A COMPARATIVE ANALYSIS BETWEEN DATA VISUALIZATION TOOLS FOR EFFECTIVE COMMUNICATION: POWER BI AND QLIK SENSE

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ABSTRACT

In today’s data-filled world, effectively communicating complex information is crucial. This research examines two widely-used data visualization tools, Power BI and Qlik Sense, to understand their effectiveness in communicating complex information. Beginning with the basics of data visualization, the study explores the unique features of both tools. By comparing their strengths and weaknesses, the research aims to guide professionals and organizations in choosing the right tool for optimizing data communication. In a world where clear communication is key, this analysis provides insights for selecting the most suitable data visualization tool to enhance communication strategies based on some common considerations.

Keywords: Complex Information, Effective Communication, Data Visualization Tools, Power BI, Qlik Sense, Key Analysis, Strength And Weakness, Enhancing Communication Strategies.

I. INTRODUCTION

Data visualization involves presenting information in graphical or visual formats, such as creating graphs, charts, and dashboards using various tools. Its purpose is to make data more easily understandable, and interpretable. In data visualization, we start with raw data, numbers, or text and transform it into a comprehensible visual representation, enhancing clarity and accessibility for analysis and decision-making.

Data visualization is essential for myriad reasons. It helps simplify complex information by using visuals like charts and graphs, making it easy for people to grasp intricate data sets. It plays a crucial role in making informed decisions by allowing a speedy and effective analysis of data trends, patterns, and outliers. This empowers individuals to make well-informed choices based on a solid understanding of the information.

Communication is a strong suit of data visualization, as visuals go beyond language barriers. It makes it easier to share findings with diverse audiences, including those not familiar with the underlying data. Visualizations are memorable, standing out more than raw data, aiding in the retention and recall of information, especially for decision-makers and stakeholders.

Identifying trends and patterns becomes simpler with visualization, drawing attention to details that may be hard to see in raw data alone. This focus on trends provides a complete understanding of the information. Data visualization also speeds up the identification of outliers, vital for maintaining data integrity and reliability. By making anomalies more visible, it contributes to ensuring the quality of the data.

User-friendly reporting is improved through visualization tools that create easy-to-understand reports and dashboards. People can quickly understand information through visuals, saving time compared to going through raw data. In summary, data visualization is a powerful tool for simplifying information, aiding decision-making, and making data accessible to diverse audiences. Conclusively, data visualization is a powerful tool for simplifying information, aiding decision-making, and making data accessible to diverse audiences.

Figure 1.1
II. LITERATURE REVIEW

[1] This paper review underscores the pivotal role of data visualization in business decisions, emphasizing simplicity, clarity, consistency, and accessibility as key factors for effective visualizations. [2] This paper stresses the vital role of diverse data visualization tools, addressing challenges and proposing AI integration and improved accessibility for future enhancements. [3] This paper highlights data visualization tools' crucial role in analysis and communication, exploring Tableau, Power BI, Python libraries, and emphasizing evolving capabilities and emerging trends. [4] This paper underscores data visualization's role in aiding management decisions, emphasizing both aesthetic and functional aspects, while highlighting the importance of careful implementation and user understanding. [5] This paper underscores the vital role of data exploration and visualization systems in the Big Data era, emphasizing the importance of protocols for accurate insights and addressing challenges in process enhancement and opportunity identification. [6] The paper underscores the pivotal role of data visualization in data science, covering diverse methods from individual charts to integrated dashboards. It explores best practices, interactivity, real-world applications, challenges, and emerging trends in this dynamic field. [7] The article is a comprehensive review of data visualization tools, discussing their features, strengths, and weaknesses. It aims to provide valuable insights for researchers and practitioners in the field of data analysis. [8] The paper provides ten principles that serve as guidance for those who seek to improve their visual message. It is a valuable resource for scientists, researchers, and anyone interested in data visualization. [9] The paper explores challenges and tools in big data visualization, addressing volume, variety, and processing speed. It introduces a classification for data visualization strategies and discusses the potential for hierarchical visualization in the context of big data. [10] The paper promotes Gapminder tools for dynamic data visualization, emphasizing their advantages for teaching with official statistical databases. It covers offline usage, tutorial videos, and highlights configuring Gapminder Bubble Chart for teaching statistical concepts and analyzing time series data.

III. PRINCIPLES OF EFFECTIVE DATA VISUALIZATION

In today's business world, the purpose of data visualization is to simplify intricate information by presenting it in clear and accessible visual formats. This facilitates the easy understanding of complex data and supports informed decision-making. So, here is the simple key principles and guidelines for creating effective data visualizations.

3.1 Conduct audience analysis:
Understand your audience through surveys or direct conversations to align visualizations with their preferences and expectations.

3.2 Maintain simplicity:
Focus on essential data for clarity; a clean design highlights crucial information, while complexity can hinder understanding.

3.3 Select appropriate chart:
Choose charts based on data and message; use a line chart for changing numbers over time or a pie chart for comparing parts of a whole.

3.4 Maintain design consistency:
Use the same colors, fonts, and layout for a professional and organized look, enhancing clarity and tidiness in visualizations.

3.5 Employ color judiciously:
Choose colors that match your message; red grabs attention, while blue creates a calm atmosphere, enhancing understanding like a wordless story.

3.6 Ensure comprehensive labeling:
Clear labels on lines and numbers make visuals universally understandable, ensuring everyone grasps the data.

3.7 Offer contextual information:
Titles and captions act as guides; the title explains the main idea, while captions provide details for each part, ensuring a complete understanding.
3.8 Verify the data:
Validate information by checking and using tools to catch mistakes, ensuring trustworthy visuals.

3.9 Engage with interactive elements:
Use digital interactivity like tooltips and zooming for engaging visual exploration, acting as personalized guides for enhanced user engagement.

3.10 Adopt strategic use of whitespace:
Whitespace provides clarity, giving your eyes room to focus on important elements and making information easier to grasp.

All these principles can provide a comprehensive guide for crafting effective data visualizations.

IV. TYPES OF DATA VISUALIZATIONS

Data visualization is a powerful means of transforming complex data sets into accessible and comprehensible insights. Different types of data visualizations do this job in various ways, making information clearer for better decisions.

4.1 Static visualization:
Static visualization is a foundational method in data representation, using traditional formats like bar charts and pie charts. Unlike interactive visuals, static ones offer a fixed snapshot of data, presenting straightforward insights without user manipulation. The simplicity of static visualizations makes them essential for conveying information clearly and concisely. The process involves transforming raw data into visually interpretable representations through key steps.

1. Data Collection: Gather relevant data.
2. Data Analysis: Analyze, clean, and transform the data.
3. Choose Visualization: Select the appropriate static format.
4. Design: Consider layout, color, and clarity.
5. Create Visualization: Craft using tools or programming languages.
7. Present: Share the impactful final visualization in reports or presentations.

Creating static visualizations requires a careful blend of analytical skills, design expertise, and technical know-how. This harmonious approach is crucial for crafting visual representations that seamlessly communicate complex information.

4.2 Interactive Visualizations:
Interactive visualizations turn data presentation dynamic, letting users actively explore and manipulate information. Unlike static visuals, interactive ones engage users through features like tooltips, zooming, and filtering, providing a personalized and adaptable approach to data exploration.

1) Data Integration: Combine data from various sources.
2) Select Interactive Features: Choose features like tooltips, zooming, and filtering.
3) Tool Selection: Pick appropriate platforms for creating interactive visualizations.
4) User-Friendly Interface Design: Design an intuitive interface.
5) Testing and Refinement: Test and refine for optimal user experience.
6) Gather User Feedback: Collect user feedback for improvements.
7) Provide Documentation: Offer clear guidance on usage.
8) Deployment: Make the interactive visualization accessible to users. By following these steps, interactive visualizations can be effectively created, providing users with a dynamic and engaging means of exploring complex data sets.

4.3 3D and Geospatial Visualizations:
3D and Geospatial Visualizations are advanced ways of showing data.
3D Visualizations add depth to charts and graphs, creating a more lifelike experience. This technique involves presenting data in a three-dimensional space, providing diverse perspectives for better comprehension.

Geospatial Visualizations map data onto geographical locations, akin to placing information on a map. This method facilitates the understanding of trends and patterns based on specific locations.

Both approaches introduce a new dimension to data, simplifying the exploration and comprehension of intricate information.

V. TOOLS AND TECHNOLOGIES

5.1. Qliksense:
It is a business intelligence and data visualization tool developed by Qlik. It is designed to help organizations turn data into insights and drive data-driven decision making. QlikSense provides a range of features that set it apart from other BI tools, including: 

- **Associative Engine:** QlikSense uses an associative engine that allows users to explore and analyze data from multiple sources in an intuitive and flexible way. This engine automatically suggests relevant data and insights based on user selections, making it easy for users to uncover hidden relationships and insights in their data.

5.1.1. Pros and cons of Qliksense:
5.1.1.1. Pros:
1. **Associative Data Model:** Enables dynamic data exploration without predefined hierarchies.
2. **User-Friendly Interface:** Accessible with a drag-and-drop interface for self-service BI.
3. **Versatile Visualization:** Offers diverse visualization options for interactive reports.
4. **Flexible Deployment:** Allows deployment on-premises, in the cloud, or in a hybrid setup.
5. **Collaboration Features:** Facilitates teamwork with robust collaboration tools.

5.1.1.2. Cons:
- **Learning Curve:** Advanced features in Qlik Sense may pose a steeper learning curve, necessitating time investment in training.
- **Cost:** Qlik Sense licenses and infrastructure costs may be a consideration, depending on the implementation scale.
- **Query Complexity:** Transitioning from traditional query-based BI to Qlik Sense's associative data modeling might be initially challenging for some users.
- **Resource Intensive:** Complex analyses or large datasets may strain system resources, impacting performance.
- **Dependency on Data Quality:** Qlik Sense's effectiveness relies on the quality of underlying data, emphasizing the importance of data quality.

5.2. PowerBI:
Power BI, a Microsoft business analytics service, facilitates data visualization and insight-sharing through interactive dashboards and reports. With self-service capabilities, users can connect to diverse data sources, transform raw data, and create visually compelling reports. Widely utilized across industries for data analysis and business intelligence, Power BI is esteemed for its user-friendly interface, seamless integration with Microsoft products, and robust features for effective data visualization and exploration.

5.2.1. Pros and Cons of PowerBI:
5.2.1.1. Pros:
- **User-Friendly Interface:** Power BI's user-friendly design caters to both technical and non-technical users, facilitating the creation of interactive visualizations.
- **Microsoft Integration:** Seamless connectivity with Microsoft products like Excel and Azure streamlines data sharing within the Microsoft ecosystem.
- **Data Source Versatility:** Power BI enables users to connect to diverse data sources, allowing for comprehensive analysis and reporting.
Widespread Adoption: As a Microsoft product, Power BI enjoys broad adoption, supported by an active community that provides ample resources and support.

Regular Updates: Microsoft consistently enhances Power BI with updates, ensuring users access the latest tools for effective data analysis.

5.2.1.2. Cons:

- Cost: Power BI’s pricing, though offering a free version, may be prohibitive for organizations needing advanced features or additional capacity.
- Learning Curve: Mastering Power BI’s advanced features may pose challenges for new users, particularly those unaccustomed to business intelligence tools.
- Limited Customization: Compared to competitors, Power BI may have constraints in customization and fine-tuning visual elements.
- Performance Issues: Handling large datasets in Power BI may result in performance issues, necessitating optimization for smoother functionality.
- Internet Dependency: Power BI’s online functionality relies on a stable internet connection, potentially causing challenges in offline or low-connectivity scenarios.

VI. COMPARATIVE ANALYSIS

The comparative analysis is conducted based on five categories: ease of use, integration, advanced analytics, cost, and community support.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Features</th>
<th>Qlik Sense</th>
<th>Power BI</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ease of use</td>
<td>Qlik Sense is made to be easy to use, but it might be a bit tricky for beginners because it can get a bit complex.</td>
<td>Power BI is easy to use and works well with Microsoft products, making it great for organizations already using Microsoft, as it’s considered user-friendly and accessible.</td>
<td>Qlik Sense and Power BI are both easy to use for many people. They have simple interfaces for different skill levels. But Power BI is better if you already use a lot of Microsoft stuff.</td>
</tr>
<tr>
<td>2.</td>
<td>Integration</td>
<td>Qlik Sense is versatile, connecting easily to different data sources beyond Microsoft, making it a good choice for organizations with diverse data from various systems.</td>
<td>Power BI works well with Microsoft products, providing a smooth experience, but it might have limitations when connecting to sources outside the Microsoft ecosystem.</td>
<td>If a company wants to connect to many different types of data, Qlik Sense is a good choice. But if a company uses a lot of Microsoft products, Power BI is better because it works smoothly with them.</td>
</tr>
<tr>
<td>3.</td>
<td>Advanced analytics</td>
<td>Qlik Sense is great at making data easy to understand with clear visuals and is strong in preparing data for detailed analysis, making it a good choice for those willing to learn.</td>
<td>Power BI is great at making impressive visuals in advanced analytics, and while it may not be as detailed as Qlik Sense, it’s easy to learn and supportive, especially for those new to advanced analytics and using Microsoft products.</td>
<td>For beginners in advanced analytics looking for an easy-to-learn platform with strong support, Power BI is a good choice, while those wanting detailed analysis and willing to invest time might find Qlik Sense with its strong visuals and interface worthwhile.</td>
</tr>
</tbody>
</table>
4. **Cost**

Qlik Sense adjusts its prices based on what each organization needs, providing flexible options to match unique budgets and pay only for the features they require. Power BI is known as a budget-friendly option, especially for those using Microsoft products, as its smooth integration with Microsoft can save costs for organizations already using these tools. Qlik Sense customizes prices for each organization, providing budget flexibility, while Power BI is generally cost-effective, particularly for Microsoft users, due to seamless integration that can reduce overall costs.

5. **Community support**

Qlik Sense has a strong user community, providing lots of resources and support for collaboration, sharing insights, and seeking guidance, enhancing the overall user experience. Power BI has a big and active user community, offering strong support where users can connect, share knowledge, and seek help, contributing to a thriving community with abundant resources and valuable insights. Qlik Sense and Power BI both focus on collaborative learning through active user communities, with Qlik Sense providing robust support and resources and Power BI boasting a large community for strong support and abundant resources.

**VII. CONCLUSION**

In conclusion, choosing a data visualization tool involves looking at factors like ease of use, integration, advanced analytics, cost, and community support. Power BI emerges as a favorable choice for beginners due to its user-friendly design, simplicity, and extensive learning support. Its seamless integration with the Microsoft ecosystem is advantageous for those already familiar with Microsoft products, offering an easier learning curve for individuals starting their journey in data analytics.

At the organizational level, the choice between Qlik Sense and Power BI depends on specific needs and priorities. If the organization values adaptability, versatility in data source connectivity, and is willing to invest in a potentially steeper learning curve, Qlik Sense may be the better option. On the other hand, for organizations deeply rooted in the Microsoft ecosystem seeking a cost-effective solution with strong community support, Power BI is a practical and efficient choice.

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