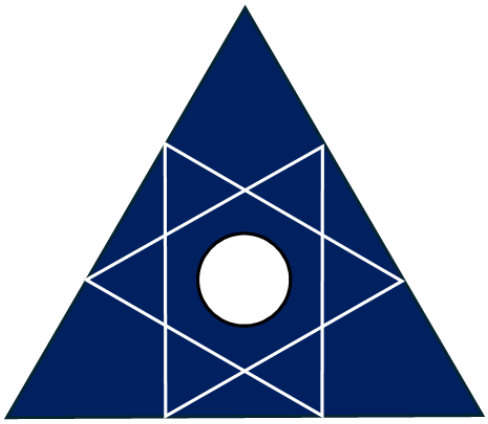
Introduction to QGIS for Business Operations and Analysis

A Practical Manual for Beginners



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Empowering Business Decisions with QGIS

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1 Foreword

Geographic Information Systems (GIS) have become indispensable in modern business decision-making. QGIS is a powerful open-source GIS application that allows businesses to visualize and analyze spatial data without expensive software licenses. This manual is designed for beginners with no prior GIS knowledge, focusing on practical business use cases – from choosing the best retail site to mapping sales territories. By following this guide, you will learn step-by-step how to use QGIS's graphical interface (no coding required) to solve real-world business problems.

2 Why GIS in Business?

In business operations, location-based insights drive smarter decisions. GIS can help answer questions such as:

- **Where should we open the next store?**
- **What sales territory boundaries will optimize our coverage?**
- **How do demographic patterns vary across our market?**

Using QGIS, you can combine your business data (customers, stores, sales figures, etc.) with geographic data (maps of cities, neighborhoods, roads) to create informative maps and perform analyses such as market segmentation, logistics routing, competitor mapping, and risk assessment. This manual will guide you through these scenarios in a hands-on way.

3 About this Manual

The structure of this manual follows a logical progression similar to the official QGIS Training Manual. We begin with the basics of QGIS – navigating the interface and adding data – and then move on to styling maps, performing analysis, and creating outputs for business reports. Each section introduces new QGIS functionalities with business-oriented examples and exercises. You will find step-by-step instructions and illustrations for tasks including:

- Importing data and creating thematic maps
- Geocoding addresses and analyzing spatial relationships
- Producing map layouts for business reports

Throughout the manual, realistic business case studies such as retail site selection, sales territory mapping, and supply chain logistics are used to demonstrate the application of QGIS tools. By the end of this guide, you will have a comprehensive foundation in QGIS, ready to tackle your own business mapping projects.

3.1 Data Download

- **QGIS Training Data:** Download sample datasets from the official QGIS Training Manual repository on GitHub: QGIS Training Tutorials.
- **Natural Earth Data:** Access free vector and raster datasets such as country boundaries and populated places at Natural Earth Data.
- **OpenStreetMap (OSM):** Obtain city-level data (roads, boundaries, etc.) via extracts from providers like Geofabrik: Geofabrik Downloads.
- **Government Portals:** Explore local or national government websites for geodata. In the US, for example, visit the US Census Bureau's TIGER/Line files at US Census TIGER/Line.
- **Public GIS Data Portals:** Check resources like Data.gov or local government GIS portals for business-relevant datasets.

4 Getting Started: QGIS Interface and Data Loading

Before diving into analysis, it is important to get comfortable with QGIS. In this section, we will cover:

- Installing QGIS and launching the program
- An overview of the QGIS interface
- Adding your first map layers

4.1 Installing QGIS and Launching the Program

QGIS can be downloaded for free from the official website (`https://qgis.org`) and is available for Windows, Mac, and Linux. It is recommended to choose the latest long-term release for stability. After downloading, run the installer and launch QGIS Desktop. Upon launch, you will be greeted by the QGIS start screen followed by the main interface.

Tip

No license is required – QGIS is open-source (GPL licensed) software supported by a global community. It can be used freely for commercial projects.

Once QGIS is open, create a new project (QGIS typically starts with a blank project by default) and prepare to explore its features.

4.2 Overview of the QGIS Interface

When QGIS opens, the window is divided into panels and toolbars. Understanding these components is crucial for following later exercises. The key elements of the QGIS interface include:

- **Layers Panel:** Displays all map layers in your project. It allows you to toggle layer visibility, change drawing order, and access layer settings.
- **Browser Panel:** A built-in file explorer that helps navigate and add data sources. It supports common vector file formats (e.g., Shapefiles, GeoJSON, GeoPackage) and databases such as PostGIS or SpatiaLite.
- **Toolbars:** A collection of toolbars (for adding data, navigation, editing, etc.). Hovering over icons displays tooltips that describe their function.

- **Map Canvas:** The central area where map layers are displayed and interacted with (zooming, panning, selecting features).
- **Status Bar:** Located at the bottom, it shows information such as current map scale, mouse coordinates, and the coordinate reference system (CRS) in use.
- **Locator Bar:** A quick search box (typically at the bottom-left) that lets you search for tools or coordinate locations by typing keywords.

Spend a moment familiarizing yourself with these elements. Panels and toolbars can be resized or toggled via the `View > Panels` and `View > Toolbars` menus.

5 Adding Your First Map Layers

To make a useful map, we need to import some data. QGIS supports a wide variety of data formats and sources. For our business examples, we will commonly use:

- **Vector layers:** e.g. Shapefiles, GeoJSON, GeoPackage files containing points (like store locations), lines (like roads), or polygons (like sales regions or market areas).
- **Spreadsheet or CSV data:** e.g. a table of customers or sales figures by location (which we can plot if coordinates or addresses are provided).
- **Basemaps or imagery:** e.g. online map tiles or aerial images for context (these come via web services).
- **Spatial databases:** e.g. a connection to a PostGIS database where enterprise data is stored.

Let's start with a simple scenario: mapping retail store locations in a city. Suppose we have a CSV file of our company's store locations with columns for store name, address, city, and maybe latitude/longitude coordinates. We also have a Shapefile of the city's neighborhoods with demographic data, and a roads layer. We'll add these to QGIS.

5.1 Step 1: Adding a Vector Layer from a File (Shapefile)

1. Click on the `Layer > Add Layer > Add Vector Layer...` menu option (or use the Add Vector Layer button on the toolbar). In the dialog, click "Browse" and navigate to your data folder.
2. Select the `City_Neighborhoods.shp` file (for example) which contains polygon boundaries of neighborhoods. Click `Open`, then `Add`. The layer will be added to the Layers panel and displayed in the map canvas.
3. Similarly, add the `City_Roads.shp` (line layer) using the same method.

You should now see the neighborhoods (polygons) and roads (lines) drawn on the map. They might have random colors initially. We will style them later.

5.2 Step 2: Adding Data from a CSV (Stores List)

1. If your store locations are in a CSV with coordinates, go to `Layer > Add Layer > Add Delimited Text Layer...`. Browse to select `Stores.csv`.
2. In the dialog, ensure the correct delimiter (e.g. comma) is selected. If the file has latitude and longitude columns, set them as the Y (lat) and X (lon) fields. QGIS will preview the first few rows.
3. Click `Add` (and specify a coordinate reference, typically WGS 84 (EPSG:4326) if using lat/long). The stores will now appear as point features on the map.

- If your data does not have coordinates but only addresses, skip this for now – we will cover address geocoding later in the manual.

4. QGIS will ask if you want to create a point layer from this table. Confirm, and the new point layer (stores) will be added to the map.

5.3 Step 3: Using the Browser Panel (Alternative Method)

You can also add data by dragging and dropping from the QGIS Browser panel. Expand the folder where your data files reside, then drag the file (e.g. the Shapefile or CSV) into the Layers panel. This achieves the same result as using the menu.

Now we have a basic map with multiple layers. The Layers panel shows them listed. You can click the checkboxes to turn layers on/off. Drag layers up or down to change drawing order (layers on top will cover those below; for example, points for stores should be above the polygons for neighborhoods so they are visible).

5.4 Note on Coordinate Reference Systems (CRS)

If layers use different coordinate systems, QGIS will prompt about transformation. For beginners, a safe route is to use WGS 84 (a common geographic coordinate system) or a local projected CRS that matches your data. In our case, if the Shapefiles have a defined CRS, QGIS will project other layers on the fly. You can see the project's CRS in the status bar (bottom-right). If needed, click it to change the project CRS. For now, we won't worry too much about projections since our data should align by default.

6 Navigating the Map Canvas

With layers loaded, you can explore the map. QGIS provides several tools to navigate:

- Use the mouse scroll wheel to zoom in/out. Alternatively, use the Zoom In/Out buttons (magnifying glass icons) on the toolbar, then draw a rectangle on the map to zoom.
- The Pan tool (hand icon) lets you click and drag to move the map.
- The Zoom Full button (world icon) resets the view to show all layers (full extent).
- You can also use the arrow keys to pan small amounts, and the plus/minus keys to zoom.

Try zooming into one part of the city. As you zoom, more detail (like the road network) becomes visible. If you zoom too far, use the Zoom Full button to reset. The status bar scale will update (e.g. 1:50,000).

If you added the stores CSV, identify one of the store points by using the Identify tool (blue "i" icon). Click on a store point – a popup will show its attributes (name, address, etc.). This is how you can inspect data on the map.

6.1 Layer Selection and Management

- **Layer Selection:** To select a feature, use the Select Features tool (white arrow icon). Click on a polygon or point to highlight it. In the Attribute Table (accessed via right-clicking the layer and selecting `Open Attribute Table`), the corresponding record will be selected.
- **Basic Layer Management:** In the Layers panel, right-click a layer name to see options:
  - `Zoom to Layer` (view the layer's extent),
  - `Open Attribute Table` (view and edit data rows),

- `Properties` (change symbology, labels, etc.),
- Other functions such as `Remove` and `Save As`.

Now that we can load data and move around the map, it's time to make the map informative and visually appealing by styling the data.

7 Visualizing and Styling Data for Business Insights

Raw data on a map is useful, but styling and labeling are what turn it into an insightful visualization. In this section, we cover how to:

- Symbolize layers (changing colors, icons, and classifications)
- Label features with text
- Create thematic maps such as choropleth (color-coded areas) and heat maps

These techniques will allow us to highlight business patterns such as high-sales regions, customer density, or category breakdowns.

7.1 Understanding Attribute Data and Layer Symbology

Each layer has an attribute table containing data about its features. For example:

- The neighborhoods layer might have fields for population, median income, etc.
- The stores layer might include fields for store type or sales.

You can use these attributes to drive your map styling:

- A thematic (choropleth) map colors areas based on a numeric variable (e.g. median income or sales performance).
- A categorized map assigns different symbols or colors based on a category (e.g. different icons for store types: retail, warehouse, competitor).
- A heat map visualizes dense point data, showing concentration as a gradient of colors (useful for customer distribution).

7.2 Changing Basic Symbology

1. In the Layers panel, double-click the `Stores` layer (or right-click and choose `Properties`, then go to the `Symbology` tab).
2. By default, it may use a simple marker (e.g. a circle). Change the marker shape, size, and color. For example, choose a bright color like red and increase the size to 6pt so the points stand out.
3. Click `OK` to apply. Now all store points appear as larger red dots.

Repeat similar steps for the `Roads` layer (e.g. set as a gray line) and the `Neighborhoods` polygons (e.g. choose a light fill color with a distinct outline).

7.3 Labeling Features with Text

Labels are crucial for maps intended for business communication. To add labels:

1. Open the `Properties` for the `Neighborhoods` layer and go to the `Labels` tab.
2. Change "No labels" to "Single Labels" and choose the field that contains the neighborhood name (e.g. `Name` or `Neighborhood`).
3. Adjust the font and size as desired (e.g. 8pt sans-serif) and select a contrasting text color. A halo or buffer around the text may be added for clarity.
4. Click `OK` to apply the labels.
5. Repeat for the `Stores` layer, enabling Single Labels and choosing the store name field. Adjust placement and font size to avoid overlapping labels.

7.4 Creating Thematic Maps

7.4.1 Example 1: Choropleth Map of Demographics (Graduated Symbols)

Scenario: A real estate team wants to identify high-income neighborhoods for targeted marketing. The dataset includes a field `Median_Income` for each neighborhood.

1. Open the `Properties > Symbology` for the `Neighborhoods` layer.
2. Change the renderer from "Single Symbol" to **Graduated**.
3. For the `Value` field, choose `Median_Income`. Select a color ramp (e.g. a gradient from light to dark, such as `YlOrBr`).
4. Click `Classify` to generate break values (selecting a classification mode like Quantile or Equal Interval with 5 classes).
5. Click `OK`. The neighborhoods will now display colors corresponding to income levels, with the map legend reflecting the income ranges.

7.4.2 Example 2: Categorical Styles for Different Categories

Scenario: The sales department wants to distinguish between company and competitor stores. Assume the `Stores` layer has a field `Type` with values such as "Company" and "Competitor."

1. Open the `Properties` for the `Stores` layer and select the **Categorized** renderer.
2. Choose the `Value` field as `Type` and click `Classify` to list unique values.
3. Edit the symbols if necessary (e.g. assign blue circle symbols for "Company" and orange triangle symbols for "Competitor").
4. Click `OK`. The map now visually differentiates between company and competitor store locations.

7.5 Creating Heat Maps for Point Density

Heat maps are effective for visualizing the density of point data, such as customer addresses.

1. Ensure you have a point layer (e.g. `Customers`) with many points.
2. Open `Layer Properties > Symbology` for the customer points layer.
3. Change the renderer to **Heatmap**. Configure the color ramp (e.g. a ramp from transparent/light to vivid colors like red for high density) and set the radius (e.g. 500 meters if working in projected units).
4. Click `OK` to apply the heatmap style.

7.6 Thematic Mapping Recap

At this point, you have learned how to:

- Style points, lines, and polygons.
- Add and customize labels.
- Create thematic visualizations such as choropleth maps, categorized maps, and heat maps.

These skills allow you to produce maps such as:

- Sales volume maps by territory using graduated colors or proportional symbols.
- Customer segmentation maps with distinct symbols for different demographic groups.
- Risk maps shading areas by risk level or incident density.
- Competitor versus company presence maps with categorical symbols.

Feel free to experiment with additional symbology options in QGIS, such as pie or bar charts (found under the "Diagrams" section in the Symbology tab) or rule-based styling for more complex conditions. The basic styles covered here will handle most business mapping needs.

8 Creating and Editing Data (Digitizing Business Information)

Often, you will need to create new spatial data in QGIS to represent business information that isn't already in a file – for example, drawing a proposed store location, outlining a custom sales territory, or updating a boundary. QGIS provides tools for digitizing (creating and editing vector features) directly on the map.

In this section, we'll learn how to create a new layer, add points/polygons, and modify features. Our example use cases include:

- Digitize a new proposed store location (point) that isn't in the current data.
- Create a sales territory polygon by combining some existing regions.
- Edit the attributes of a feature (e.g., update a store's status).

8.1 Creating a New Vector Layer

Suppose our retail analysis identified a promising area with no current store and we want to mark a proposed site. We will create a new point layer for proposed sites.

Steps to Create a New Layer:

1. Go to `Layer > Create Layer > New Shapefile Layer...` (or choose New GeoPackage Layer). For this exercise, a Shapefile is simpler.
2. In the dialog, choose **Point** as the geometry type. For the CRS, select the same coordinate system as your project (e.g., EPSG:4326) so that the data aligns correctly.
3. Under "New Field", define attributes for the layer. For example, add a field `Name` (Text type, length 50) and `Status` (Text type) or `PotentialSales` (Numeric), depending on the information you wish to store.
4. Save the layer as `Proposed_Stores.shp` (or in a GeoPackage) and click `OK`. The new empty layer will be added to the Layers panel.

8.2 Adding Features (Digitizing)

To add a feature to a new (or existing editable) layer:

1. Select the `Proposed_Stores` layer in the Layers panel and click the **Toggle Editing** button (pencil icon). The layer is now editable.
2. Click the **Add Point Feature** tool (often represented by a pencil with a star or a point icon).
3. Click on the map where you want to add the new store. For example, choose a location near a road intersection in a high-income, low-competition area.
4. When prompted, enter the attributes for the new point (e.g., `Name = "Proposed Store A"`, `Status = "Proposed"`).
5. Click `OK`. The point will appear on the map. (If it is not clearly visible, apply a distinct style or label to the `Proposed_Stores` layer.)

You can add as many points as needed. When finished, click **Toggle Editing** again and confirm to save your edits.

Similarly, you could create a new polygon layer for custom territories:

- Create a new layer with **Polygon** geometry and fields like `Territory Name` and `Rep Name`.
- Use the **Add Polygon Feature** tool to draw the territory. Click to add vertices, then right-click (or press Enter) to finish the polygon, and fill in the attributes.

Example: Creating a Sales Territory Polygon
Imagine you want to define a sales territory covering three neighborhoods assigned to Rep John:

1. Create a new polygon layer named `Sales_Territories` with appropriate fields.
2. Toggle editing and use the **Add Polygon** tool to trace the boundaries (you can enable snapping for precision).
3. Finish the polygon, and set the attributes (e.g., `Name = "Territory A"`, `Rep = "John"`).
4. Save your edits.

8.3 Editing Features and Attributes

To edit an existing feature's geometry or attributes:

- Toggle editing on the layer and use the **Vertex Edit** tool to adjust vertices (for polygons/lines) or move points by dragging.
- To delete a feature, select it and press the delete key while in edit mode.
- To edit attributes, either open the attribute table in edit mode and modify cells directly or use the **Identify** tool to select a feature and then edit its attributes in the pop-up.

For example, if a proposed store becomes operational, change its `Status` from "Proposed" to "Open". Always save your edits and toggle off editing to prevent accidental modifications.

9 Spatial Analysis for Business Decision-Making

With data in place and maps styled, the true power of GIS lies in spatial analysis—using location relationships to answer business questions. QGIS provides a suite of analysis tools via its Processing Toolbox and menu actions. In this section, we cover common spatial analysis tasks relevant to business:

- **Attribute Queries:** Find features that meet certain criteria (e.g., areas with high population).
- **Spatial Queries:** Examine relationships between layers (e.g., customers within 5 km of a store).
- **Buffering:** Create zones around features to represent areas of influence (e.g., catchment areas).
- **Overlay Analysis:** Combine datasets to analyze spatial intersections or differences.
- **Spatial Joins:** Transfer attributes based on spatial relationships (e.g., counting points within polygons).
- **Network Analysis:** Determine shortest routes or service areas along road networks.
- **Density and Clustering:** Visualize point concentration via heatmaps or statistical clustering.

9.1 Attribute Queries: Filtering Data by Attributes

For example, to find all neighborhoods with a population over 10,000 and median income above $50k:

- Use the **Query Builder** (right-click the layer > `Filter...`) and input an expression like:

```
"Population" > 10000 AND "Med_income" > 50000
```

- Alternatively, use **Select by Attribute** from the Processing Toolbox to highlight these features.

This temporary filter can later be exported as a new layer if needed.

9.2 Spatial Queries and Buffers: Proximity Analysis

Buffers create a zone at a specified distance around a feature. For example, to analyze competitor impact:

1. Use the **Buffer** tool (Processing Toolbox) on the Competitor Stores layer, setting a distance of 3 km.
2. The output, a polygon layer (e.g., “Buffered (3km)”), can be styled semi-transparently.
3. Use **Select by Location** to select features from the Company Stores layer that intersect the competitor buffers.

This identifies company stores within 3 km of a competitor, which might require further strategic analysis.

9.3 Overlay Analysis: Combining Layers

Overlay analysis combines two layers to reveal spatial interactions:

- **Difference:** Subtract competitor buffer zones from high-potential neighborhoods.
- **Intersection:** Find overlapping areas between different criteria (e.g., high-income and high-population regions).

For instance, subtract the competitor influence areas from candidate neighborhoods to yield “Sites_ExcludingCompetitors.”

9.4 Spatial Joins and Summaries

Spatial joins transfer attributes based on location. Examples include:

- Counting the number of customer points within each sales territory.
- Attaching the distance to the nearest competitor to each store using the **Join attributes by nearest** tool.

Such enhancements provide new insights, such as correlating sales with competitive proximity.

9.5 Network Analysis: Routes and Drive-Time Areas

For scenarios where road network distances or travel times are more relevant:

1. Use the **Shortest Path** tool (via the Road Graph plugin or built-in network analysis) to find optimal routes between points, such as from a warehouse to a store.
2. For service areas, use tools (or plugins like ORS Tools/QNEAT3) to create drive-time isochrones, which represent areas reachable within a set time.

9.6 Spatial Statistics and Hotspots (Advanced)

Advanced spatial statistical tools in QGIS include:

- Calculating centroids of point clusters.
- Creating distance matrices between features.
- Performing cluster analysis (e.g., using DBSCAN) to identify high-activity areas.
- Conducting hotspot analysis (e.g., Getis-Ord) to identify statistically significant clusters.

10 Integrating External Data: Geocoding, Tables, and Databases

Business data often exists outside of GIS files. QGIS supports integration of external data sources.

10.1 Geocoding Addresses

Geocoding converts textual addresses (e.g., "123 Main St, Springfield") into map coordinates. One common method is using the MMQGIS plugin:

1. Install MMQGIS via `Plugins > Manage and Install Plugins`.
2. Prepare a CSV file containing address components.
3. Use `MMQGIS > Geocode > Geocode CSV with Google / OpenStreetMap` to convert addresses to points.
4. Load the output shapefile (e.g., `Customers_Geocoded.shp`) into QGIS.

10.2 Joining Tables to Spatial Data

If additional data (e.g., monthly sales) is in an Excel/CSV table:

1. Add the table via `Layer > Add Layer > Add Delimited Text Layer` (choose "No geometry" if it lacks coordinates).
2. Right-click the spatial layer (e.g., Stores) and select `Properties > Joins`.
3. Create a new join using a common key (e.g., `Store_ID`).
4. The joined attributes can be visualized or symbolized on the map.

10.3 Connecting to Spatial Databases

For enterprise environments, spatial data might reside in databases like PostGIS:

1. In the Browser panel, right-click **PostGIS** and create a new connection with your credentials.
2. Drag the required table (e.g., `public.stores`) into your map.
3. If editing is enabled, you can update data directly in the database.

10.4 Using Web Map Services (Basemaps and Data Feeds)

Adding basemaps provides contextual reference:

- Use the default OpenStreetMap layer under **XYZ Tiles** or install the **QuickMapServices** plugin for more options.
- For government or specialized data, add layers via **WMS/WMTS** (image layers) or **WFS** (vector data).

These integrations allow you to bring the most up-to-date business and geographic data into QGIS, ensuring robust spatial analysis and informed decision-making.

11 Extending QGIS Functionality with Plugins

One strength of QGIS is its plugin ecosystem. We've already used one plugin (MMQGIS for geocoding, QuickMapServices for basemaps). There are many others that cater to specialized business needs:

- **QGIS2Web:** Exports your QGIS map to an interactive web map (e.g., for sharing with clients on a webpage).
- **TimeManager / Temporal:** Animates maps over time if your data has time stamps (e.g., sales over time).
- **DataPlotly:** Creates charts (bar, line, scatter) inside QGIS from your data – useful to complement maps with graphs for reports.
- **ORSTools / QNEAT3:** For advanced network and routing analysis (drive-time polygons, multi-stop route optimization, service area calculations).
- **Dashboard plugin:** Provides dashboard-like views within QGIS, combining maps and charts.

Installing a plugin is as simple as using the Plugins Manager. Always read the plugin documentation for usage instructions. Keep in mind that plugins are community-contributed, so quality may vary, but many are excellent and widely used.

12 Presenting Results: Creating Map Layouts and Exporting

Now that we have performed analyses and crafted meaningful maps, the final step is often to present these results – whether in a report, a presentation, or to share with stakeholders. QGIS provides a Print Layout designer where you can compose maps with titles, legends, logos, and other elements, then export to PDF or image formats.

12.1 Using the Print Layout Tool

Think of the Print Layout as your canvas for the final map (separate from the main QGIS interface). You can create multiple layouts for different maps or page sizes from the same QGIS project.

Step-by-Step: Creating a Basic Map Layout

1. In the QGIS main window, go to `Project > New Print Layout` (or use the Layout Manager to manage multiple layouts). Name it, for example, *"Business Map Layout"*.
2. A new window opens – this is the Layout Editor. Set the page size via `Layout > Page Setup` (default is A4 or letter; change to landscape if needed).
3. Click the **Add Map** button (icon resembling a globe with a plus) in the Layout Editor toolbar. Draw a rectangle on the page to capture the current map view.
4. To update the map view, use the **Move Content** tool in the layout or return to the main QGIS window, adjust the view, then right-click the map frame and select `Set Map to Canvas Extent`.
5. Add other elements:
   - **Title:** Click **Add Label** (the "T" icon), then type in a title such as *"Proposed Store Locations and Demographics"* in the Item Properties panel.
   - **Legend:** Click **Add Legend** and place it on the page. Adjust the displayed layers and names in the Item Properties.
   - **Scale Bar:** Click **Add Scale Bar**, place it at the bottom, and configure the style, units, and segment size.
   - **North Arrow:** Click **Add Picture** to include a north arrow. In Item Properties, select one of the built-in SVG symbols.
   - **Company Logo:** Use the **Add Picture** tool to insert your company logo (PNG/SVG) for branding.
   - **Text Annotations:** Add additional text elements for notes or data sources as needed.
6. Arrange the elements neatly using alignment tools and guide rulers.
7. Once satisfied, save the layout via `Layout > Save`.

12.2 Exporting Maps for Reports

With your layout ready, you can export it:

- **As an Image:** Click the **Export as Image** button, choose a resolution (e.g., 300 dpi for print), and save as PNG, JPEG, etc.
- **As a PDF:** Click the **Export as PDF** button to generate a PDF with vector graphics for sharp quality.
- **As SVG:** Optionally, export as SVG if further editing in software like Adobe Illustrator or Inkscape is required.

Tip: If your map contains many details or small labels, review the exported file for readability. Adjust label sizes or line widths as needed for the final output medium.

When designing your layout, consider the narrative:

- Use a clear title that explains the map's purpose.
- Ensure the legend is concise by removing any extraneous layers.
- Add annotations or callouts for non-GIS audiences to highlight key insights (e.g., circle a hotspot labeled *"Highest customer density"*).

- Incorporate company branding (colors, logo) where appropriate.

For example, a final map titled *"Proposed Store Locations and Trade Areas"* might show:

- City neighborhoods colored by income.
- Existing and proposed store locations.
- 5 km buffers around proposed stores to represent trade areas.
- Competitor locations.
- A legend with clear symbols and a note on data sources (e.g., “Data: 2025 Q1, Sources: Company Database and Census”).

This exported map can then be embedded into reports or presentations, providing a static snapshot that effectively communicates your spatial analysis results.