· Established systems dominate

Buyer Power:
· High
· Need low-cost, usable tools

Threat of New Entrants:
· Moderate
· Tech is accessible

Threat of Substitutes:
· Moderate
· Spreadsheets still used

Supplier Power:
· Moderate
· Relies on public data sources

COMPETITION
Why We are Different

Feature	Existing Tools	Our Solution
Real-time Tracking	Yes	Yes
Forecasting (Next 7 days – 2 years)	No	Yes
Easy to Use	No	Yes
Designed with Shelters	No	Yes
Affordable for Nonprofits	No	Yes

Methodology

AGILE

- Plan
- Design
- Develop
- Test
- Release
- Feedback
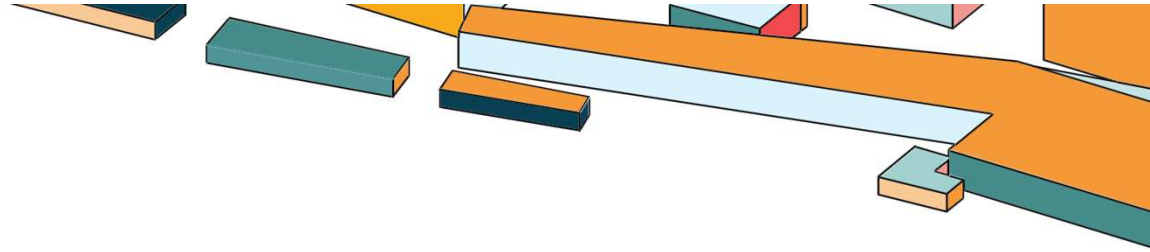
✓ Agile approach with weekly sprints

🤝 Close mentorship with YW Calgary

Regular testing, feedback loops, and stakeholder reviews
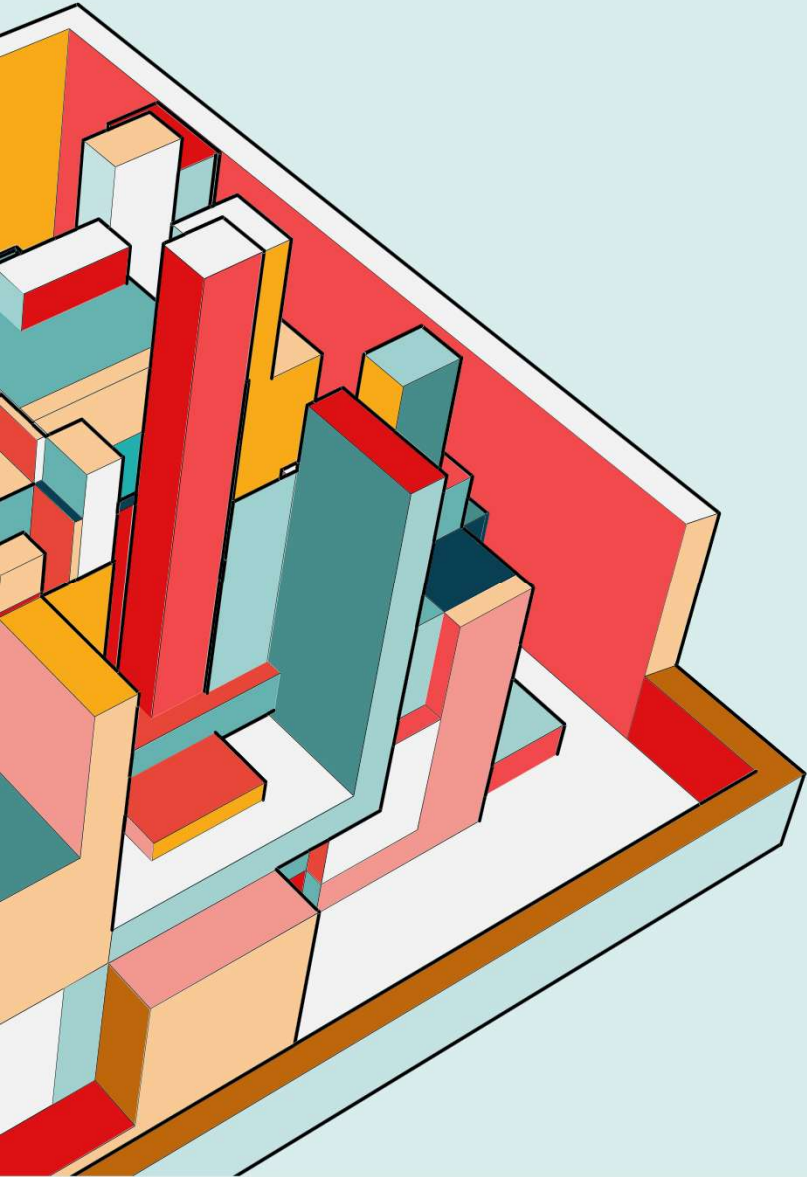
Demo:
How It Works

Prototype 1: Shelter Occupancy Dashboard
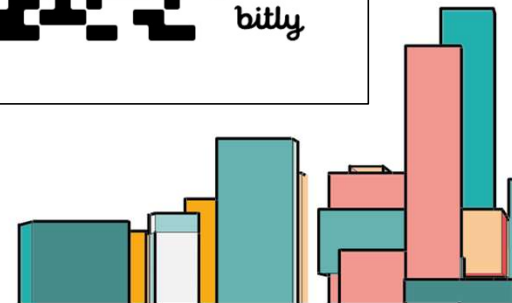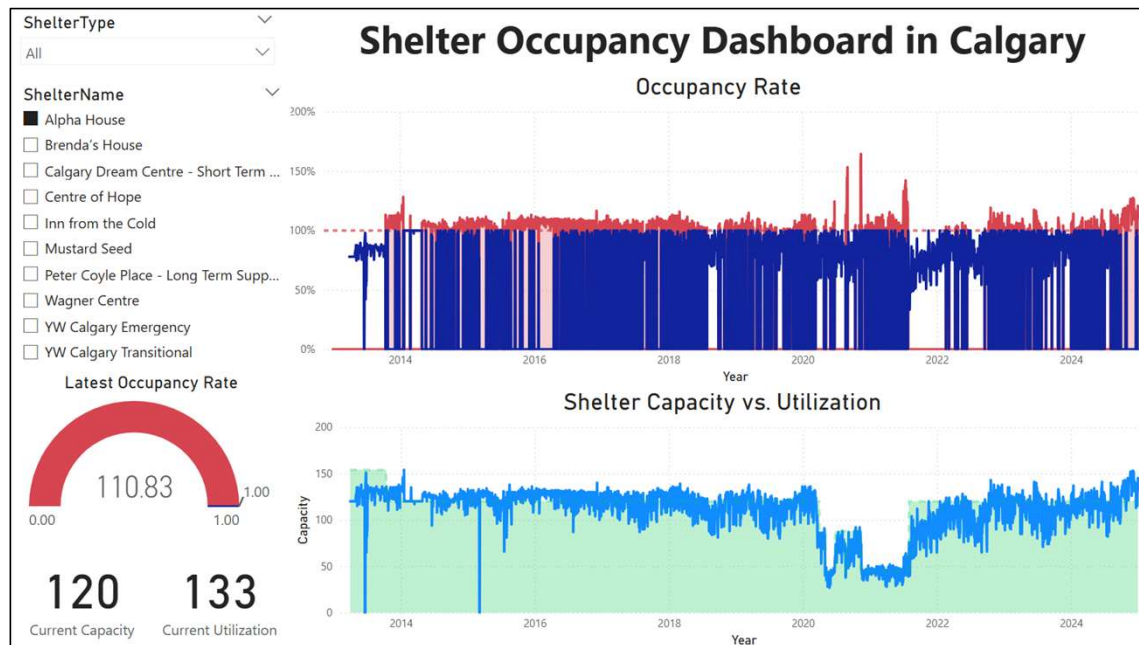
Prototype 2: Shelter Occupancy Rates Forecast Web-App
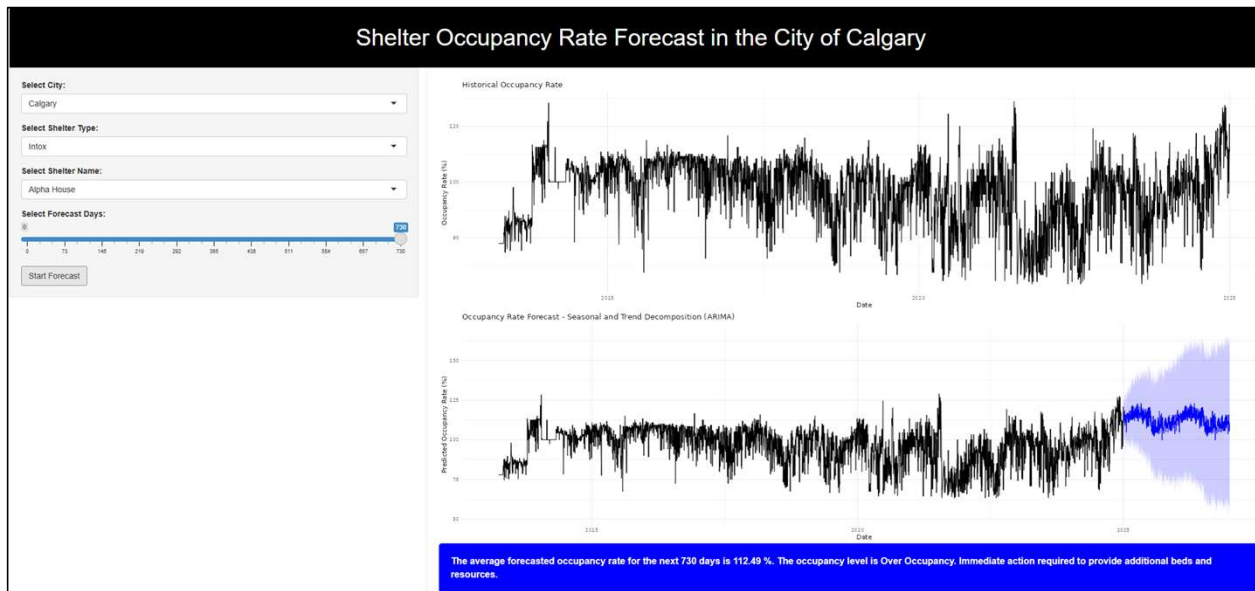
Model: Seasonal Decomposition Auto-Regressive Integrated Moving Average (ARIMA)

Prototype 3: Action Plan Framework

Occupancy level	Occupancy Rate	Action
Low Occupancy	< 60%	Address underutilized resources
Moderate Occupancy	60% - 85%	Maintain Efficiency & Flexibility
High Occupancy	85% - 100%	Proactive Intervention is Necessary
Over Occupancy	>100%	Immediate action required
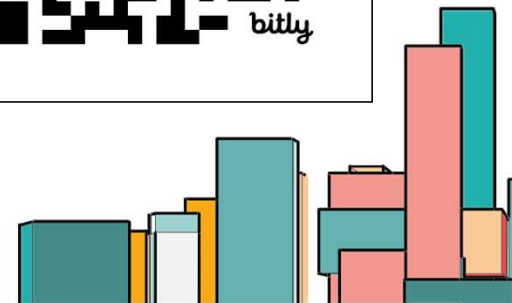
Prototype 3: Action Plan Framework

Occupancy level	Occupancy Rate	Notes
Low Occupancy	< 60%	Underutilized resources
Moderate Occupancy	60% - 85%	Normal operations
High Occupancy	85% - 100%	Risk of overcrowding
Over Occupancy	>100%	Need more beds immediately

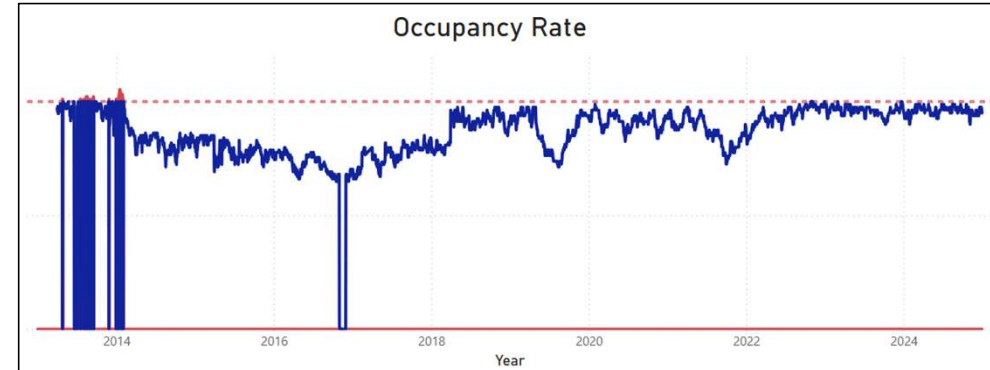# Supporting Materials
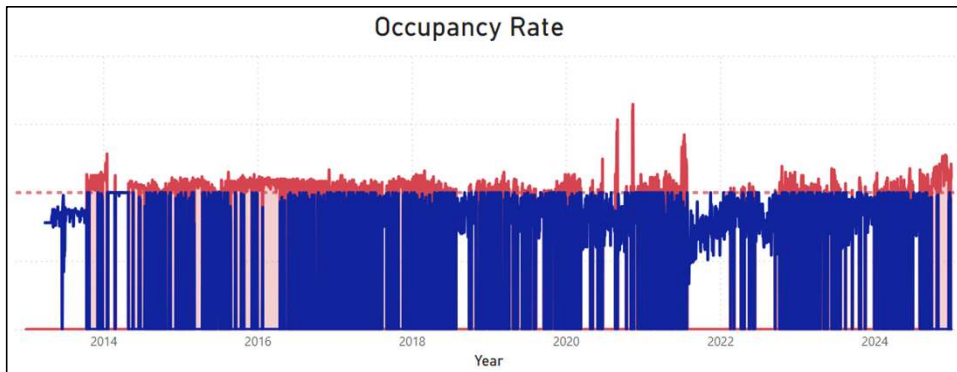
Alpha House | Intox
Trend: **Stable**
Occupancy level: **Frequent Over-occupancy**

Calgary Dream Centre | Transitional
Trend: **Increasing**
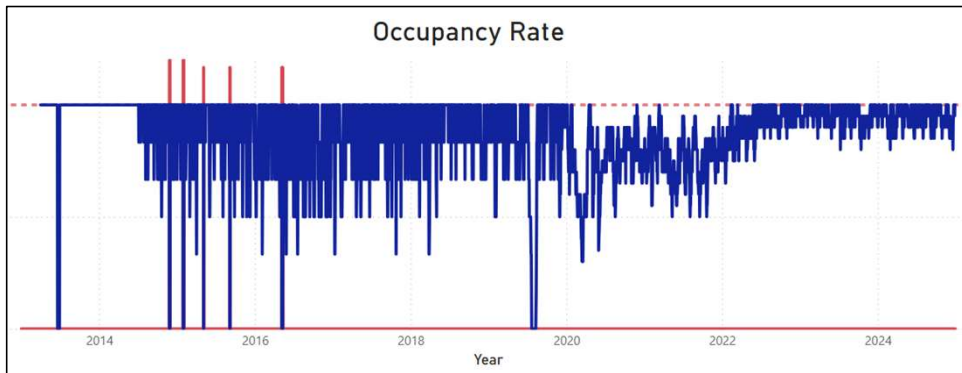Occupancy level: **Over-occupancy, especially after 2021**
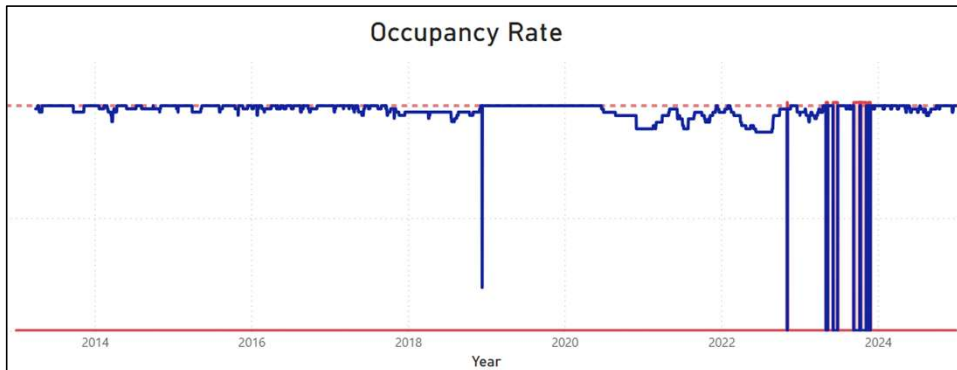
Peter Coyle Place | Transitional
Trend: **Stable, Rare Fluctuations**
Occupancy level: **Frequent High to Full Occupancy**

YW Calgary Transitional | Transitional
Trend: **Fluctuating from 2014 to 2022, stabilized afterwards**
Occupancy level: **High to Moderate Occupancy**
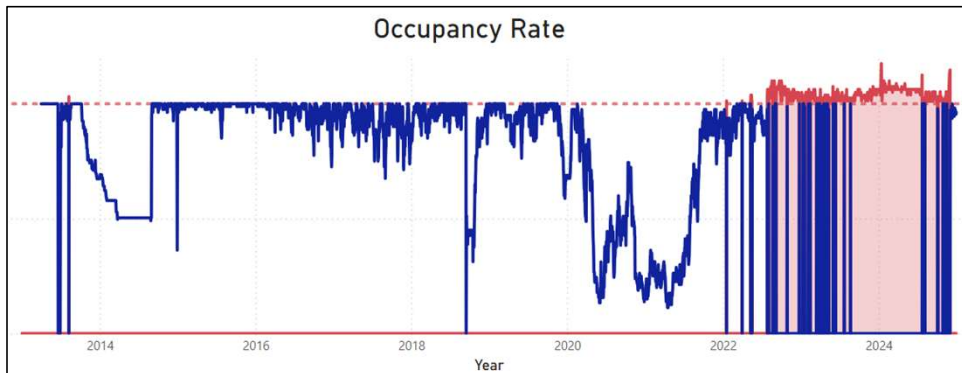
Supporting Materials

YW Calgary Emergency | Women Emergency
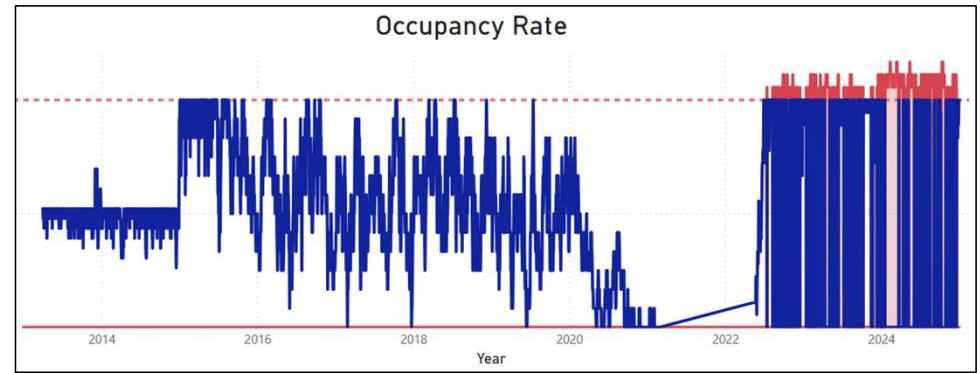Trend: **Stable, Decreased on year 2020 to 2022**
Occupancy level: **Consistent High Occupancy**

Wagner Centre | Adult Emergency
Trend: **Decreasing until 2022, stable years after**
Occupancy level: **Low to Moderate until 2022, Over Occupancy years after**

Centre of Hope | Adult Emergency
Trend: **Stable until 2018, Decreased in 2020, Remained stable afterwards**
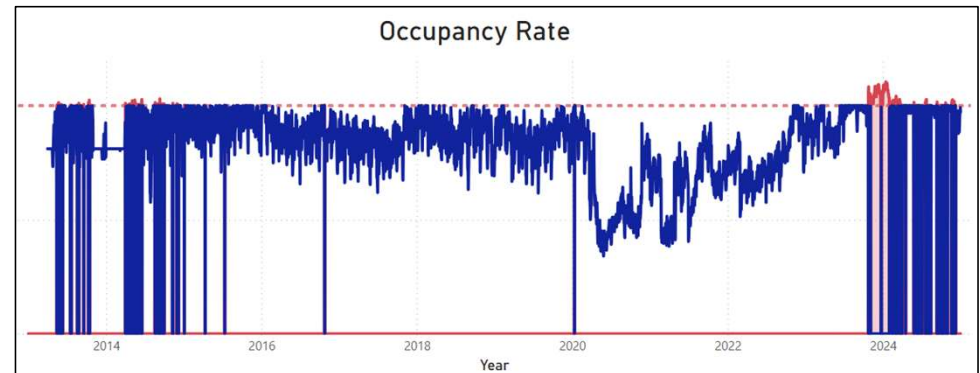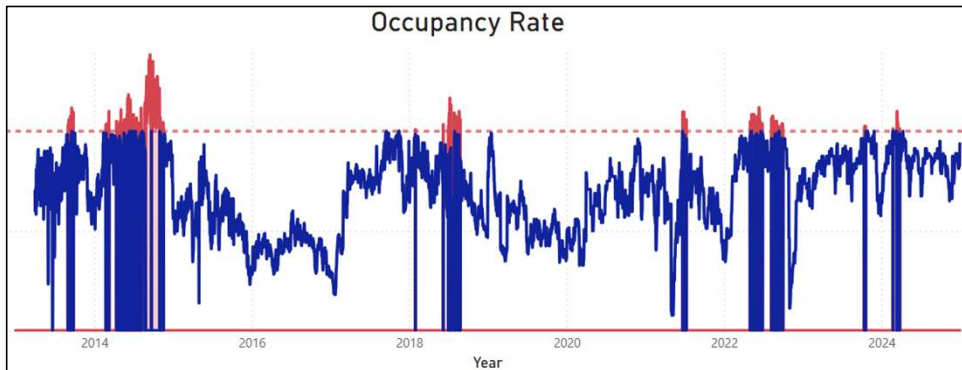Occupancy level: **Over Occupancy starting from middle 2022**

Mustard Seed | Adult Emergency
Trend: **Stable until 2019, Decreased in 2020, Increased again afterwards**
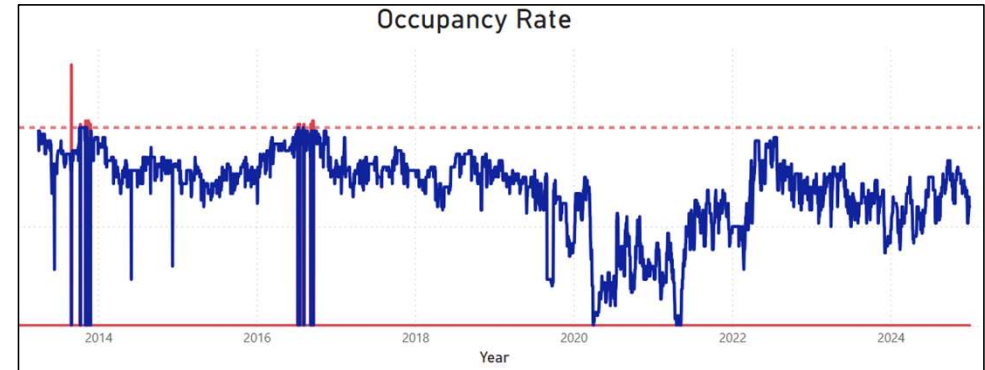Occupancy level: **High Occupancy**

Supporting Materials

Inn from the Cold | Family Emergency
Trend: **Obvious Fluctuations**
Occupancy level: **Over Occupancy during 3rd and 4th Quarter**
                Low to Moderate during 1st and 2nd Quarter

Brenda's House | Family Emergency
Trend: **Fluctuating**
Occupancy level: **Moderate Occupancy**

Results and Analysis

Shelters Affected	Occupancy Level in the Next 2 Years	Analysis
Alpha House	Critical Over-occupancy	Immediate Action Required
Wagner Centre	Critical Over-occupancy	Immediate Action Required
Mustard Seed	Critical Over-occupancy	Immediate Action Required
Peter Coyle Place	High Occupancy	Proactive Intervention is Necessary
Centre of Hope	High Occupancy	Proactive Intervention is Necessary
Calgary Dream Centre	High Occupancy	Proactive Intervention is Necessary
YW Transitional	High Occupancy	Proactive Intervention is Necessary
YW Emergency	High Occupancy	Proactive Intervention is Necessary
Inn from the Cold	High Occupancy	Proactive Intervention is Necessary
Brenda's House	Moderate Occupancy	Maintain Efficiency & Flexibility

Recommendation for Critical Over-Occupancy Shelters

Alpha House | Wagner Center | Mustard Seed
Intox | Adult Emergency | Adult Emergency

	Allocate funding for possible expansion of shelter spaces	Request additional funding from stakeholders for possible expansion of shelter spaces (i.e. Government of Alberta, Partners, Sponsors, Donors, etc.)	NLT 3rd Quarter Year 1
		Secure temporary shelter spaces, such as hotels or private-market apartments, to provide immediate relief and increase capacity.	Year 1
	Increase partnerships with other emergency shelters in the city	Collaborate with other emergency shelters within the city to facilitate the referral of clients and adopt housing-first support approach.	Continuously
		Participate in the Service Hub Model program led by the GoA to establish referral of individuals experiencing homelessness to a wider range of resources.	Year 1
	Improve case management of the clients in the shelter	Review the Average Length of Stay (ALOS) at the shelters and determine specific clientele who have overstayed their intended shelter duration.	Within 1st Quarter Year 1
		Establish a seasonal staffing pool and maintain a list of well-trained on-call staff, while complying with the standard case management ratio to client.	NLT Year 2
	Conduct Future Studies and Innovations	Conduct comprehensive future studies to assess additional factors that influence the demand for shelter services, such as economic trends, seasonal fluctuations, and client needs.	Year 1

Recommendation for High Occupancy Shelters

Peter Coyle Place | Centre of Hope | Calgary Dream Centre | YW Transitional |
Transitional | Adult Emergency | Transitional | Transitional |

YW Emergency | Inn from the Cold
Women Emergency | Family Emergency

|			
	Develop and implement new strategies for better tracking	Utilize the Web app to track the occupancy rate for one week in advance.	Weekly
		Develop and implement more effective planning and resource allocation based on the tracking of occupancy rate weekly.	Quarterly
	Utilize the capacity more effectively	Develop the resource allocation plans (staff, facilitie) during underused capacity.	Quarterly
		Coordinate with other housing partners to utilize underused capacity using the predictive occupancy rate from the Web app.	Continuously
	Understand and communicate progress on shelter demands	Conduct needs analysis by assessing more factors which can affect shelter demands (seasonal, economic trends, client's needs).	Year 1
		Working with community/housing partners to develop and implement a "by-name" list to support coordination of resources and understand changes in shelter demands in Calgary.	Quarterly Year 1
		Develop communication strategies for regular communication with and receiving information from the community/housing partners for shelter demands.	Quarterly

Recommendation for Moderate Occupancy Shelter

Brenda's House | Family Emergency

	Improve Resource Allocation and Capacity Utilization	Maintain 90% occupancy rate in moderate occupancy shelters with a balance of staff allocation to meet client needs.	Monthly
		Ensure that the available shelter spaces are occupied during high-demand periods by coordinating with other community partners.	Year 1

Presentation to Industry Mentor
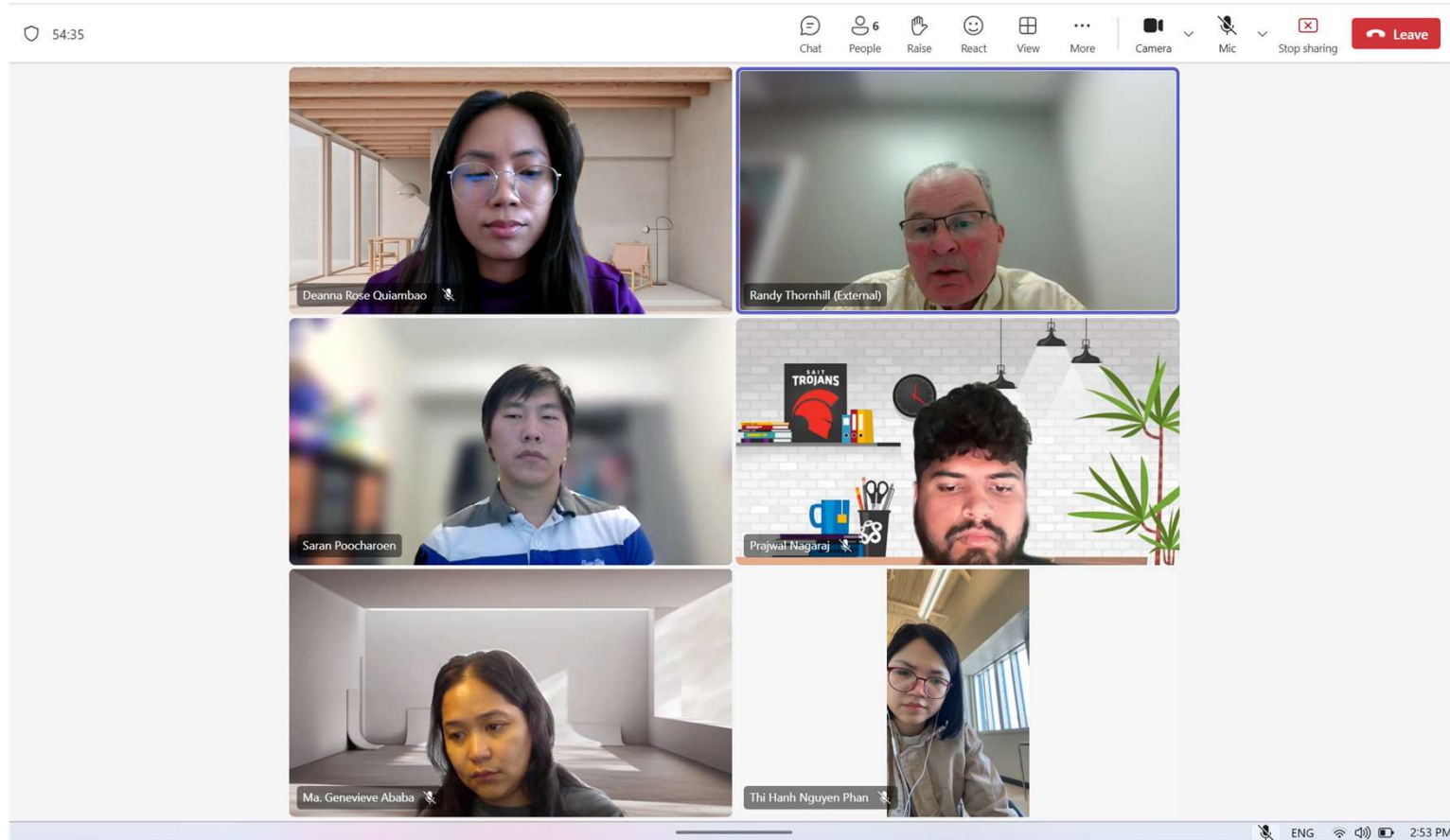
CapCon 2025
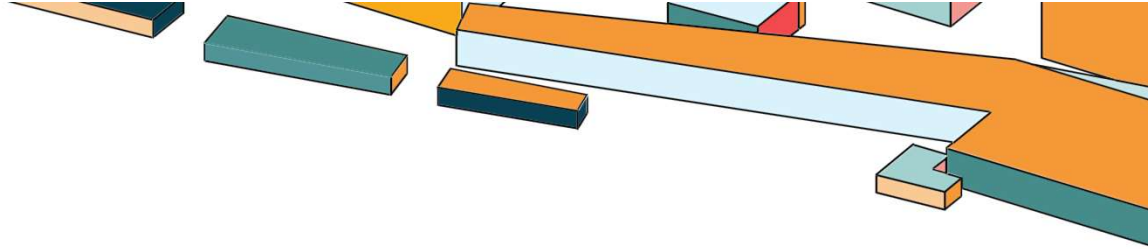
With our Industry Mentor
Mr. Randy Thornhill, YW Calgary

With our Capstone Instructor
Ms. Chantelle LaMotte, School of Business, SAIT

THANK YOU

"Let's build smarter, more responsive shelters – starting today."

Do you have any questions?