Analytics with Oracle APEX for Enhanced Data Warehouse Management: A Case Study of a Greek Soft Drinks Company

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This research paper examines the strategic deployment of Oracle APEX by a prominent Greek soft drinks manufacturing enterprise for the enhancement of data warehouse management spanning the period from 2018 to 2022. The integration of Oracle APEX, renowned for its low-code application development capabilities, has emerged as a pivotal catalyst in optimizing data processing workflows, elevating analytical functionalities, and cultivating streamlined decision-making processes within the organization's data ecosystem. This article delves into the specific benefits and outcomes derived from the adoption of Oracle APEX in the context of data warehousing, shedding light on the transformative impact on the company's operations.

Keywords: oracle APEX, data warehouse, company, decision making, analytics

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1 Introduction

In the dynamic realm of data management, organizations are progressively embracing cutting-edge tools and technologies to unlock the complete potential of their data resources. This article centers on a Greek Soft Drinks manufacturing enterprise that, recognizing the need for a robust data warehouse solution, implemented Oracle APEX for the data of years 2018 to 2022.

The integration of data warehousing in soft drinks companies revolves the combination of data from diverse sources to facilitate effective decision-making, analysis, and reporting. This often entails the utilization of the Snowflake schema, a sophisticated approach to organizing data in a warehouse. A study conducted by Mohammed, (Mohammed, 2019), delves into a comparative analysis of the Star and Snowflake Schemas within the framework of structured databases, focusing on a trading company with global operations. The findings of this study suggest that the Star Schema surpasses the Snowflake Schema in terms of query complexity and performance efficiency. Additionally, Levene and Loizou, (Levene & Lozou, 2003) examine the snowflake schema, emphasizing its efficacy as a robust design for data warehouses. They underscore its structural attributes and its capacity to update relations independently, all while preserving referential integrity. A study by Wang and Kourik, (Wang & Kourik, 2015), explores the Snowflake schema's role in connecting data warehouse environments with analytical processing, enabling adaptable analysis and navigation through hierarchies. Dageville et al. (Dageville, et al., 2016), describe the Snowflake Elastic Data Warehouse, a multi-tenant, scalable, and elastic system with full SQL support, emphasizing its suitability for semi-structured and schema-less data. These investigations showcase the development and implementation of data warehouse designs such as the Snowflake schema, underscoring their significance in large-scale data management, particularly in sectors like the soft drinks industry.

Oracle APEX, a low-code development platform, offers a comprehensive suite of tools for creating web applications and is particularly well-suited for data-centric applications, (Angeioplastis, Tsimpiris, Varsamis, Baggia, & Leskovar, 2023). The incorporation of Oracle APEX by the company followed a methodical integration approach, encompassing tasks such as migrating existing data and creating customized applications tailored to their precise requirements. (Ahmed, 2016)

explores the contribution of Oracle APEX in the development of cloud-based applications, underscoring its user-friendly nature in crafting web-based data-centric applications. The study suggests that Oracle APEX's interactive reports enable the creation of intricate applications with minimal coding effort. In a complementary vein, Srinivas, Biswas and Srinivasan, (Srinivas, Biswas, & Srinivasan, 2010), introduce a tool that complements Oracle APEX by providing an application overview, likely incorporating interactive reporting features. This implies the pivotal role of interactive reports in comprehending and managing complex database applications Addressing the security dimension, (Austwick, 2013) delves into the secure implementation of Oracle APEX, including interactive reports, to ensure data integrity and privacy. Lastly, Veerasamy, (Veerasamy, 2022), emphasizes Oracle APEX's capacity for low-code application development, extending to the creation of interactive reports. These reports are deemed essential for swift application development in Oracle APEX, especially for business analytics and decision-making purposes.

This article examines the step-by-step implementation methodology, detailing how Oracle APEX was configured to meet the company's data warehousing requirements.

2 Methods and materials

2.1 Data warehouses

A data warehouse (DW) is a digital storage system that connects and harmonizes large quantities of data from various sources. Its purpose is to fuel business intelligence (BI), reporting, and analytics while supporting regulatory requirements, enabling companies to transform their data into information and make intelligent decisions based on insights. Data warehouses store both current and historical data in one location, serving as a single source of truth for an organization. Data flows into a data warehouse from operational systems, databases and external sources, typically at regular intervals. A well-designed data warehouse serves as the foundation for any successful BI or analytics program. Its primary function is to fuel the reports, dashboards, and analytical tools that have become essential for modern businesses. A data warehouse provides the information for your decisions based on

data and assists you in everything from developing new products to managing inventory levels.

2.1.1 Methodology

We gathered four years' worth of operational data for the business, encompassing values such as quantities, costs, profits, transportation costs, dates, product names, etc, (see. Table 1.)

Table 1: The structure of the star schema fact table

Column Name	**Data Type**	**Nullable**
ID	NUMBER	N
SUMCOST	NUMBER	Y
YEARDATE	NUMBER	Y
MONTHDATE	NUMBER	Y
SUMAMOUNT	NUMBER	Y
SUMPROFIT	NUMBER	Y
PRODUCTNAME	CHARACTER	Y
SUMTRANSPCOST	NUMBER	Y

Following this, we proceeded to a process of data cleansing and modification. Then, we employed a targeted SQL query to aggregate and summarize operational data crucial for our business analysis. The query, executed on the **RAW_FULL_SALE** table, focused on extracting key metrics such as quantities, costs, profits, and associated product details.

```
SELECT year(`date`) as yaerdate, month(`date`) as monthdate,
`productName`, sum(`amount`) as sumamount, sum(`cost`) as
sumcost,     sum(`transportCost`)     as     sumtranspcost,
sum(`profit`) as sumprofit
FROM `RAW_FULL_SALE`
group by year(date), month(date), `productName`;
```

This SQL query employs the **GROUP BY** clause to aggregate data based on the year, month, and product name. The resulting dataset provides a summarized view of quantities, costs, transport costs, and profits, organized for effective analysis.

Furthermore, this aggregated data serves as the foundation for our Fact Table, a central component in our analytical framework. By structuring the data in this manner, we aim to facilitate seamless integration and utilization within the Oracle APEX environment.

To visually represent this process, refer to Figure 1, depicting the SQL query results and their subsequent integration into the Oracle APEX tool for enhanced analytical capabilities. The effective translation of raw business data into this structured format lays the groundwork for insightful decision-making within the broader context of our study.

This SQL-driven data aggregation and integration methodology ensures a robust and structured approach to deriving meaningful insights from our business data. The subsequent analysis within Oracle APEX enhances our ability to make informed decisions and underscores the synergy between SQL-based data processing and advanced analytics tools.

Subsequently, we transferred the table to Oracle APEX, enabling us to leverage the tools it provides. Utilizing the functionalities within the Oracle environment, we proceeded to apply and implement various operations. This comprehensive approach allowed us to harness the capabilities of Oracle APEX effectively. Ultimately, the objective was to empower the company to make informed decisions based on the refined and organized data.

By incorporating the data into Oracle APEX and employing its robust features, the company can streamline data analysis, generate insightful reports, and gain valuable business intelligence. This process facilitates the decision-making process, enabling the company to navigate areas such as product development and inventory management with greater precision and strategic foresight.

3 Results

Following our meticulous data processing methodology, the Results section unveils a comprehensive analysis drawn from aggregated data. The subsequent visual depiction, showcased in Figure 1, illuminates the central menu interface of the application designed for Nektar Company. The refined data facilitates an intuitive

exploration of key metrics, empowering users with a platform for informed decision-making.

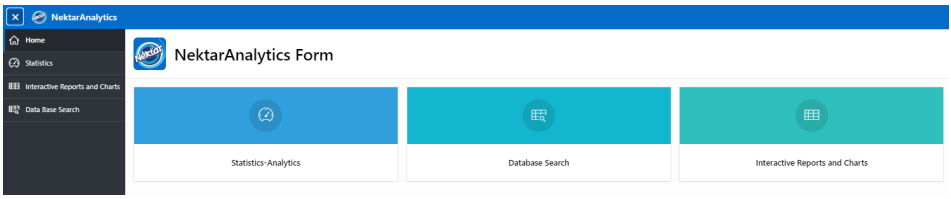

Figure 1: The main menu of the application
Source: Own - Printscreen

Figure 2. unfolds a visual narrative through a dynamic dashboard within the Nektar Company's application, featuring an array of charts to illuminate key performance metrics. This dashboard offers a comprehensive overview of financial insights, with pie charts dedicated to showcasing Cost per Year and Profit per Product Names. The Cost per Year pie chart provides an immediate visual representation of annual financial distributions, facilitating quick comparisons and trend identification. Simultaneously, the Profit per Product Names pie chart offers a focused lens on individual product profitability, guiding strategic decision-making. Complementing these pie charts are insightful histograms presenting additional dimensions of financial analysis. Cost per Month, Profit per Year, Profit per Month, and Cost per Product Names histograms delve into finer details, unraveling temporal patterns and product-specific financial nuances. This graphical representation not only enhances the interpretability of the data but also equips stakeholders with actionable insights for optimized financial management. As we proceed, subsequent sections will delve into the nuanced interpretations of these charts, extracting implications and strategic considerations derived from this visual representation to guide Nektar Company in its pursuit of informed decision-making.

Interactive reports within Oracle Application Express (APEX) emerge as a robust mechanism for the visualization and interactive exploration of data in web applications. This sophisticated feature not only elevates the user experience but also substantially refines data handling within the Oracle APEX environment. Serving as a pivotal tool for data visualization and management, these interactive reports provide a versatile platform characterized by customization, security, and user-

friendly functionalities. By offering dynamic and responsive ways to interact with data, interactive reports in Oracle APEX play a pivotal role in empowering users to glean meaningful insights and navigate through complex datasets seamlessly.

Figure 2: Dashboard with analytics in various charts
Source: Own - Printscreen

In this study, we harnessed the capabilities of this powerful tool to create an Interactive Reports form, as illustrated in Figure 3. This form provides users with dynamic control, enabling them to execute actions on the table data, such as applying filters and generating charts. The user-friendly interface and interactive functionalities embedded in the form enhance the flexibility and efficiency of data manipulation, facilitating seamless exploration and analysis within the dataset.

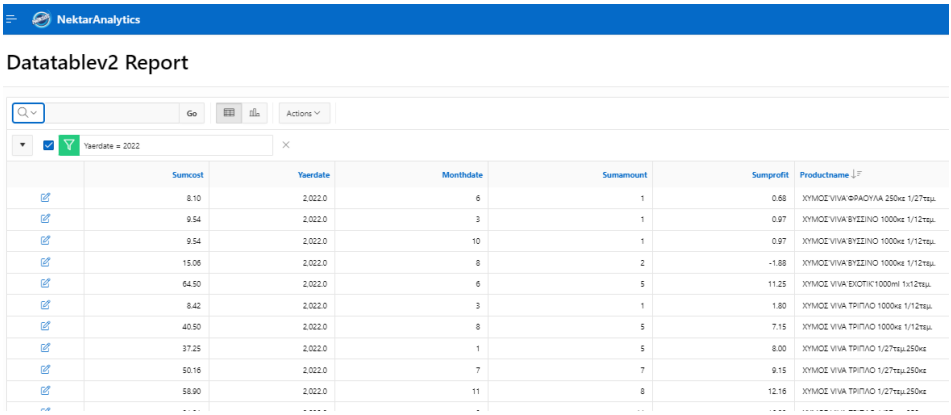

Figure 3: Interactive Report tool
Source: Own - Printscreen

In Figure 4, the upper side showcases settings pertaining to the report's printing functionality, such as page size and width. On the left side, users are presented with dynamic options to customize the chart type (bar, line with area, pie, and line) and define axis values. This dual presentation offers a comprehensive view of the user-driven choices available, empowering them to dynamically configure the report to suit their analytical preferences. The presented settings underscore the adaptability of the interactive report, providing users with the flexibility to tailor visualizations and printing parameters according to their specific requirements.

Figure 5 presents a dynamic chart illustrating the overall profit of the enterprise on a monthly basis for the year 2022. This graph was dynamically generated using the Interactive Reports tab, in accordance with the selections provided in Figure 4. The chart visually encapsulates the financial performance of the business throughout the year, offering a clear representation of monthly profit variations.

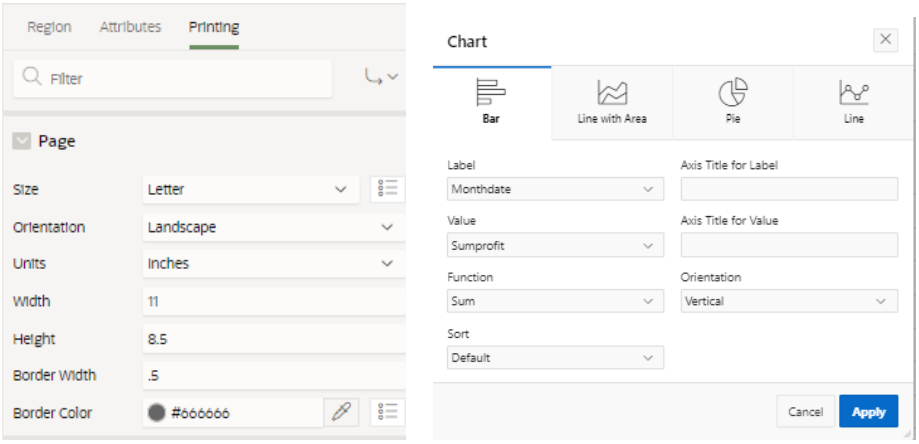

Figure 4: Settings and parameters in the interactive report
Source: Own - Printscreen

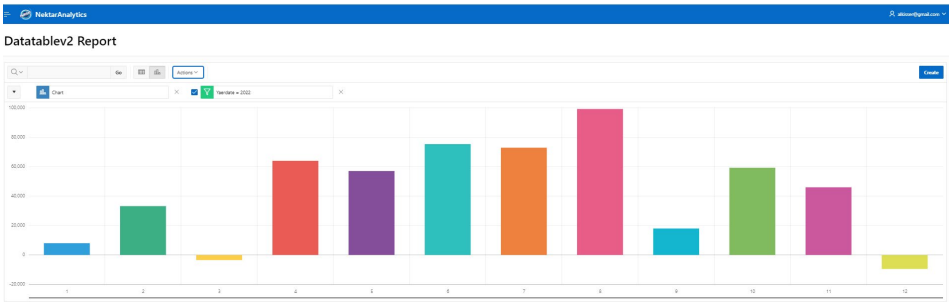

Figure 5: Total profit per month for 2022 year
Source: Own - Printscreen

In a similar fashion, Figures 6 and 7 were dynamically generated to depict the overall profit of the company per product, specifically when the total profit exceeds 5000 units. Additionally, Figure 7 employs a pie chart to showcase the company's total costs for the years 2018-2022. This visualization enhances the understanding of cost distribution over the specified period, adding a layer of granularity to the financial analysis.

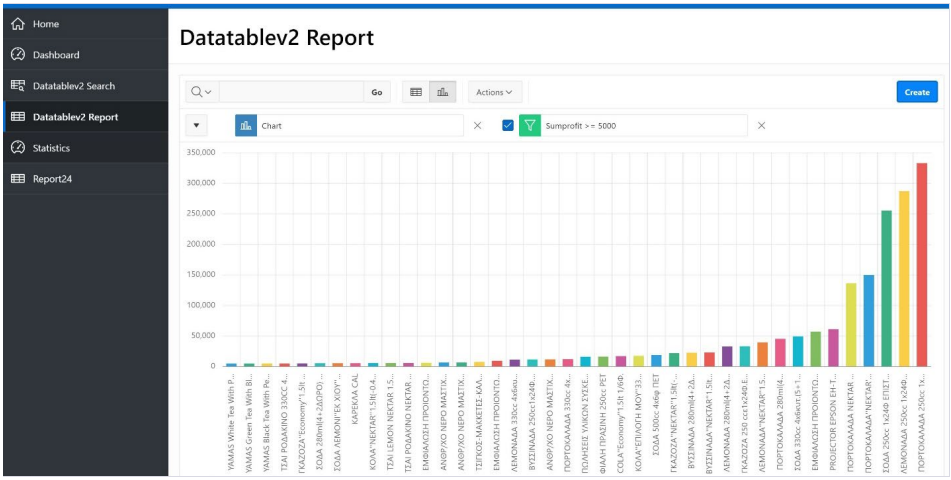

Figure 6: A bar chart of total profit per product with a filter in profit values
Source: Own - Printscreen

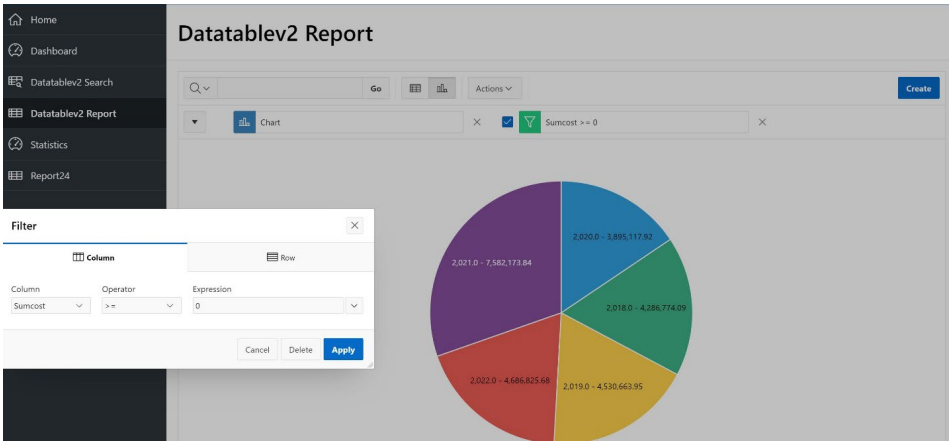

Figure 7: Pie chart for total cost per year
Source: Own - Printscreen

Figure 8 illustrates the Database Search Form, a pivotal component in our analytical framework. This form serves as a user-friendly gateway, empowering users to dynamically query and explore the underlying database. The interactive elements within the form enable users to refine searches based on various parameters, fostering a seamless and tailored exploration of the dataset. By facilitating precise

data retrieval, the Database Search Form enhances the efficiency of information discovery and supports users in obtaining specific insights within the expansive dataset.

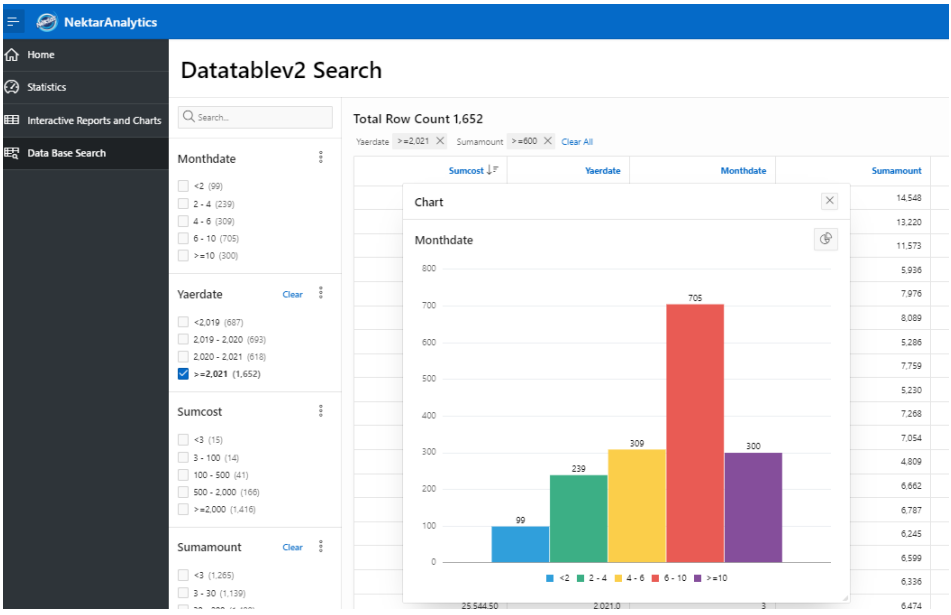

Figure 8: The Data Base Search form
Source: Own - Printscreen

3 Conclusion

This research paper highlights the strategic implementation of Oracle APEX in a leading Greek soft drinks manufacturing enterprise, showcasing its profound impact on data warehouse management from 2018 to 2022. The integration of Oracle APEX, renowned for its low-code application development capabilities, played a pivotal role in optimizing data processing workflows, enhancing analytical functionalities, and fostering streamlined decision-making processes within the organization's data ecosystem. In line with the findings and outcomes of this study, the positive implications of Oracle APEX in data warehousing at the examined company can be succinctly summarized. The systematic integration of Oracle APEX resulted in streamlined data processing, significantly reducing latency and enhancing the overall efficiency of the data warehouse operations. This optimization directly

impacts the timeliness and reliability of data-driven insights. The company experienced a notable improvement in analytical capabilities, enabling more in-depth data exploration and trend analysis. This enhancement contributes to a nuanced understanding of the business landscape, supporting strategic decision-making. In addition, decision-makers now have real-time access to critical insights, fostering faster and more informed choices. This acceleration in decision-making is particularly valuable in the dynamic business environment. The step-by-step implementation methodology outlined in this study, detailing the configuration of Oracle APEX to meet specific data warehousing requirements, serves as a blueprint for organizations seeking to leverage advanced technologies for enhanced data-driven operations. The combination of SQL-based data processing and Oracle APEX's advanced analytics tools exemplifies a harmonious synergy, enabling robust and structured data analysis.

In conclusion, the successful integration of Oracle APEX into the data warehousing practices of the Greek soft drinks manufacturing company not only exemplifies the transformative power of advanced technologies but also serves as a guiding example for organizations navigating the complexities of modern data management. As businesses continue to adapt to the digital era, Oracle APEX emerges as a potent tool for optimizing data warehouse operations, unlocking the full potential of organizational data, and facilitating a data-driven decision-making culture.

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