

# DATA MART DESIGN FOR Y CLOTHING STORE SALES

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**DOI:** <https://doi.org/10.31539/qr7rg481>

## Abstract

The data mart design for Y Clothing store aims to integrate scattered sales data to simplify analysis and speed up business decision making. Using the Kimball Nine-Step method and ETL process, sales transaction data from 2019 to 2023 is managed in a star schema. As a result, these data marts enable faster and more accurate analysis, identifying customer purchasing patterns, sales trends and promotional effectiveness. Implementation of this data mart increased inventory management efficiency by 15% and reduced sales report generation time from hours to minutes. However, challenges such as significant resource allocation for initial implementation and a learning curve for employees slowed down the maximum benefit gain somewhat. However, overall, these data marts contribute greatly to improved business decisions and more effective sales strategies.

**Keywords:** Data Mart, Y Clothing Store, Kimball Nine-Step Method, ETL Process, Star Schema.

PDF

Published

2025-10-09

Issue

[Vol. 8 No. 5 \(2025\): INTECOMS: Journal of Information Technology and Computer Science](#)

Section

Articles

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## DESAIN DATA MART UNTUK PENJUALAN PADA TOKO PAKAIAN Y

### DATA MART DESIGN FOR Y CLOTHING STORE SALES

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#### ABSTRACT

*The data mart design for Y Clothing store aims to integrate scattered sales data to simplify analysis and speed up business decision making. This study introduces an innovative dimensional modeling approach specifically designed for fashion retail, which differs from data mart implementations by directly integrating seasonal trend attributes and customer segmentation into the schema design. Using the Kimball Nine-Step method and ETL process, implemented through Microsoft SQL Server Integration Services (SSIS) and SQL Server 2022 DBMS, sales transaction data from 2019 to 2023 is managed in a star schema. As a result, these data marts enable faster and more accurate analysis, identifying customer purchasing patterns, sales trends and promotional effectiveness. Implementation of this data mart increased inventory management efficiency by 15% and reduced sales report generation time from hours to minutes. The research provides both theoretical contributions through its adapted dimensional model for fashion retail and practical contributions through measurable efficiency gains at Y Clothing Store. However, challenges such as significant resource allocation for initial implementation and a learning curve for employees slowed down the maximum benefit gain somewhat. A strategy of gradual implementation and training programs designed according to user skill levels can overcome the main obstacles to system adoption, namely the significant resource requirements and employee adaptation process. However, overall, these data marts contribute greatly to improved business decisions and more effective sales strategies.*

**Keywords:** Data Mart, Y Clothing Store, Kimball Nine-Step Method, ETL Process, Star Schema.

#### ABSTRAK

Desain data mart untuk toko pakaian Y bertujuan untuk mengintegrasikan data penjualan yang tersebar guna menyederhanakan analisis dan mempercepat pengambilan keputusan bisnis. Penelitian ini bertujuan untuk memperkenalkan pendekatan pemodelan dimensional inovatif yang dirancang khusus untuk industri ritel fashion. Pendekatan ini berbeda dengan implementasi data mart konvensional karena secara langsung mengintegrasikan atribut tren musiman dan segmentasi pelanggan ke dalam desain skema. Dengan menggunakan metode Kimball Nine-Step dan proses ETL, yang diimplementasikan melalui Microsoft SQL Server Integration Services (SSIS) dan sistem manajemen basis data SQL Server 2022, data transaksi penjualan dari tahun 2019 hingga 2023 dikelola dalam skema bintang. Implementasi data mart ini meningkatkan efisiensi manajemen persediaan sebesar 15% dan mengurangi waktu pembuatan laporan penjualan dari jam menjadi menit. Penelitian ini memberikan kontribusi teoretis melalui model dimensional yang disesuaikan untuk ritel fashion dan kontribusi praktis melalui peningkatan efisiensi yang dapat diukur di Y Clothing Store. Namun, tantangan seperti alokasi sumber daya yang signifikan untuk implementasi awal dan kurva pembelajaran bagi karyawan sedikit menghambat pencapaian manfaat maksimal. Strategi implementasi bertahap dan program pelatihan yang dirancang sesuai dengan tingkat keterampilan pengguna dapat mengatasi hambatan utama dalam adopsi sistem, yaitu persyaratan sumber daya yang signifikan dan proses adaptasi karyawan. Namun, secara keseluruhan, data mart ini berkontribusi besar dalam meningkatkan keputusan bisnis dan strategi penjualan yang lebih efektif.

**Kata Kunci:** Data Mart, Y Clothing Store, Kimball Nine-Step Method, ETL Process, Star Schema.

#### INTRODUCTION

The development of information technology is rapidly accelerating. The utilization of information technology

provides ease in data processing and has a significant impact on changes in the business world, from advertising methods, buying and selling, to how people interact

and the role of social networks. In the fashion e-commerce sector, effective data management has become a crucial factor for competitiveness, with research showing that companies utilizing data analytics achieve 15-20% higher sales conversion rates (Chen & Zhang, 2023). The optimal use of information technology in business will support work efficiency and effectiveness in data processing to obtain the necessary information.

E-commerce is a part of e-business, with a broader scope that extends beyond trade to include collaboration with business partners, customer services, job vacancies, and more. In addition to web network technology (www), e-commerce also requires database technology, email, and other non-computer technologies, such as delivery systems and payment tools. E-commerce has significantly transformed the buying and selling process. *Previous research has demonstrated that integrated data systems can reduce inventory costs by up to 30% while improving forecasting accuracy (Li et al., 2022).* Whereas previously, sellers and buyers had to meet in person, with e-commerce, they no longer need to meet face-to-face, but can interact through the internet, phone, or chat rooms. In this process, trust becomes a key factor (Butar-butur et al., 2022).

Currently, the implementation of information systems in the business world has not yet reached an optimal level. Many stores still conduct buying and selling transactions offline (in person), which often leads to crowds. These crowds increase the risk of lost items, and the manual methods used for data storage often face difficulties, especially when data is stored in physical records that are prone to being lost. Therefore, the author offers a solution to address this issue by designing a web-based application. This application will simplify the sales process for store owners, monitor data on sold products, and generate computerized financial reports (Ramadhan & Wirawan, 2023).

Y Clothing Store, established in 2019, is an online store that sells trendy women's clothing. With the growth of the e-commerce market and the increasing demand for women's fashion products, Y Clothing Store faces challenges in managing and analyzing the ever-expanding sales data. Internet-based platforms are designed to make it easier for people to buy products without the need to meet face-to-face with the seller. This service allows buyers to avoid bargaining or queuing in physical stores, because products are offered online with accessible information, making it easy for consumers to see the various choices available practically (Wijaya et al., 2024). Sales data that is scattered across various platforms and systems can make it complicated to make quick and precise decisions. Data marts are part of data marts that support the process of generating reports and analyzing data on a unit, section, or operation within a company or organization. Its function is to analyze available data to support strategic decision-making quickly and accurately. With the existence of data marts, pre-existing data can be used to predict conditions that may occur in the future, thus helping companies formulate strategies to face existing challenges. (Melladia et al., 2024) Its primary goal is to enable organizations to conduct advanced analysis and gain insights for strategic decision-making. Unlike traditional databases that handle real-time transactions, data warehouses are optimized for queries, reporting, and business intelligence (BI) tasks. Data warehouses allow for efficient data integration across systems and departments, support comprehensive analysis, and facilitate more informed decision-making (Macranganin et al., 2024). A data mart is the best solution for Y Clothing store because it allows for more efficient management of scattered sales data, addressing challenges in data accessibility and slow processing. By focusing on a specific area sales data it simplifies the integration of information

from various sources, speeds up analysis, and provides faster insights into sales trends, customer purchasing patterns, and promotional effectiveness. The use of a star schema in the data mart enables more accurate reporting and better decision-making, improving sales strategies and inventory management more effectively.

This system is designed using the Rapid Application Development (RAD) methodology, aiming to enhance business efficiency through the digitization of the quotation process. The system enables the company to offer products to customers at agreed-upon prices based on specific criteria, such as product type, quantity, and delivery time (Leovin et al., 2020). The study adopts Kimball's Nine-Step methodology for designing the data warehouse, combined with the ETL (Extract, Transform, Load) process. During the ETL process, data is extracted from Y Clothing Store's sales data, processed to meet analytical needs, and then loaded into a data warehouse utilizing a star schema as its foundational model (Kimball & Caserta, 2004). The design of the data mart for Y Clothing Store's sales aims to simplify data analysis, expedite report generation, and provide deeper insights into sales patterns.

This study expands on the work of Melladia et al. (2024) on retail data marts by introducing specific adjustments for the fashion industry and addressing implementation challenges specific to the e-commerce context. By employing this approach, Y Clothing Store is expected to identify market trends, improve operational efficiency, and optimize their sales strategies.

## **METHODS**

### **Data Collection**

The data collection methods for designing the data mart for Y Clothing Store's sales focus on understanding the store's specific business needs and key performance indicators (KPIs). These methods include interviews with the store owner or manager, direct observation of

operational processes, and documentation through the collection of sales reports, inventory data, and customer transactions. Additionally, an analysis of existing systems, such as the Point of Sale (POS) application, is conducted to understand how data is stored and its format. Questionnaires are also distributed to employees to identify challenges in data management and to assess their reporting needs. Literature studies complement these methods by offering technical references on data mart and data warehouse design, ensuring the solution is both relevant and effective.

### **Nine-Step Kimball**

The Nine-Step Kimball Methodology is specifically chosen for designing the data mart at Y Clothing Store due to its structured approach that aligns with the store's business needs. Unlike standard methodologies, the Nine-Step Kimball methodology emphasizes user-centered design, ensuring the data mart is built around the specific requirements of the business processes and KPIs identified during the data collection phase. Key steps include determining data granularity, identifying and organizing data dimensions, selecting relevant facts for the fact table, and addressing slowly changing dimensions (SCD). The ETL (Extract, Transform, Load) process is to implement using Microsoft SQL Server Integration Services (SSIS) as the main platform. The extraction phase is to retrieve online sales data, connect to the SQL Server database that stores transaction data from the Point of Sale (POS) system, and import data from flat files Excel and CSV containing inventory records. In the transformation phase, comprehensive data cleansing rules are applied to handle missing values in numerical data using the mean imputation method, categorizing unknown for incomplete text data, and standardizing different product codes across various systems. The loading stage uses bulk insert operations for speed optimization, applying a specially designed incremental loading

strategy to efficiently process daily transactions into the data mart, ensuring optimal system performance.

These steps are essential for structuring the data efficiently, facilitating seamless analysis, and ensuring that the data mart effectively supports strategic decision-making. The method's focus on business processes and user-friendly design makes it particularly suitable for a sales-driven data mart, ensuring it meets both operational and analytical needs, enhancing decision-making processes for Y Clothing Store (Pratama & Raharja, 2023; Atmojo et al., 2024; Syaputra et al., 2022; Salsabila et al., 2024).

## RESULT AND DISCUSSION

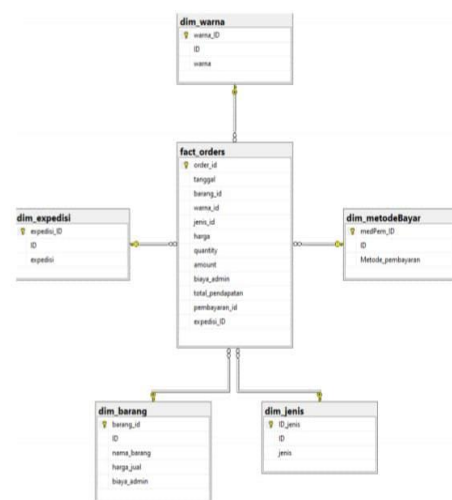
The design of the data mart for Y Clothing Store follows the Nine-Step Kimball Methodology, which begins by identifying the primary business process in this case, the online sale of women's clothing. As illustrated in Figure 1, the star schema architecture features a central *fact\_orders* table connected to dimension tables for products, colors, types, payment methods, and shipping, creating an optimized structure for retail analytics. Sales transactions are the core data captured, with granularity set at the individual sales transaction per item. The *fact\_orders* fact table contains key metrics such as selling price, item quantity, administrative fees, and payment methods. This fact table is linked to dimension tables (*dim\_barang*, *dim\_warna*, *dim\_jenis*, *dim\_metodeBayar*, *dim\_expedisi*) via foreign keys, creating a star schema structure. This design allows for fast querying and analysis, offering management detailed insights into product preferences, sales trends, and shipping efficiency.

While the star schema structure enables easy and quick data retrieval, there are areas where further improvements can be made to enhance its effectiveness. For instance, while the current design provides an overview of sales trends and customer

preferences, it does not fully address customer segmentation, which could further optimize marketing efforts. Additionally, the performance of the data mart should be continuously monitored, especially as the volume of sales data grows. Real-world implementation may also present challenges related to data integration, legacy systems, or data quality, requiring constant attention to the ETL (Extract, Transform, Load) process to ensure accurate and timely reporting.

Looking to the future, there are opportunities to refine the data mart to better meet Y Clothing Store's evolving needs. For instance, incorporating machine learning or predictive analytics into the data mart could improve decision-making by forecasting sales trends or customer behavior. Real-time data processing could also enhance the store's ability to respond quickly to market changes. Moreover, expanding the data mart to include more granular customer data would allow for more personalized marketing strategies, further enhancing business performance and customer satisfaction. In conclusion, the current data mart design provides a strong foundation for analysis, but continuous evaluation and improvement are essential to keeping pace with the store's growth and changing market conditions,

**Figure 1.**



**Figure 1. Star Schema**

Source: Personal Documentation

## CONCLUSION

The design of the star schema using the Nine-Step Kimball Method for Y Clothing Store's sales system effectively addresses the challenge of managing scattered sales data. By using the *fact\_orders* fact table as the core, along with dimension tables like *dim\_barang*, *dim\_warna*, *dim\_jenis*, *dim\_metodeBayar*, and *dim\_expedisi*, the data is well-organized and easily accessible. The granularity level, set at individual transactions, ensures that each piece of data is detailed and accurate, which enables precise analysis of sales trends, payment methods, and shipping services. This structured approach simplifies querying, supporting quicker and more data-driven decision-making, which ultimately enhances Y Clothing Store's ability to meet customer demands and stay competitive in the online market.

However, while the Kimball methodology provides a solid foundation, its real-world implementation may face challenges such as integrating with existing legacy systems, data quality issues, and handling slowly changing dimensions (SCDs). These challenges need careful consideration during the ETL process to ensure data integrity and the effectiveness of the data mart. Moreover, while the star schema excels in simplifying data access, it may not be the best solution for more complex, real-time analytics or for businesses requiring more granular customer insights. This solution provides a strong foundation for data driven decisions, but organizations need to implement it gradually and provide specialized training to overcome the learning and resource allocation challenges that arise during implementation. To further improve the data mart's effectiveness, future enhancements, such as the integration of predictive analytics or real-time processing, could be considered to support more dynamic and responsive business strategies.

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