General Sri John Kotelawala Defence University

Faculty of Management Social Science and Humanities

Department of Language

BSc in Applied Data Science Communication

SQL for Data Science (LB1224)

Year 1: Semester 2

Group Assignment 03

Task -02

Group Members

D/ADC/24/0021-D.P.Chami Sadunika

D/ADC/24/0024-M.M.C.C.Marasinghe

D/ADC/24/0033-E.S.R.Ruparathna

D/ADC/24/0034-W.D.S.N.Kulasooriya

2018-2024

IMP WORK PERMIT HOLDERS IN CANADA

Table of Content

Task 02

1. Introduction

The Canadian labour market is subject to continuous change due to both domestic and international factors, such as economic demands and immigration policies. The Temporary Foreign Worker Program and the International Mobility Program are two major contributors towards the resolution of labour shortages and the economic growth of Canada. The TFWP makes provisions for Canadian employers to temporarily hire foreign nationals if qualified workers are not available, while the IMP caters to those positions in the best interest of Canada's broad economic, cultural, and social interests, without including an LMIA requirement. Both these programs together play a significant role in industries like technology, health care, and manufacturing.

This report explores and analyses the Canadian Monthly IRCC Updates dataset using various advanced data analytics tools, including Microsoft SQL Server and Power BI. These tools help clean, transform, and visualize immigration trends and insights into labor demands and policy impacts. From this data set, we extracted four major industries with preferred occupations, given their high value in the Canadian labor market. It is as follows,

Information technology	Healthcare	Agriculture	Hospitality and tourism
2171-Information systems analysts and consultants 2172-Database analysts and data administrators 2173-Software engineers and designers 2174-Computer programmers and interactive media developers 2175-Web designers and	3011-Nursing coordinators and supervisors 3012 - Registered nurses and registered psychiatric nurses 3111 - Specialist physicians 3112 - General practitioners and family physicians 3113-Dentists 3114-Veterinarians 3121- Optometrists 3122 - Chiropractors 3124 - Allied primary health practitioners 3125 - Other professional occupations in health diagnosing and treating	0821-Managers in agriculture 0823-Managers in aquaculture 2123-Agricultural representatives, consultants, and specialists 2222-Agricultural and fish products inspectors 2225-Landscape and horticulture technicians and specialists	0631 - Restaurant and food service managers 0632-Accommodation service managers 6311-Food service supervisors 6312-Executive housekeepers 6313-Accommodation, travel, tourism and related services supervisors 6314-Customer and information services supervisors 6315-Cleaning supervisors

developers 2281- Computer network technicians 2282- User support technicians 2283 Information systems testing technicians 3012 Registered nurse and registered psychiatric nurse	3131-Pharmacists 3132-Dietitians and nutritionists 3141 - Audiologists and speech-language pathologists 3142 - Physiotherapists 3143-Occupational therapists 3144 - Other professional occupations in therapy and assessment 3211 - Medical laboratory technologists 3212 - Medical laboratory technicians and pathologists' assistants 3213 - Animal health technologists and veterinary technicians 3214-Respiratory therapists, clinical perfusionists and cardiopulmonary technologists 3215-Medical radiation technologists 3216 - Medical sonographers 3217-Cardiology technologists and electrophysiological diagnostic technologists, n.e.c. 3219-Other medical technologists and technicians (except dental health) 3121 - Optometrists 3222-Dental hygienists and dental therapists 3223-Dental technologists, technicians and laboratory assistants 3231-Opticians	8252- Agricultural service contractors, farm supervisors, and specialized livestock 8431 General farm workers 8432-Nursery and greenhouse workers 8611- Harvesting labourers	6321-Chefs 6322-Cooks 6331-Butchers, meat cutters and fishmongers - retail and wholesale 6332-Bakers 6512-Bartenders 6513-Food and beverage servers 6522-Pursers and flight attendants 6525 Hotel front desk clerks 6532-Outdoor sport and recreational guides

	3232-Practitioners of natural healing 3233-Licensed practical nurses 3234 - Paramedical occupations 3236-Massage therapists 3237-Other technical occupations in therapy and assessment 3411-Dental assistants 3413-Nurse aides, orderlies and patient service associates 3414-Other assisting occupations in support of health services 4151-Psychologists		

The findings of this study are designed to provide a broader perspective on the socio-economic impacts of both TFWP and IMP on Canada's innovation-based industries and their broader sustainability, particularly information technology, healthcare, agriculture, hospitality and tourism. Additionally, this interactive dashboard presents a visual storyline of these trends to underpin data-driven decisions and strategic policy development.

In this work, we show how sophisticated data visualization and analysis can transform raw data into actionable insights, thus making valuable contributions to a discourse on immigration and its contribution to shaping the Canadian economy.

2. Methodology

2.1 Importing Data

To create the dashboard, the data set was imported from the official police data website Dataset: https://open.canada.ca/data/en/dataset/360024f2-17e9-4558-bfc1-3616485d65b9.

Next open datasets on the EXCEL sheet then rearrange the columns.

2.2 Modeled the Dataset

After importing dataset, we created a dataset using that dataset. These are the steps

1. Select high value industry in Canada labor market.
    - Information Technology
    - Health Care
    - Agriculture
    - Hospitality & Tourism
2. After that , the Provinces were selected for the data set
    - New Foundland and Labrador
    - Prince Edward Island
    - Nova Scotia
    - New Burnswick
    - Quebec
    - Ontario
    - Manitoba
    - Saskatchewan
    - Alberta
    - British Colombia
    - Yukon
    - Northwest Territories
    - Nunavut
3. Then only the jobs in the relevant fields were selected from the jobs listed in those provinces.

4. After the above steps, the new data set was created using the data from 2018 to 2024.

2.3 Creating Database in SQL

Database > New Database > Database Name (NEW SALES 1) > ok

Double click on NEW SALES 1> Task > Import Flat File > Next >

Browse > NEW SALES 1 DB > Next

2.4 Data Cleaning Part

- Add new Column, Change the column names and change the data type accordingly.
- Values between 0 and 5 were shown as "--" and the median value between 0 and 5 was 3, "--" was used for this.
- Then insert allow nulls > next > finish
  Next, replace the null values as '0' using the T-SQL code

2.5 Imported the Datasets into Power BI

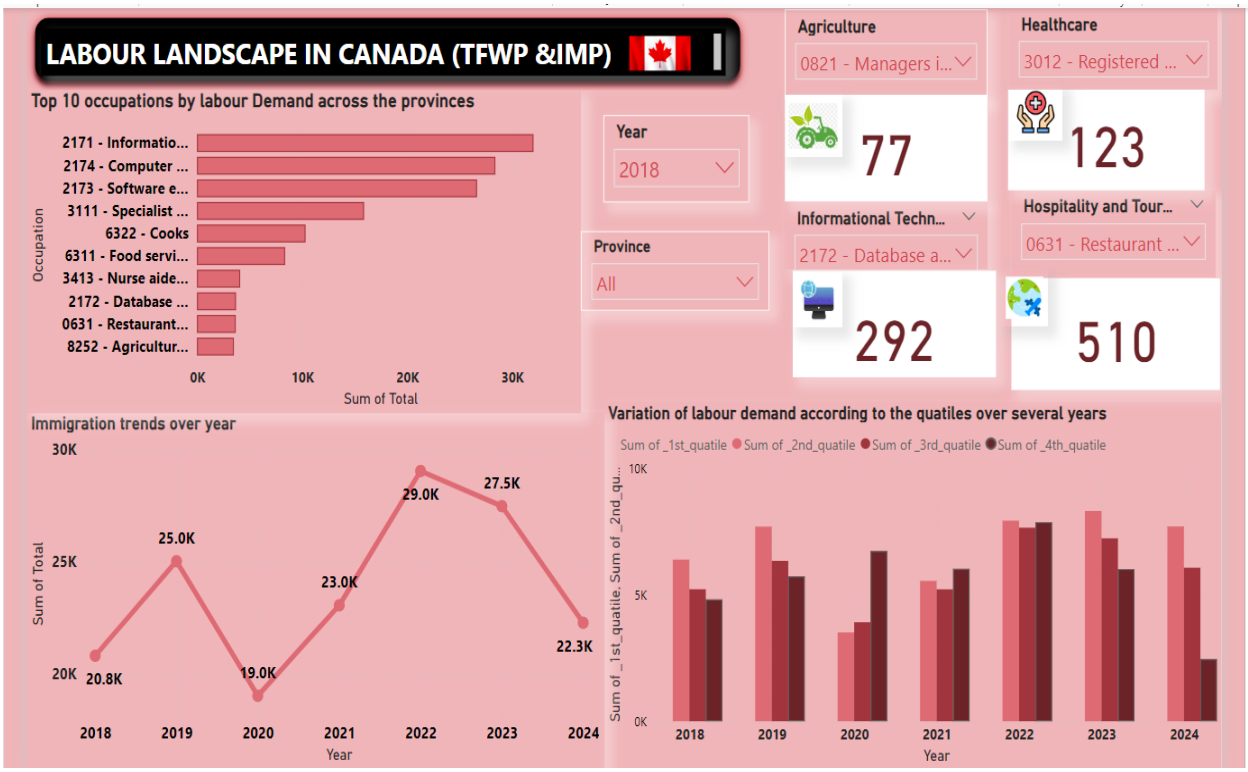
Next import the datasets into Power BI through the following steps

Get data > SQL server > server name > ok

Then select the 'NEW SALES 1' datasets which we imported previously to the SQL.

3. Visualization

3.1 Dashboard Review



3.2 Card Visualization

In this visualization, we used Card visualization to visualize each major industry because this visualization helps to present the data in such a way that users can grasp the relevant insights without much hassle. A card visualization in data visualization is a simplistic, condensed representation depicting a single value or key metric. It is usually used on the dashboard for faster insights.

Information Technology

In this case, the cards will only show the total number of foreign workers in the visible IT industry. Also using the slicer as mentioned above, we can filter it according to the desired year, province, or job occupations.

Key insights

- Labour Demand: The total number of foreign workers in the IT sector underlines the vital dependence of this industry on international talent to meet Canada's rapidly growing technological and innovation-driven demand.
- Regional Insight: Filtering by province offers sight to which regions are talent pools for IT, quite evidentially where the technology ecosystems are thriving, Ontario or British Columbia.
- Time Trend: Year-based filtering shows growth patterns in foreign worker dependency, reflecting trends in global tech hiring and evolving digital skill gaps. Occupation-Specific Insights: Filtering by job roles shows what IT specialties are most in demand, such as software engineering, AI research, or cyber security.

Healthcare

In this visualization, we used a card visualization for the specific total foreign workers in the healthcare industry. Also using a slicer, we can filter this by selected year selected province, or selected job occupations.

Key insights

- Essential Workforce: The visualization of the healthcare card serves to highlight foreign workers in filling labor gaps in such vital health services as nursing, caregiving, and medical technologies.
- Provincial Trends: Filtering reveals provinces with higher healthcare worker recruitment, which may correlate with population needs or healthcare investments (e.g., Alberta, Quebec).
- Global Events Impact: Time trends may record increased demand during global calamities such as pandemics, reflecting the industry's response to emerging health challenges.

Agriculture

This visualization shows the total number of foreign workers in the healthcare industry, using a slicer we can filter this by selected year, selected province, or selected job occupations.

Key insights

- Seasonal Demands: Agriculture is very seasonal, hence it often requires temporary foreign workers, and slicer-based analysis will show which peak years or regions are driving these trends, such as Manitoba and Saskatchewan.

- Labour Dependence: It reveals the sector's reliance on foreign manpower, necessary to ensure adequate food chain supplies.
- Job-Specific Breakdown: Field workers, animal tenders, and machinery operators are examples of occupations that denote the diversity in this industry for different needs.

Hospitality and Tourism

As well as this visualization also shows the specific total number of foreign workers in the Hospitality and Tourism sector, using a slicer we can filter this by selected year, selected province, or selected job occupations.

Key insights

- Labour Shortages: The overall number of foreign workers shows the impact of staff shortages in this service-oriented industry, particularly in tourism-heavy provinces like British Columbia and Alberta.
- Global Events Effect: Filtering by year shows the influence of global events, like economic downturns or a pandemic such as COVID-19, on the hiring trends of foreign workers in this industry.
- Seasonality: A trend for particular years and months shows the concomitance with peak tourism seasons.

3.3 Slicer

Mainly we use two slicers for our convenience,

Province

Filters data by geographic areas. There are 13 areas as indicated below

- Newfoundland and Labrador
- Prince Edward Island
- Nova Scotia
- New Brunswick
- Quebec
- Ontario
- Manitoba
- Saskatchewan
- Alberta
- British Columbia
- Yukon
- Northwest Territories
- Nunavut

Year

Filters data to specific years (20018-2024)

- Also additionally, we used a slicer for each major industry to easily filter their job occupations.

3.4 Top 10 Occupations by Labour Demand Across The Provinces

The bar chart listing the top 10 occupations in demand across Canadian provinces shows that the key positions vital to Canada's economy, most of all dependent on immigrant labor, are dominated by technology. This is shown through the highest need for information systems analysts and consultants (2171), computer programmers (2174), and software engineers (2173). This trend reflects the overall accelerating digital transformation and a growing demand by Canada for qualified IT workers to underpin innovation, cyber security, and digital solutions across industry.

Significant labor shortages are also present in the healthcare industry; the fourth-ranked Specialist Physicians (3111) highlight the ongoing lack of medical knowledge, particularly in underserved and rural areas. Furthermore, positions like Nurse Aides, Orderlies, and Patient Service Associates (3413) demonstrate the growing need for healthcare support workers in Canada due to the country's aging population and growing healthcare service requirements.

These labor-intensive sectors thus have a great demand for jobs such as Cooks (6322), Food Service Supervisors (6311), and Restaurant and Food Service Managers (0631). Such is indicative of the post-pandemic recovery period, during which there is now strong reliance on foreign workers as businesses open up and tourism heats up to meet the requirements of such skilled labor areas.

Furthermore, although they are in the last places, agriculture and critical services are not out of the race. Especially for seasonal work, Agricultural Service Contractors and Farm Supervisors (8252) are fundamental to food production in Canada and the rural economy. In contrast, database analysts and administrators (2172) reflect a rising importance of analytics and data management to advance productivity and decision-making in several sectors.

The overall trends seem to show that the technology sector is driving innovation and economic growth, while the healthcare sector seems to emphasize labor shortages. The dependence of Canada on foreign labor to keep critical operations running is further demonstrated through the hospitality and agricultural sectors. Moving forward, Canada needs to focus on skilled labor programs such as Express Entry and the TFWP if it wants to attract talent from across the globe. While workforce training and targeted recruitment will solve shortages in healthcare and other key sectors, policies supporting rural communities have the potential to sustain agricultural employment. It will take investment in tech education and the acquisition of international talent to retain Canada's competitive advantage in the digital economy.

3.5 Immigration Trends over Year

From this line graph, immigration among foreign workers from 2018 to 2024 represents global events, economic conditions, and policy changes that have taken place. During the period between 2018 and 2019, immigration increased steadily from 20.8K to 25.0K. Strong demand for labour in industries such as technology, healthcare, and food service, combined with welcoming immigration laws in Canada, particularly with its employer-sponsored programs and methods such as Express Entry were the main drivers. Canada's standing as a place with economic potential further drew in highly qualified foreign labor.

Immigration then suddenly dropped dramatically to 19.0K in 2019–2020, however, largely as a result of the COVID-19 epidemic. This closing of borders, travel restrictions worldwide, and delays to processing work permits and visas led to a delay in the international flow of labor. Besides that, the pandemic-related temporary layoffs and reduced firm activities reduced demand for foreign laborers in several sectors.

While it increased to 23.0K in 2021, immigration decreased sharply between 2020 and 2022, reaching a peak of 29.0K in 2022. This rebound was mostly driven by Canada's economic openness and rising labor demand, especially in vital industries like food services, technology, and health. Recovery was also facilitated by employer-driven hiring to address urgent labor shortages and efforts to clear immigration backlogs caused by the pandemic.

After 2022, immigration started to gradually decline, falling to 27.5K in 2023 and then to 22.3K in 2024. Some of the reasons contributing to this decline were inflation, rising living expenditures, and slower economic progress. Housing affordability issues in major cities have become a major turnoff for skilled labor, and Canada's standing has been further hurt by increasing competition from countries like Australia and Germany that offer more attractive immigration options. The flow of foreign workers can also be influenced by more restrictive immigration rules or changes in work permit practices.

While the pandemic recovery was strong for immigration to Canada, sustainability in these numbers will be much more complex to maintain. Policy makers must focus their efforts on how economic uncertainty, housing unaffordability, and ensuring that Canada can continue to attract top talent from around the world will be addressed. Simplified immigration procedures and incentives can indeed help Canada position itself more strategically in the global market for talent, but associated programs with essential industries of healthcare and technology need reinforcement with regards to meeting labor demand.

3.6 Variation of Labour Demand across Quartiles (2018–2024)

The labor demand trend analysis from 2018 to 2024, divided into four quartiles for each year, shows seasonal variations and how these are aligned with economic conditions, industry trends, and global disruptions. This section gives a detailed overview of the variations observed in the trends and the underlying drivers causing these variations.

2018 Revised Observation

- Labour demand in 2018 shows relatively lower levels across all quartiles compared to later years like 2019 and 2022. Demand is relatively even across all four quartiles without peaking significantly in anyone. Lower overall demand would indicate that 2018 was a base year of moderate hiring in all industries before the economic boom observed in 2019 and before the pandemic boom.

2019: Increase in Q1 and Q2

- There is a significant rise in the demand for labor in Q1 and Q2. This rise indicates Early-year economic activity, leading to higher hiring in sectors such as IT, healthcare, and Agriculture. Growth in demand within seasonal industries such as construction and tourism in Q2.

2020: Major Decline Across Quartiles

- Labour demand fell dramatically across all quartiles and for Q1 and Q2, reflecting the impact of the COVID-19 pandemic. This was fundamentally affected by Widespread job losses in the hospitality, retail, and tourism sectors and reduced hiring on account of economic uncertainty and lockdown restrictions.

2021: Signs of Recovery

- Labor demand in Q2 and Q3 reflects a gradual recovery compared to 2020. Key sectors, including IT, Agriculture, and healthcare, saw an increase in manpower demand. This rebound was boosted by post-pandemic adjustments and hiring for labor shortages. However, overall levels still lag from pre-pandemic years such as 2019.

2022: Peak Labour Demand

- Labour demand rose remarkably in all quarters of the year, while Q4 was higher than any other previous year. Among the factors that have influenced this peak are, Strong economic recovery post-pandemic, Immigration programs that address labour shortages and Seasonal hiring growth in industries such as hospitality, agriculture, and construction during Q2 and Q3

2023: Stabilization with Q3 Dip

- Labour demand remained robust in Q1 and Q2 but saw a notable dip in Q3. This decline probably came because of inflationary pressures and economic slowdowns in consumer-sensitive sectors such as healthcare and IT. The lower Q3 levels indicate businesses' cautious hiring strategies amid uncertainty.

2024: Early Declines Observed

- For Q1 and Q2, labour demand is on a steady level, but a decline is observed in Q3 and Q4.Potential reasons may include, Increasing automation and cost-cutting measures in labor-intensive industries and Seasonal slowdowns, especially in Healthcare and agriculture, in Q4.

4. Conclusion

According to the analysis of immigration and Canadian labor market, foreign workers are highly important in sustaining and developing key sectors such as information technology, healthcare, agriculture, hospitality, and tourism. The TFWP and IMP are fundamental to resolve current and future labor market shortages and for Canada's attainment of economic, social, and cultural goals.

This statistic shows that health care continues to represent an ongoing requirement for key professionals in support of an aging population and increased medical needs, while technology remains the most dynamic industry in terms of innovation and specialized skills. Agriculture and hospitality show a reliance on immigrant labor that is seasonal in nature and service-oriented, indicating vulnerability to world events and adjustments in the economy.

Immigration patterns from 2018 to 2024 reflect post-pandemic resilience and recovery, with noticeable oscillations driven by shifting policies, world events, and economic constraints. However, the recent years' downward trend points to issues such as inflation, affordability, and global talent competition.

Canada needs to strengthen its labour laws, invest in the country's own workers, and create focused immigration channels going forward. A strategic focus on skillsets, technology, and fair rural policies would ensure long-term growth and entrench Canada's position as a competitive global economy.