



# Cost Data Unleashed: A Power BI AFLCMC/HN Case Study

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*Image 1: Author Patrick Casey, at ICEAA 2024 Workshop*

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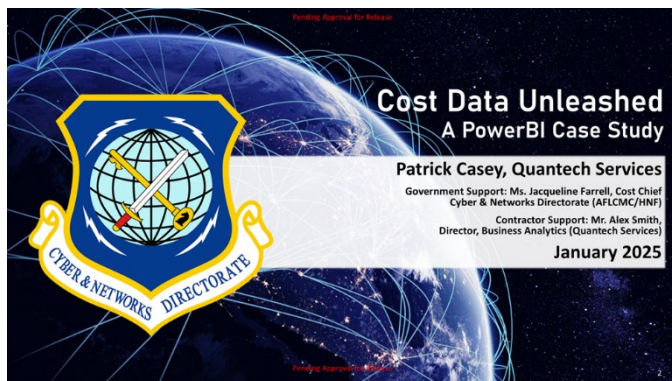
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## 1 PAPER AND PRESENTATION SYNERGY

The objectives of this paper and the associated presentation diverge to provide complementary and standalone value. The presentation slide deck aims to deliver high-level insights tailored for a live audience and follows the same flow as the paper. Multiple times in the presentation, it is mentioned that additional information can be found in this paper.



*Image 2: Cost Data Unleashed  
Slide Deck Title Slide*

The paper outlined in the previous section delves into more granular details, including:

- A thorough background on Microsoft Power BI, including its history and relevance within the Department of Defense (DoD).
- Detailed explanations of Power BI functionality, progressing from beginner to advanced use cases.
- An introduction to and analysis of the Air Force Life Cycle Management Center (AFLCMC) Cyber & Network Directorate (HN) Labor Rate Database, demonstrating its integration into Power BI.
- Comprehensive outlines of use cases, future enhancements, and lessons learned.

This paper merges technical depth with actionable insights, serving as a resource for cost analysts seeking to harness Power BI's capabilities for dynamic decision-making.

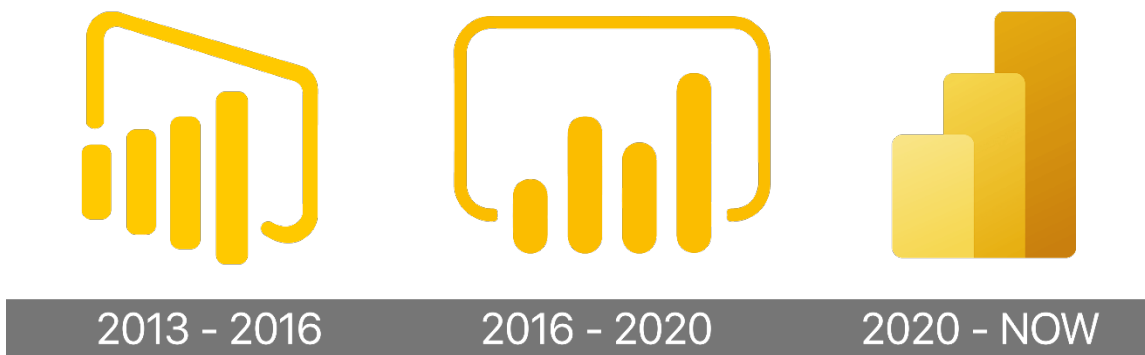
## 2 THE POWER BI EVOLUTION

### 2.1 Microsoft's Data Journey

Microsoft has long been at the forefront of making data accessible and actionable. Founded in 1975, the company's mission to empower everyone with technology has led to revolutionary tools.

In 1985, Microsoft launched Excel, which transformed business analytics by offering powerful data entry, calculation, and analysis tools. Excel's grid format and formula capabilities revolutionized how businesses analyzed data, enabling professionals to perform complex calculations and generate financial models directly from their desktops. This innovation set the stage for more interactive and scalable platforms.

In 2015, Microsoft introduced Power BI, an advanced tool that builds on Excel's legacy. Power BI allows users to create dynamic, interactive dashboards, perform real-time analyses, and seamlessly integrate data across systems. Its ability to manage large datasets and visually compelling and interactive dashboards distinguished it as a transformative tool for modern data analytics.



*Image 3: Power BI Logo Evolution*

Power BI's integration with the Microsoft 365 suite provides users with cloud-based scalability, intuitive data visualizations, and the ability to effortlessly share insights across teams. These features make it a powerful platform for data-driven decision-making. Its compatibility with other tools, such as SQL databases, Azure cloud services, and Python scripts, enhances its utility for technical and non-technical users.

## 2.2 The DoD’s Adoption of Power BI

The Department of Defense (DoD) has recognized Power BI as a secure and scalable solution for complex data analysis needs. Power BI seamlessly integrates with existing Microsoft tools, such as Excel, SharePoint, and Microsoft Teams, enabling users to build on familiar platforms and reduce learning curves.

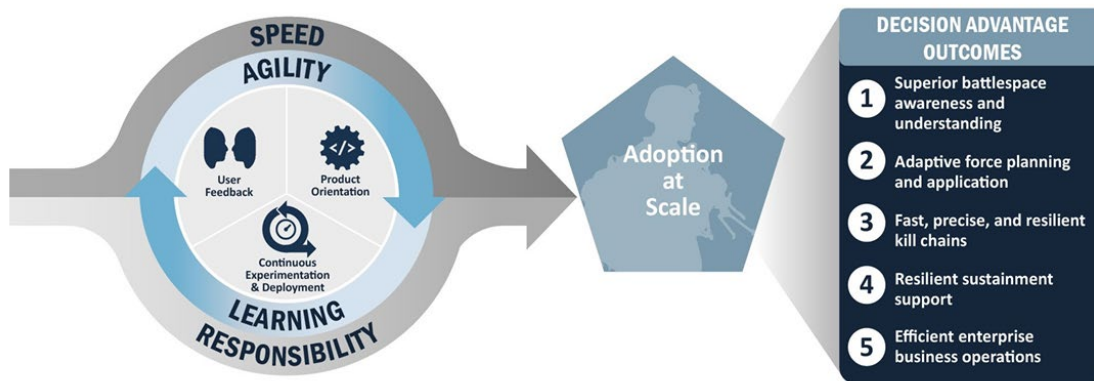


Image 4: Employing an Agile Approach to Adoption

The need for real-time analytics in mission-critical environments has made Power BI a preferred choice within the DoD. Power BI’s ability to pull data from multiple secure sources and deliver actionable insights has enhanced decision-making efficiency. Its robust security protocols ensure compliance with stringent requirements for handling classified and sensitive information, making it a trusted platform for government operations.

Power BI Service, the platform's cloud-based extension, allows DoD analysts to share insights across secure networks while maintaining compliance with government security standards. This capability has been crucial in facilitating collaboration across departments and contractors.

### 3 HN LABOR RATE DATABASE OVERVIEW

#### 3.1 Database Creation and Pedigree

The primary intent behind the creation of the Air Force Life Cycle Management Center (AFLCMC) Cyber & Network Directorate (HN) Labor Rate Database is to provide a robust, centralized resource for assisting in the pricing and negotiation of individual Labor Category (LCAT) labor rates. This tool ensures reasonability and consistency by benchmarking incoming rates against historical data, including contract actuals, B-Tables, and negotiated rates from Proposal Negotiation Memorandums (PNMs). All labor rates are fully burdened with fees included and have been inflated to the current fiscal year utilizing the latest DoD Inflation Indices. Additionally, it lays the groundwork for creating subcategories to enhance labor category mapping, enabling nuanced cost analysis. By offering these capabilities, the database empowers analysts to substantiate pricing discussions and negotiations, ensuring fairness and alignment with market trends.

The AFLCMC/HN Labor Rate Database is a comprehensive repository designed to support cost analysis across a wide array of programs and vendors. The database includes detailed information for over nine hundred unique data points collected from the Aerial Networks Division (AFLCMC/HNA), the Cryptologic & Cyber Systems Division (AFLCMC/HNC), and the Enterprise IT & Cyber Infrastructure Division (AFLCMC/HNI).

Initially created by HNCN Analysts (thanks to K. Hurias, M. Stone, B. Opaska, and C. Salinas), this database and accompanying Excel analysis were presented to HN in September 2023. A data call was sent to all HN analysts requesting additional data points, with remarkable success (thanks to all supporting analysts and J. Farrell). Data was compiled in Power BI, and various visualizations were created with HN cost analysts in mind. After coordination and review with the HN Cost Chief and Cost Technical Director, the Power BI model was presented to all HN Cost Analysts and provided for use. The linked Excel spreadsheet was hosted on SharePoint so that future updates could be made and all those with Power BI could refresh their model to obtain new data and updates.



*Image 5: AFLCMC/HNC Logo*

### 3.2 Database Structure and Capabilities

The database is structured around key tables that capture program details, vendor affiliations, labor categories (LCATs), and historical rates. These tables are linked through unique identifiers to maintain relational integrity and enable seamless queries. The database incorporates metadata fields for inflation-adjusted rates, geographic cost differentials, and job-specific certifications, ensuring analysts have the context for nuanced evaluations.

All inputs to the database are derived from verified contract actuals, structured B-Tables, or negotiated rates documented in PNMs. These sources provide a high degree of reliability and traceability, ensuring the database serves as an authoritative reference for cost analysis and pricing validation.

The Power BI model has twenty-five data fields. The complete definitions of all fields (in alphabetical order) are found in Image 6: Labor Rate Data Fields. All data fields can be used in the Power BI model. Some fields have been created for future analysis and statistical investigations.

The inclusion of well-defined and comprehensive data fields is critical in preparing for a wide range of analyses and visualizations within the HN Labor Rate Database. These fields, encompassing program details, vendor affiliations, labor categories (LCATs), and historical rates, form the foundation for creating dynamic, data-driven insights. The database supports seamless queries and robust reporting by maintaining relational integrity and linking these fields through unique identifiers.

[Contract Labor Rate Data Fields \(Alphabetically\) >>](#)

**Ctr Labor Rates** - Name of Table in "HNC Labor Rate Database 26Aug24" Excel File

- **Appropriation** - Used in Normalization Equation (All 3600 Currently)
- **Business Size (LB/SB/U)** - Large Business, Small Business, Unknown
- **Contract #/ Source Title** - 656 Data Points w/Contract Info
- **Contract Name** - 25 Unique Contracts
- **Contract Position Title** - Rawest Labor Category (LCAT) Input
- **CONUS/OCONUS** - Continental US/Outside Continental US
- **HN Branch** - 10 Unique Branches within HNC
- **Input Date** - Date Data Was Entered Into Database
- **Input Name** - Initials of Data Collection Specialist
- **Input Rate** - Rawest Labor Rate, Tied to Input Rate FY
- **Input Rate FY** - Fiscal Year of Input Rate, Used in Inflation Equation
- **Known Subcontract (Sub/U)** - Some Info Here Regarding Subs...
- **Level** - Junior, Journeyman (Mid), Senior, SME
- **Normalized FY** - Fiscal Year To Inflate Rate To (Currently 2024)
- **Normalized Rate** - Input Rate Inflated to Normalized Fiscal Year (FY24)
- **Program** - 18 Unique Programs
- **Source** - Contract Rates, B-Tables, or PMN
- **Sub-Program** - 32 Unique Program Sub-Elements/Phases
- **Subcategory - Based on Ctr Position** - Cleaned Contract Position Titles  
Used in One-to-Many Model Relationship w/LCAT Key Table
- **Vendor** - 35 Unique Vendors
- **Vendor Avg Growth (or Varies, Unknown)** - For Future Escalation Analysis
- **Vendor Division** - For Potential Future Analysis
- **Work Location City (Opt)** - Optional Field for Potential Future Analysis
- **Work Location State (Opt)** - Optional Field for Potential Future Analysis
- **Zone** - Hardship Duty Zone, Hostile Zone, or N/A

*Image 6: Labor Rate Data Fields (Alphabetically)*

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### 3.3 Proprietary Data Abstraction

For this presentation, multiple steps were taken to ensure no proprietary or confidential information was shared while still providing analysts with the information needed to utilize this database (requests to be made officially through AFLCMC/HN) or create a similar Power BI.

- Vendor names, program names, branch names, and vendor-specific labor categories were abstracted to protect the identities of all involved parties.
- All data points were grouped (using participating analysts' best judgment) into one of ten “Calculated Labor Categories.”
  - Management, Platform Development, Data Science, SW/Product Dev, Cybersecurity, IT/Day 2 Ops, Design, Test, FM/Contracting, & Writing.
  - LCAT Mapping can be edited/updated, or user-defined categories can be utilized (see [4.3 Power BI 301: Advanced Techniques](#)).
- To further ensure no actual dollar values were tied to any data shown, all labor rates were obfuscated by taking each rate's percent delta from the average and multiplying by \$100.
  - This abstracts each rate while displaying statistically relevant data for this paper and presentation.

The 10 calculated labor categories represent a wide range of professional expertise, each characterized by distinct subcategories. **Cybersecurity** includes roles like cybersecurity analyst, IA engineer, and IA lead, focusing on safeguarding systems and data integrity. **Data Science** spans positions such as data scientist, database engineer, and digital engineer, emphasizing data analysis, modeling, and system management. **Design** features creative roles like graphic designer, web developer, and UI/UX designer, centering on aesthetics and user experience. **FM, Contracting & Analysis** comprises roles such as procurement analyst and contract specialist, focusing on financial management and contractual oversight. **IT/Day 2 Operations** includes positions like IT center manager and help desk manager, ensuring IT infrastructure remains operational.

### 3.4 Significance in Cost Analysis

The HN Labor Rate Database is invaluable for benchmarking and validation. Analysts can compare proposed labor rates against historical data to ensure fairness and reasonableness. For instance, when reviewing contractor proposals, analysts can quickly reference the database to



Image 7: AFLCMC/HN Logo

identify trends, outliers, or potential cost-saving opportunities. By serving as a centralized repository, the database facilitates consistency and accuracy in cost estimation. It allows analysts to:

- Identify cost drivers for specific roles and projects.
- Track labor rate trends over time.
- Benchmark vendor performance relative to historical averages.

Integrating this database with Power BI enhances its utility, enabling interactive visualizations that bring labor rate data to life.

For readers looking to replicate the general approach utilized to create this model, the following quick-start guide outlines the process:

- **Data Collection:** Compile labor rate data from verified sources, ensuring clean and consistent inputs.
- **Power BI Setup:** Import data into Power BI, establish relationships, and apply filters.
- **Visualization:** Customize dashboards with charts, graphs, and decomposition trees.
- **Analysis:** Apply dynamic filters to explore trends and make data-driven decisions.

This guide simplifies implementation for first-time users while maintaining flexibility for advanced analysis.

## 4 POWER BI 101, 201, AND 301

While Power BI is the primary focus of this case study, exploring alternative tools like Tableau and QlikView can enhance our understanding of dynamic data visualization platforms. For example, Tableau offers superior drag-and-drop capabilities for non-technical users, while QlikView excels in managing large datasets in real time. However, Power BI's seamless integration with Microsoft Office products and built-in Data Analysis Expressions (DAX) functionality make it a versatile choice for the Department of Defense.

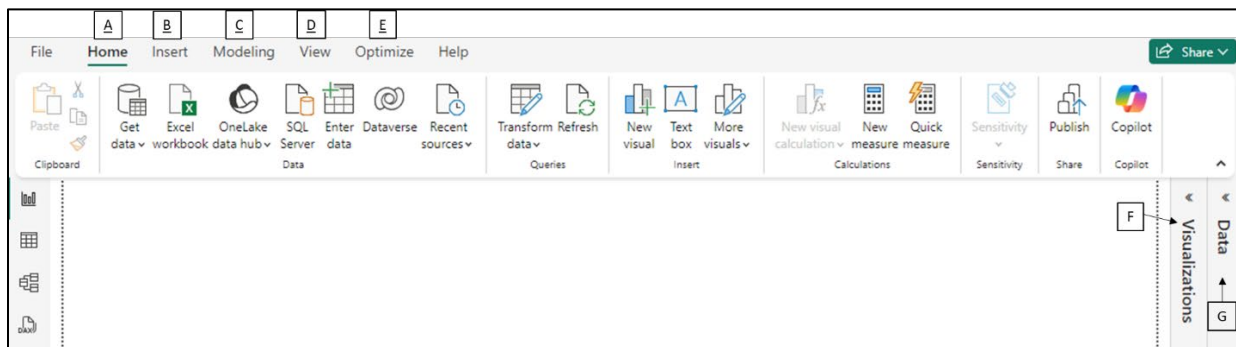
## 4.1 Power BI 101: Essentials

Power BI's entry-level functionalities focus on simplicity and accessibility, making it easy for beginners to get started. The ribbon navigation system organizes key functionalities into intuitive tabs, such as visualizations, data modeling, and sharing options. This design simplifies the process of exploring Power BI's features.

Inexperienced users benefit from Power BI's drag-and-drop interface, which allows them to create charts and tables without writing complex code. For example, users can import an Excel spreadsheet and instantly generate a bar chart or pie graph, enabling them to uncover insights without extensive technical knowledge.

### 4.1.1 The Power BI Ribbon

The Ribbon in Power BI is similar to other Microsoft Office products and organizes commands into tabs for easy access:



*Image 8: The Power BI Ribbon*

**Home tab (A):** This is where you can find the most commonly used features, like importing data, creating new visualizations, and refreshing your data. **Insert tab (B):** Use this to add various visual elements, such as charts, buttons, and text boxes. **Modeling tab (C):** Here, you can work with data models, create calculated columns, and manage relationships between tables. **View tab (D):** Adjust your view, including themes, and toggle visibility for certain features like gridlines and snap to grid. **Optimize tab (E):** Run various Power BI wizards to optimize presets and analyze performance. **Visualizations tab (F on right):** Select and add charts and graphs to the report canvas. **Data tab (G on right):** Focus on data queries, transformations, and editing tables directly.

### 4.1.2 Linking Power BI with Excel

Power BI integrates seamlessly with Excel, allowing you to import and link data for analysis. **Importing excel data:** Click the \*Home\* tab, then select \*Get Data\*. Choose \*Excel\* from the data sources and navigate to your file. You can then select which sheets or tables to load. **Creating live connections:** You can connect live to Excel workbooks stored on OneDrive or SharePoint. This ensures that any updates in Excel are reflected in Power BI automatically. **Using excel workbooks:** Once data is imported, Excel workbooks can be used within Power BI as a data source for visualizations.

### 4.1.3 Tab-Based Interaction

Power BI uses a tab-based interface to organize your work into sections:

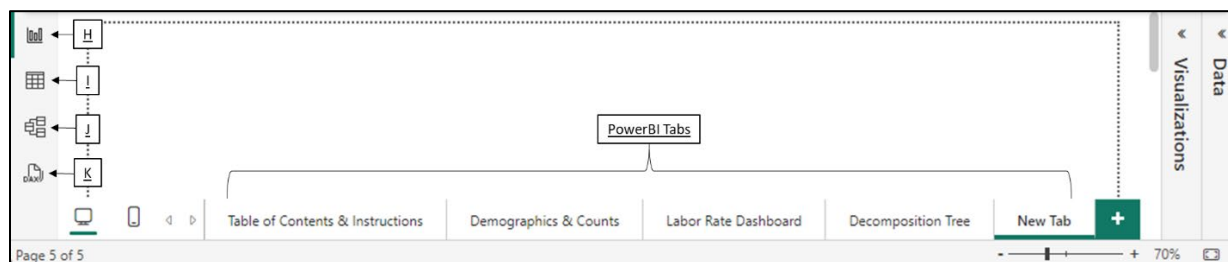


Image 9: Power BI Tabs

**Report view (H):** This is the main area where you create and interact with visualizations. It is organized into multiple pages, similar to tabs in a workbook. **Table view (I):** A tab to explore your data tables, create calculated columns, and format data. **Model view (J):** Manage relationships between different data tables here. You can drag and drop to create or edit connections. **Data Analysis Expression (DAX) query view (K):** DAX queries help quickly explore and gain insights from your semantic data model. Get started by right-clicking items in the Data pane to generate DAX queries such as top one hundred rows and showing the values in a data column.

#### 4.1.4 Visualizations

Visualizations in Power BI allow you to transform data into graphical representations.

- **Types of Visuals:** Common visuals include bar charts, line graphs, pie charts, maps, and tables. Power BI also supports custom visuals from the marketplace.
- **Creating Visualizations:** Drag fields from the \*Fields\* pane onto the canvas, and Power BI will suggest a visualization type. You can change the type from the visualization pane.
- **Interactivity:** Power BI's visualizations are interactive. Selecting a data point in one visualization can highlight or filter related data in others.

Most symbols in Image 10 should be familiar to those who have created any

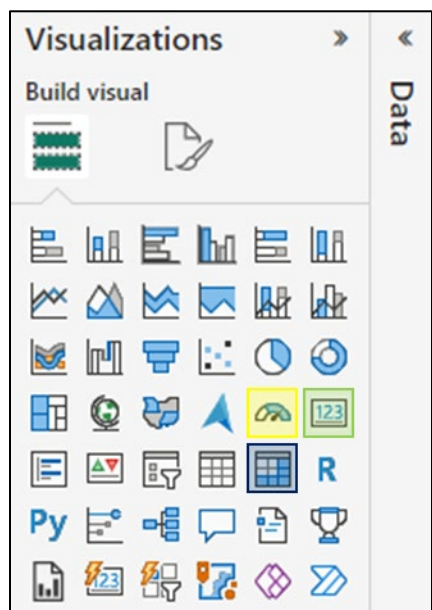


Image 10: Power BI Visualizations Tab

visualizations in Excel (the first three rows are all creatable in Excel). Table 10 also includes three highlighted Power BI-specific visualizations that I have found particularly useful.

**Highlighted in Yellow:** A Gauge Chart has a circular arc and displays a single value that measures progress toward a goal. The goal, or target value, is represented by the line (needle).

**Highlighted in Green:** A Power BI Card displays one or more data points. Sometimes, a single number is the most important thing you want to track in your Power BI dashboard or report, such as total sales, market share year over year, or total opportunities.

**Highlighted in Blue:** A Power BI Matrix is a type of table that supports a stepped layout. A table supports two dimensions, but a matrix makes displaying data

meaningful across multiple dimensions easier.

When you combine the abilities to add additional visualizations from the Microsoft Store, create custom visualizations utilizing R and Python, and integrate natively with Power Apps and Power Automate, the possible visualization options become close to infinite.

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### ***4.1.5 Output and Sharing***

Once your report is ready, you have several options to share it:

- **Publishing to Power BI Service:** Share your reports with others by publishing them to the Power BI Service, where others can view and interact with them.
- **Exporting Reports:** You can export to PDF, PowerPoint, or print them directly.
- **Sharing Dashboards:** After publishing to the Power BI Service, you can share dashboards directly with your team or organization. You can control access and permissions to ensure that only the right people can view or edit the reports.

### ***4.1.6 Bonus: Bookmarking Filter Selections***

From the View Tab in the Ribbon, you can toggle the Bookmark Pane. From the Bookmark Pane, you can Add a Bookmark, Rename Bookmarks, and Delete Bookmarks. Bookmarks create a link to the filters that are currently applied on the current tab. In this model, bookmarks have been made to an unfiltered Demographics & Counts Tab and Labor Rate Dashboard Tab. Bookmarks can also be attached to buttons as an action (this is how the "Clear Filters" button was created).

## **4.2 Power BI 201: Intermediate Concepts**

Intermediate users can leverage Power BI's capabilities for more complex data relationships and analyses. Establishing one-to-many relationships ensures data integrity when linking tables. For example, connecting labor categories to historical rate trends simplifies navigation and analysis within complex datasets.

These features enable users to:

- Create calculated columns and measures to derive new insights.
- Implement dynamic filtering to explore subsets of data interactively.
- Visualize complex relationships using matrix tables or custom charts.

### 4.2.1 Understanding Relationships in Power BI

In Power BI, relationships define how data from different tables are connected. These relationships allow you to pull data from multiple tables into a single report or visualization. A

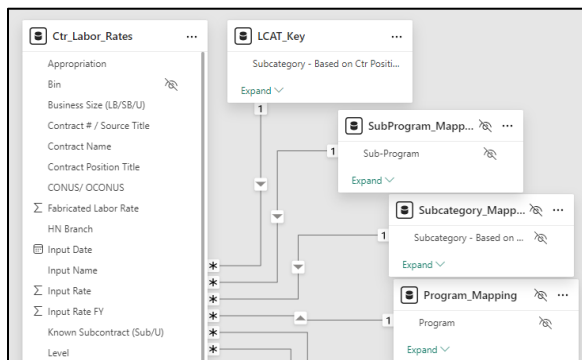


Image 11: Power BI Relationship Mapping

**One-to-Many Relationship:** This is one of the most common types of relationships. It connects a single record from one table, the "one" side, to multiple records in another table, the "many" side. Example: Imagine you have two tables: orders and customers. Each customer can place multiple orders, so the relationship between customers (one) and orders (many) is a one-to-many relationship.

### 4.2.2 Replacing LOOKUP Functions with Relationships

In Excel, a LOOKUP Function (V, H, or X) is often used to pull data from one table into another based on a matching value. However, in Power BI, you can achieve the same result more efficiently with relationships. **Efficiency:** Unlike LOOKUP, which needs to be manually set up and adjusted, relationships in Power BI automatically link data based on common fields (keys). **Automation:** Once a relationship is established, it automatically updates as data changes, eliminating the need to redo LOOKUPS manually. **Scalability:** Power BI can oversee large datasets more effectively than Excel, and relationships allow for easy scaling without compromising performance.

### 4.2.3 Making Re-Mapping Easy

One of the main advantages of using a one-to-many relationship in Power BI is the ease of re-mapping or updating data connections. **Dynamic linking:** If data changes in one of the tables (e.g., a new customer is added), the relationship automatically updates without manually adjusting anything. **Centralized management:** Relationships in Power BI are managed centrally in the Model View. This allows you to easily see and adjust how tables are connected, unlike in Excel, where LOOKUPS must be individually checked and updated. **Data integrity:** By using relationships, you ensure that data is consistently and accurately linked across your report, reducing the risk of errors that can occur with manual LOOKUPS.

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#### 4.2.4 Visualizing and Leveraging Relationships

Once you have set up a one-to-many relationship in Power BI, you can leverage it in your reports and dashboards. **Filtering across tables:** When you filter data in one table (e.g., selecting a customer), Power BI automatically filters the related data in the connected table (e.g., showing only orders for that customer). **Combined data visualizations:** You can create visuals that pull data from both the "one" and "many" tables, giving you richer insights. **Example:** Using this schema a chart showing total sales per customer can be easily created by leveraging the relationship between customers and orders tables.

Using a one-to-many relationship simplifies your data model, making it more robust, easier to manage, and scalable for future data updates.

### 4.3 Power BI 301: Advanced Techniques

Advanced users can explore Power BI's more sophisticated tools to uncover deeper insights. Dynamic grouping functionality allows users to segment data into meaningful categories, facilitating tailored analysis.

Power BI's formula language, Data Analysis Expressions (DAX), and its Extract, Transform, Load (ETL) tool, Power Query, enable users to clean, manipulate, and analyze data with precision. For instance:

- DAX can calculate weighted averages or percent changes across categories.
- Power Query simplifies data cleansing by automating tasks like removing duplicates or reshaping columns.

By combining these tools, advanced users can create dashboards that forecast labor rate trends and provide actionable insights for leadership teams. Beyond static dashboards, Power BI's compatibility with machine learning tools like Python and Azure ML enables predictive analytics. For instance, incorporating an anomaly detection model using Python scripts can flag vendor labor rates that deviate significantly from historical benchmarks.

### 4.3.1 Creating Groups in Power BI

In Power BI, you can create custom groups or categories within an existing field to better segment and analyze your data. This feature is remarkably useful when grouping specific values for reporting purposes without modifying the underlying data.

Creating user identified groups allows you to:

- **Simplify Reporting:** Group related items together to make interpreting your reports easier.
- **Perform Custom Analysis:** Tailor data segmentation to meet specific business needs or preferences.
- **Create Dynamic Categories:** Quickly adjust groupings based on changing criteria without altering the original data.

### 4.3.2 Methods for Creating Groups in Power BI

There are several ways to create groups within an existing field:

**Manual grouping:** In any report or visualization, right-click the field you want to group in the data pane. Right-click on the field in the data section of the tab. Select new group. In the groups window, you will see all the unique values in that field. You can then manually select items to group together by checking the boxes next to them. Click the group button to combine them under a new name. Rename the group to something meaningful. Any items not included in a group will either remain ungrouped or be placed into an "Other" category, depending on your selection.

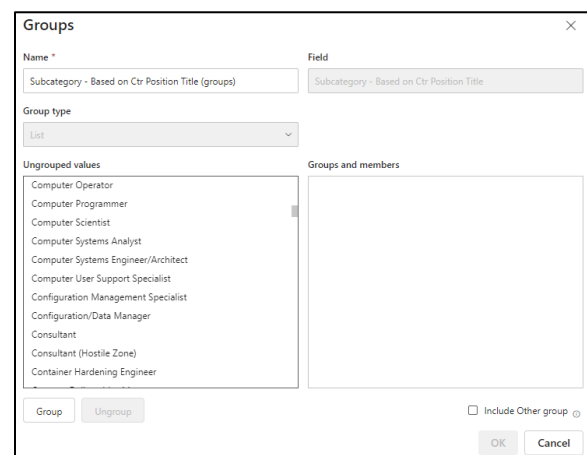


Image 12: Power BI Group Creation Screen

**Grouping by range (bins):** Similar to manual grouping, right-click on the field in the Fields pane. This opens the Groups window. Choose Bins. Specify the bin size (e.g., group by ranges of 10, 100, etc.). Power BI automatically creates equal-sized groups or bins based on your defined range.

**Using DAX for custom grouping:** You can create a new column using Data Analysis Expressions (DAX) to define custom groups for more advanced groupings. Go to the Modeling tab and select New Column. Use a DAX formula to define the groups. **For example:** Grouping = SWITCH(TRUE(), Table[Field] IN {"Value1", "Value2"}, "Group 1", Table[Field] IN {"Value3", "Value4"}, "Group 2", "Other") This formula groups specific values into "Group 1" or "Group 2" and labels anything else as "Other." Once created, this new column can be used in your visuals just like any other field.

#### *4.3.3 Managing and Modifying Groups*

**Modify groups:** To modify existing groups, right-click on the grouped field and select Edit Groups. Here, you can add or remove items from a group, rename groups, or delete them.

**Dynamic updates:** If your underlying data changes, Power BI will automatically update the groups based on the new data. **Meaningful group names:** Always give your groups clear, meaningful names to ensure your reports are easily understood. **Consistency:** Keep your groupings consistent across reports to maintain clarity. **Review and adjust:** Regularly review your groups, especially if the data changes over time, to ensure they remain relevant.

#### *4.3.4 Practical Example*

Let's say you have a field called product category with values like laptops, desktops, tablets, and accessories. You want to create broader categories like computers (combining laptops and desktops) and other (tablets and accessories). **Method:** Use manual grouping to combine laptops and desktops into computers. **Result:** Your report now shows the broader category computers alongside other instead of each product category separately.

### 4.3.5 Grouping Summary

Creating user-identified groups in Power BI allows for flexible data segmentation and enhances the clarity and focus of your reports. Whether through manual grouping, bins, or DAX, Power BI provides the tools to customize your data presentation to meet your analytical needs.

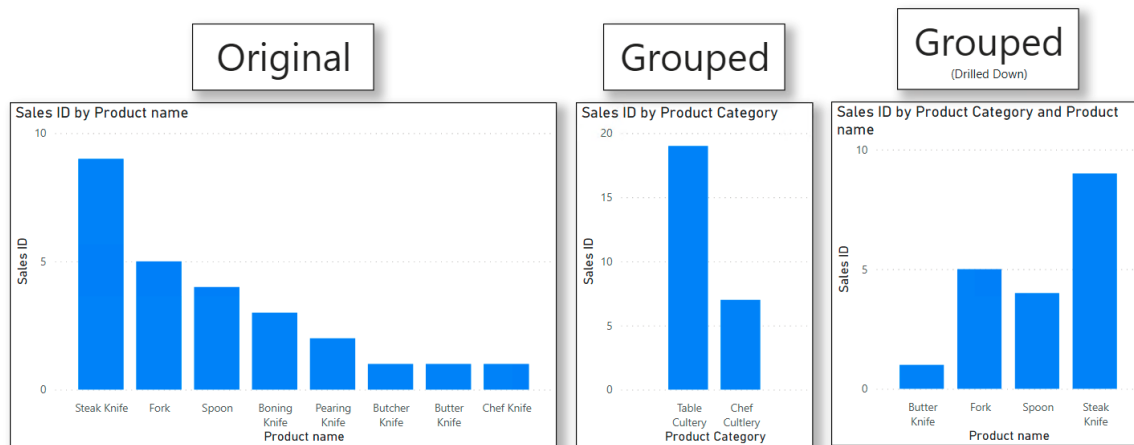


Image 13: Grouped Data Example

## 5 HN LABOR RATE POWER BI TABS

The various HN Labor Rate Power BI Dashboard tabs were designed to provide a versatile tool for cost analysis. Applications range from real-time pricing evaluations to forward-looking cost estimations. Each use case demonstrates the dashboard's capabilities in addressing specific analytical challenges, from validating labor rates during source selection to forecasting costs for complex engineering efforts.

Among these, Use Case 1: Pricing and Negotiation Support stands out as the most impactful and widely applicable. This use case empowers analysts to leverage the database for benchmarking proposed rates against historical data, identifying variances, and providing actionable insights to procurement teams (PK). It exemplifies the dashboard's ability to enhance decision-making and ensure fair, defensible outcomes

Conversely, the final use case, which involves projecting costs based on anticipated full-time equivalent (FTE) labor, highlights the importance of detailed engineering input for accurate results (and multiple concerns with this approach). This scenario, while offering significant potential, reminds us of the need for precise and collaborative data inputs to achieve reliable projections.

Together, these use cases underscore the dashboard’s utility across varying levels of complexity and analytical depth, showcasing its flexibility and strategic value.

### 5.1 Demographics & Counts Tab

The Demographics & Counts tab offers a high-level overview of data distribution, providing essential context for deeper analysis. This tab displays the number of data points per program, sub-program, vendor, and labor category represented in the database.

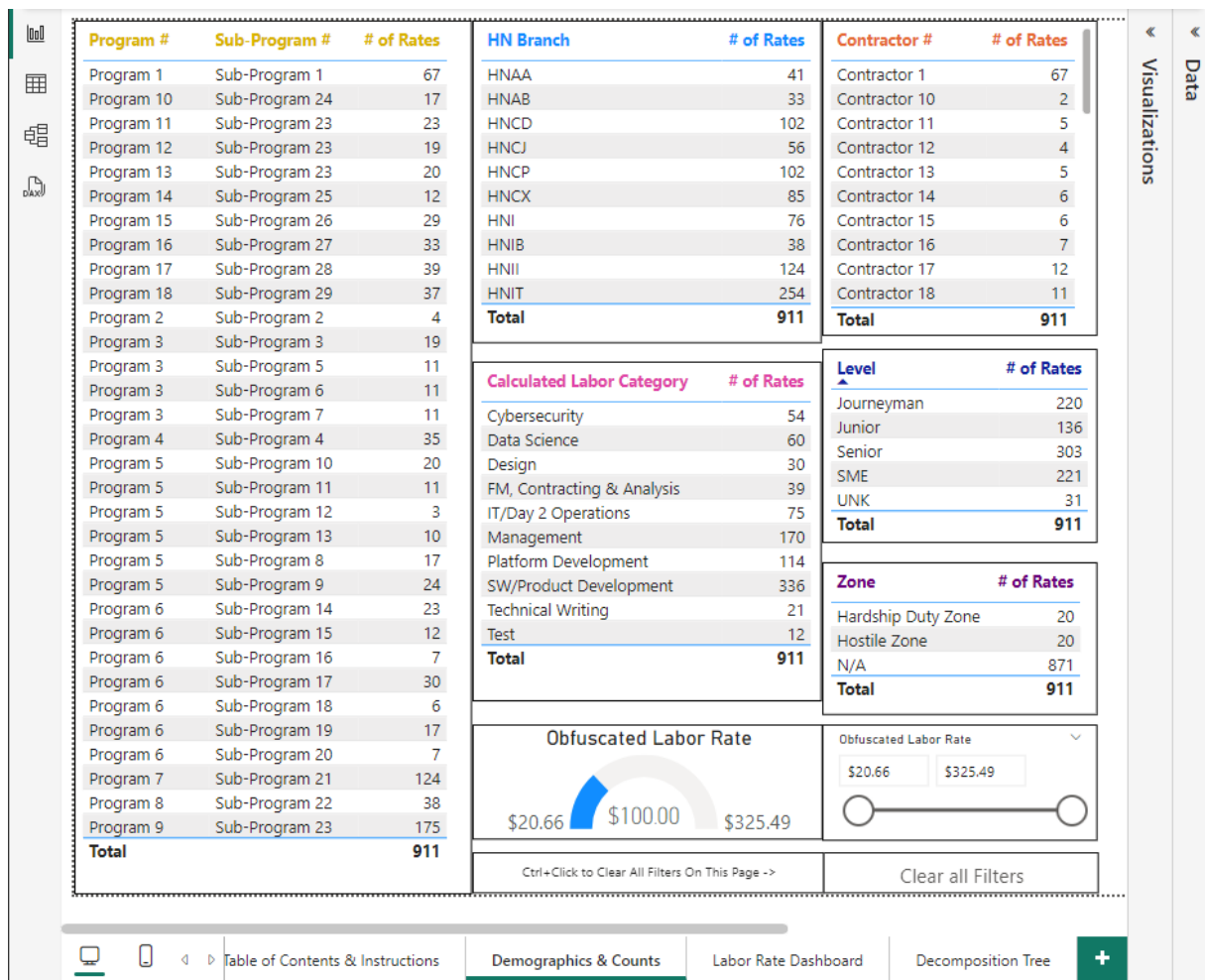


Image 14: HN Labor Rate Power BI Demographics & Counts Tab

For example, this tab can highlight which programs and sub-programs are in the database or that approximately 50% of the database is comprised of SW/Product/Platform Development labor categories. This tab should also emphasize how the analyst plans to utilize the data in the database and Power BI dashboard. The filtering selected on any Program, Branch, LCAT, or

Contractor filters all tables on this tab, allowing analysts to see a complete picture of data captured in any subset of data. Use Cases 1-3 in the following section depict potential dashboard usage. In each case, analogous effort or anticipated vendor information is critical and highlights the need for LCAT-level details when utilizing LCAT averages or actuals from this model.

### 5.2 Labor Rate Dashboard

The Labor Rate Dashboard tab is the central hub for exploring and comparing labor rates. Users can apply dynamic filters to drill down into specific programs, vendors, or labor categories. This tab also allows for historical trend analysis, enabling analysts to identify cost drivers or forecast future labor rate increases.

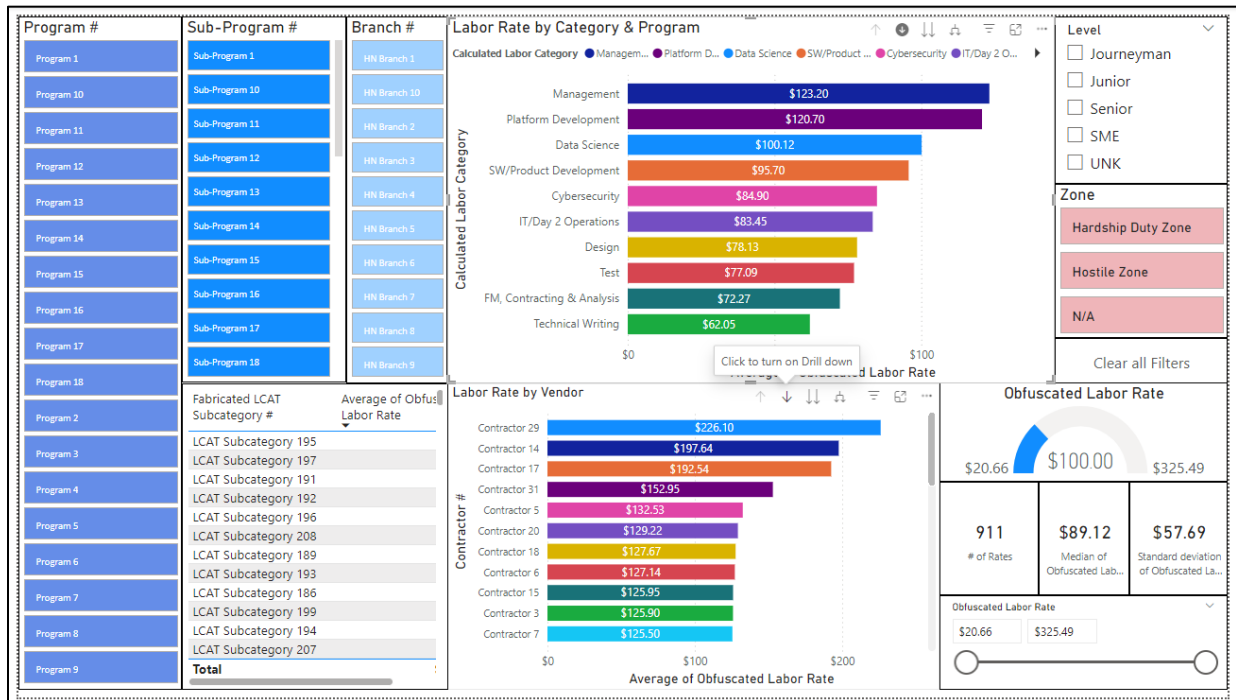


Image 15: HN Labor Rate Power BI Labor Rate Dashboard Tab

Again, any filtering selected on this page applies to all visualizations on this tab, which allows analysts to quickly see all LCAT information for any possible subset of the data. Any combination of data selected will automatically update the other graphs and statistical information. Additional filters for any category can be added to this dashboard. A popular request for a “Labor Rate Date pre-Normalization” range slider has already been implemented.

The accompanying PowerPoint slide deck highlights the two main drill-down options on this tab: The Labor Rate by Category & Program graph (top) drills down on “Calculated Labor Category” and displays the LCAT Level and accompanying Average Labor Rate. The Labor Rate by Vendor graph (bottom) drills down on “Contractor #” and displays the LCAT Subcategory and accompanying Average Labor Rate. All slicers on this page are linked to provide the most applicable subset of data based on the estimate needs.

### 5.3 Decomposition Tree

The Decomposition Tree tab provides a unique way to explore hierarchical data. It breaks down complex datasets into manageable components, such as rates by region, vendor, and expertise level. This visualization tool allows users to understand relationships and dependencies within the data, offering more profound insights.

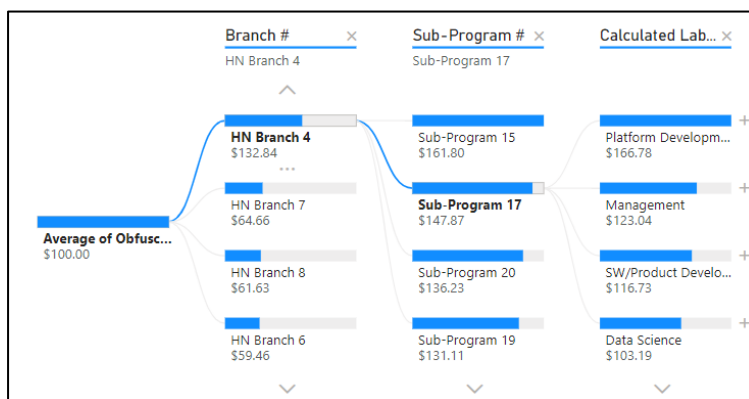


Image 16: Decomposition Tree Example

## 6 LCAT LABOR RATE DASHBOARD USE CASES

### 6.1 Use Case 1: Technical Evaluation Assistance

Use Case 1 represents the most impactful application of the HN Labor Rate Database in its current state, particularly during source selection and technical evaluations. By comparing proposed LCAT rates against historical benchmarks, analysts determine reasonability and provide procurement professionals (PK) with actionable insights. This process aligns closely with FAR 15.404-1, which emphasizes price reasonableness determinations based on cost or price analysis.

For the first use case, the following program assumptions have been made:

- The program is in source selection and wants to determine if the rates proposed are fair and reasonable.
- The program has identified Contractor 23 as the most likely candidate.
- The program has stated that no SMEs are required for this effort.
- The program requirements are for cybersecurity, data science, management, SW/product development, and design support.

Potential Conclusion: Proposed LCAT/Level combinations can be compared to the historical database’s eighty-seven relevant rates.

This use case demonstrates how Power BI supports fair and reasonable labor rate evaluations during source selection processes. For example, during a proposal review, a program identifies a requirement for cybersecurity, data science, and IT management support without



Image 17: Use Case 1: Dashboard Snapshot

SME-level personnel. Power BI enables analysts to compare proposed labor rates with the historical database, identifying eighty-seven comparable rates and validating fairness.

Beyond identifying rate discrepancies, this use case encourages deeper exploration into underlying factors. For example, are variances driven by differences in direct rates or company-specific fringe, overhead, and burden rates?

Additionally, identifying vendor characteristics (e.g., small business vs. large vendor) adds context to the analysis. By delivering these insights, analysts demonstrate expertise and add value to the negotiation process, supporting PK with comprehensive narratives for decision-making.

## 6.2 Use Case 2: Labor Category (LCAT) Level Delta Analysis

Use Case 2 explores the strategic implications of labor category transitions, offering insights into the cost dynamics of adjusting workforce compositions. Specifically, it examines scenarios where programs might replace lower-level LCAT roles, such as Journeyman positions, with higher-level roles like Senior staff.

The second use case utilizes a more specific set of Program Assumptions: The program has stated that it wants to replace all Data Science Journeyman FTEs with Senior FTEs and noted that no one is in a Hardship/Hostile Zone.

If the Data Science team is a blend of multiple Vendors, then the average labor rate could increase by approximately 50% (Image 18,  $\$69.87 * 50\% \approx \$105$ ).

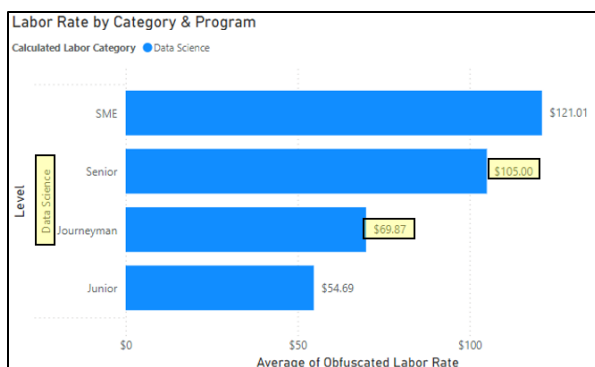


Image 18: Use Case 2: Data Science Labor Rates by Level

If the Vendor is known, the average labor rate could increase by approximately 56% (Image 19,  $\$91.52 * 56\% \approx \$142.61$ ).

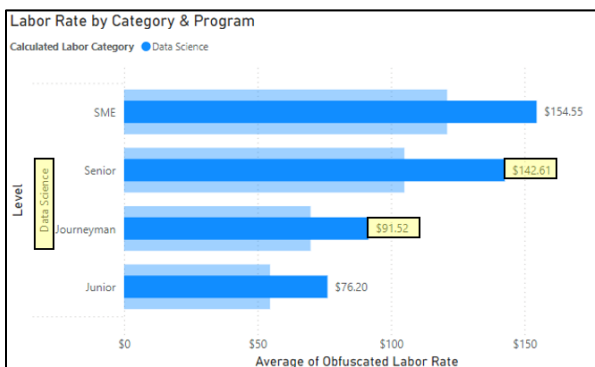


Image 19: Use Case 2: Data Science Labor Rates with Specific Vendor

This use case explores the cost implications of transitioning labor categories. For instance, a program may plan to replace Data Science Journeyman roles with Senior roles. Using Power BI, analysts estimate an average labor rate increase of 50-56%, depending on vendor mix. Such analysis provides decision-makers with actionable data for budgeting and negotiations.

This analysis enables decision-makers to anticipate the fiscal impact of such transitions, accounting for vendor-specific labor rates, project requirements, and potential cost increases. By leveraging the HN Labor Rate Power BI Dashboard, analysts can provide detailed, data-backed projections highlighting how labor mix changes affect overall costs, offering actionable insights to support informed programmatic and budgetary decisions.

### **6.3 Use Case 3: Projected LCATs + Full-Time Equivalent (FTE) Hours**

Use Case 3 demonstrates the dashboard's ability to estimate costs for a program or project by combining projected Full-Time Equivalent (FTE) hours with historical labor category (LCAT) data. While this approach offers valuable insights, its effectiveness relies heavily on the accuracy and relevance of the EN/PM team's inputs. The reliance on LCAT-specific data for overarching program estimates introduces inherent limitations, due to the lack of visibility into the required skill mix. Without a clear understanding of the mix of roles and expertise needed to execute the effort, cost estimates risk being incomplete or misaligned with actual program demands.

A primary concern in this scenario is determining a valid program analogy. Effective analogous programs share comprehensive similarities, including the type of work performed, the necessary skill mix, and the balance between prime and subcontracted labor. Allowing the EN/PM team to build up their own LCAT structures can lead to significant discrepancies unless they align closely with historical data. Questions such as "What is the program analogy in this case?" and "What type of work will be performed?" must be addressed early to ensure accurate cost projections. Additionally, while robust, the database's structure may not always separate prime and subcontractor contributions within the same proposal, further complicating the analysis.

Another critical factor is the labor breakout provided by the EN/PM team. Analogous programs are inherently defined by their inclusion of all necessary labor types and an appropriate skill mix to complete a comparable effort. When EN/PM teams select or omit specific roles, the resulting estimates may lose the integrity of an accurate analogy. This approach should be employed cautiously and only in rare circumstances, such as renewing contracts where the workforce is already in place ("butts-in-seats" contracts). In other situations, a more holistic review of historical data and comprehensive program requirements is advised to ensure accuracy and reliability.

These concerns underscore the importance of collaboration between analysts, EN/PM teams, and procurement stakeholders to refine inputs and validate assumptions. By maintaining a clear focus on aligning labor breakouts with analogous programs and required skill mixes, the dashboard can serve as a powerful tool for informed cost estimation. However, it is vital to apply these methodologies judiciously, recognizing their limitations and ensuring the inclusion of all relevant data to produce actionable insights.

The last use case assumes a minor contract with a defined LCAT labor breakout is up for renewal, and a quick estimate per FTE is required. The PM/PK team has provided you with the period of performance, the current (and future via a sole-source J&A) vendor information, and the following contract FTE breakout:

LCAT Category	LCAT Subcategory	Level	FTEs Required
Data Science	Subcategory 189	SME	0.25
SW/Product Dev	Subcategory 204	Senior	2
Management	Subcategory 187/188	Journeyman	2
Management	Subcategory 188	Junior	3

*Image 20: Use Case 3: LCAT Labor Breakout*

This breakout allows corresponding LCAT rates in dollars per hour to be pulled directly from the Power BI model (Obfuscated Rates: \$260.39, \$216.76, \$201.99, and \$184.21, respectively). We can now compute costs using [FTEs \* Hours Per Year \* Labor Rate] with the appropriate risk and inflation applied.

**Note:** The average labor rate above is 215.84 dollars per hour, whereas the average labor rate weighted by FTEs is 200.72 dollars per hour. This highlights the need for FTE breakouts by LCAT when applying LCAT labor rates. Entry-level junior position labor rates and tenured subject matter expert labor rates alike can easily skew averages from this database.

This use case demonstrates Power BI's capability to forecast labor costs by combining projected Full-Time Equivalent (FTE) hours with vendor-specific labor rates. For example, analysts can estimate the total cost of a 2-year engineering support contract by applying FTE-based calculations to historical vendor rates. The dashboard provides real-time insights, enabling accurate planning and resource allocation.

## 7 FUTURE ACTIONS AND ADVANCED ANALYSIS

Future iterations of the HN Labor Rate Database will incorporate additional data categories to enhance analytical depth and relevance. Proposed additions include:

- **FTE Allocations by LCAT:** This will enable true weighted average Fully Burdened Labor Rates (FBLRs) by project, highlighting the overarching project size.
- **Project-Level Tags:** Categories to classify projects by technology domain (e.g., SW-intensive, HW-intensive), providing context for applicability.
- **Commodity-Specific Trends:** Enabling targeted rate analysis by commodity area or technology type.
- **Historical Rate Change Analysis:** Tools to visualize rate increases over time by vendor or commodity specifics, supporting strategic cost forecasting.

Future enhancements will leverage advanced analytics to deepen the database's utility. Proposed developments include:

- **Adding New Data Points:** Incorporate data fields such as geographic location and additional certifications to enrich analysis.
- **Automating Inflation Adjustments:** Develop scripts or DAX formulas to apply inflation factors dynamically, ensuring accurate rate comparisons.

- **Advanced Delta Analysis Tools:** Create a tool to track and visualize year-over-year labor rate changes, highlighting trends for initiative-taking cost management.
- **Machine Learning Integration:** Leverage machine learning algorithms for predictive analysis, such as forecasting future labor rates based on historical patterns and market factors.

## 8 POWER BI PITFALLS AND CAUTIONS

### 8.1 Common Challenges

While Power BI offers immense potential, particular challenges must be managed to ensure its effectiveness. Regular updates are necessary to keep data and visuals relevant, as outdated dashboards risk providing inaccurate insights. Maintaining clear, consistent documentation, including naming conventions and data source descriptions, simplifies updates and troubleshooting. Ensuring appropriate permissions are maintained is critical to safeguarding sensitive data and avoiding disruptions caused by broken links or access changes.

### 8.2 Best Practices

- To mitigate common pitfalls, users should adopt the following best practices:
  - **Establish Maintenance Cadence:** Schedule regular updates to ensure dashboards remain accurate and relevant.
  - **Enforce Documentation Standards:** Develop detailed documentation to support knowledge transfer and troubleshooting.
  - **Implement Robust Access Controls:** Regularly review permissions to ensure sensitive data is protected, and access is aligned with organizational needs.

## 9 CONCLUSION

Power BI has redefined cost analysis through its powerful visualization and analytics capabilities. The integration of the AFLCMC HN Labor Rate Database showcases the tool's ability to transform complex datasets into actionable insights. With planned enhancements, including automation and expanded data fields, Power BI remains a critical asset for cost analysts. Collaboration opportunities are plentiful for those looking to replicate or extend this work.



*Image 21: The Power BI Future - AI Created*

## 9.1 Access Requests and Collaboration

Strict security and confidentiality protocols govern access to this tool to protect proprietary information and maintain compliance with organizational and government standards. Analysts, program managers, and other stakeholders interested in leveraging this resource must submit formal access requests through the appropriate AFLCMC/HN channels.

Access to the database and dashboard is not guaranteed and is subject to several validation layers, including security clearance checks, non-disclosure agreements (NDAs), and confirmation of an official need for use. Prospective users must clearly articulate their intended use cases, ensuring alignment with program or organizational goals. Collaboration opportunities are extended to individuals and teams who demonstrate the potential to contribute meaningfully to the database's enhancement or application.

Quantech Services Inc. and AFLCMC/HN welcome inquiries and proposals for collaborative efforts to enhance the database and dashboard. Interested parties are encouraged to contact Patrick Casey at [pcasey@quantechserv.com](mailto:pcasey@quantechserv.com) or through the appropriate AFLCMC/HN channels. Together, we can drive innovation in cost analysis, ensuring that these tools continue to deliver value for programs and stakeholders across the DoD.

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