

# Design of a Sales Performance System for SMEs based on Business Intelligence and Data Warehouse

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## INFORMASI ARTIKEL

## ABSTRACT

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The influence of information technology today is powerful. It impacts people's lives because technological changes are running so fast and affect the way of thinking and behaving in competition in the business world and organizations. Small and Medium Enterprises (SMEs) must be able to adapt to this technology to maintain their business. It means that digitizing SMEs means integrating technology into all business activities. In this study, Toko Cerme is the object of research. The Toko Cerme is a SMEs in the form of a minimarket located in Central Java, Indonesia. The Toko Cerme takes advantage of technology to help run business processes so that they can be managed optimally. In running its business, The Toko Cerme is currently using an information system to input product data and transaction activities. The purpose of this research is to propose a Design of a Sales Performance System based on Business Intelligence and a Data Warehouse to support business processes at the Toko Cerme so that it can efficiently process data and information in the future. From the research that the authors conducted, it can be concluded that the results of this study are the creation of a data warehouse and business intelligence design using the nine steps Kimbal method. At the same time, Pentaho Data Integration (PDI) is a tool. The design is used as a reference in producing information relating to sales transactions.



## I. Introduction

The influence of information technology today is powerful. It impacts people's lives because technological changes are running so fast and affect the way of thinking and behaving in competition in the business world and organizations. Information technology is also directly related to digital transformation. Digital transformation is changing activities, processes, and overall business models by taking advantage of technological developments [1][2]. Therefore, businesspeople must keep up with technological developments in today's online era. Like it or not, Small and Medium Enterprises (SMEs) must be able to adapt to this technology to maintain their business. Business owners and SMEs must inevitably keep up with existing developments by carrying out digital transformation to develop and run a business. This change also changes the way buying and selling transactions, product offerings, business models, and other business activities move from traditional to digital methods [3][4].

Small and Medium Enterprises (SMEs) in Indonesia play an essential role as the backbone of the national economy. According to the ASEAN Investment Report (Association of Southeast Asian Nations) released in September 2022, Indonesia has the most SMEs in the ASEAN region. The report notes that the number of SMEs in Indonesia in 2021 will reach around 65.46 million units. In 2021, Indonesian SMEs were recorded to be able to absorb 97% of the workforce, contribute 60.3% to the Gross Domestic Product (GDP), and contribute 14.4% to national exports. The proportion of Indonesian SMEs workforce absorption is the largest in ASEAN. In neighboring countries, SMEs only absorb labor in the range of 35% -85%. However, when viewed from its performance, Indonesia still loses to Myanmar, whose SMEs can contribute up to 69.3% of the local GDP. Indonesian SMEs are also lagging compared to Singapore, whose export contribution reaches 38.3%, Thailand at 28.7%, Myanmar at 23.7%, and Vietnam at 18.7%. Currently, the Indonesian government is trying to encourage the improvement of the performance of national SMEs, one of which is through a digitalization strategy [5].

Digital transformation impacts customer interactions and transactions and transforms business operations. As hybrid work models are increasingly becoming the norm, businesses must adapt so that employees can work and collaborate efficiently [6]. It means that digitizing SMEs means integrating technology into all business activities. They start from administrative matters, finance, and staffing to marketing and sales. The digitization of SMEs has several essential values in business and economic growth. With the development of business in a company, it will always be accompanied by more and more data stored in a system. In the business world, sales transaction data can be used by company management to analyze the current business. In addition, the transaction data can also be used as a decision support in the future.

In this study, Toko Cerme is the object of research. The Toko Cerme is a SMEs in the form of a minimarket located on Jl. Suprpto No.9, Dusun II, Purwosari, Kec. Baturraden, Banyumas Regency, Central Java, Indonesia. Technological developments, which are increasing rapidly daily, have awakened various SMEs, including The Toko Cerme, to take advantage of technology to help run business processes so that they can be managed optimally. In running its business, The Toko Cerme is currently using an information system to input product data and also in transaction activities. However, the data analysis process will become slower when more data is processed. In addition, management must reprocess the information generated by the system to produce a better visualization. Some of these things can affect the speed of decision-making from management.

Problems in processing large amounts of data can be solved through data warehouse technology and business intelligence technology. The combination of data warehouse technology and business intelligence can assist users in analyzing sales data. The purpose of this research is to propose a Design of a Sales Performance System based on Business Intelligence and a Data Warehouse to support business processes at the Toko Cerme so that it can efficiently process data and information in the future.

## II. Literature Review and Related Works

### A. Sales Performance System

Every business must have a target to achieve within a specific period. To meet these targets, enterprises generally use tools to support their sales performance management. With this sales performance management application, it is easier for businesses to know or monitor their sales team's performance. Sales Performance Management is a process to improve sales performance and increase company revenue [7]. Usually, sales performance management is used to achieve individual sales quotas and company sales targets and maximize efficiency throughout the sales process [8].

Sales performance management is an operational and analytical system that automates and unifies the sales process [9]. The application of this system aims to improve the effectiveness, efficiency, and overall performance of the sales organization [10]. To achieve these goals, sales performance management tools assist the business or team leader in monitoring the sales team. In addition, these tools also help businesses store customer data, determine potential prospects, automate admin tasks, collaborate between groups, and so on [11]. That way, it will be easier for businesses to know business growth in real-time, the amount of revenue, and the number of sales. This must be separate from the ability of sales performance management to automate the sales process so that it can streamline the sales team's time when making sales [12]. Sales performance management tools are a must for businesses looking to increase sales.

### B. Data Warehouse

A data warehouse is a system that retrieves and consolidates data periodically from the source system to a dimensional or normalized data store. It usually contains several years of history and is presented for business intelligence or other analytical activities [13]. The data warehouse allows the integration of various types of data from multiple systems, providing faster access for executives to obtain information and analyze it as strategic information material [14]. The data warehouse will produce reports and analyses related to the organization's or users' needs and is used as a decision support tool [15].

A data warehouse is a computer system whose job is to archive and analyze historical data for the purposes of a particular organization or business. Management information can be in the form of data related to sales, salaries, and other daily details [16]. Analyzing data in a structured manner can produce more accurate information to support a company's decision-making. That is why the data warehouse is included in one of the supporting parameters for business intelligence activities.

### C. Business Intelligence

Business Intelligence is a system and application that processes data in a company or organization into knowledge. This application analyzes past data, analyzes it, and then uses this knowledge to support organizational decisions and design [17]. Business intelligence is one aspect that will assist companies in determining marketing strategies based on market data and exploiting this data to obtain information to determine decisions. This process is carried out mathematically using specific methods and through computer-based systems [18]. The data set will then be processed using the appropriate techniques, tools, and software

[19]. The final results of the process include industry needs, profit descriptions, relevant marketing strategies, and other decision-makers [20]. The existence and benefits of business intelligence are essential in a company, making the results of analysis on a business so that it can be used as a reference for the company.

### III. Methods

#### A. Method of Collecting Data

In conducting this study, the author uses several methods to obtain data so that it can be collected into the material to conduct research towards the next stage. The following methods are used, in Figure 1. Phase Interviews were conducted to determine the sales system that runs at the Toko Cerme. The data collection techniques by making observations of ongoing activities at the Toko Cerme. From the observation results, obtained several things needed for data design analysis. In this method, the author seeks theory through references related to the research conducted at the Toko Cerme.

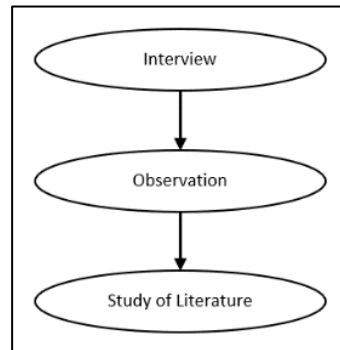


Figure 1. Method of Collecting Data

#### B. Research Framework

After conducting research, the authors designed a research framework to be used. The Figure 2 is the author's research framework. The first phase, is System Requirements Analysis, shows that the process starts from the functional requirements analysis process available at the Toko Cerme. This applicable requirement contains what procedures the system will carry out to be developed. The next stage is Data Modeling, the design of the Data Warehouse will be carried out by the functional requirements analysis. The method used is Kimball's nine steps, where this method consists of 9 steps consisting of [21]:

- Choosing the process is a step to analyze the process that is currently running.
- Choose the grain. In this section, decide precisely what a fact table represents.
- Identify and conform the dimension. At this stage, the dimensions of the grain that have been made before are determined.
- Choose the fact. After determining the grain and dimensions, the fact table can be determined.
- Store precalculations in the fact table. In this process, calculations are determined in the fact table, so the measure you are looking for is obtained.
- Rounding out the dimension table, at this stage, is an addition to the dimension determination stage. At this stage, the dimension table is equipped with attributes and descriptions.
- Choosing the duration determines the duration of the data used in the data warehouse.
- Track the changing dimension slowly. At this stage, it considers changes in sizes that can gradually be traced.
- Deciding the query priorities and the query modes, this stage uses a physical design to produce a data warehouse that will be used for data analysis.

The last phase, Extract Transform Load (ETL) is a process for converting and combining data from various sources to be input into the data warehouse. The following is the meaning of each process in ETL:

- Extract: Extract is a process for retrieving and sorting data sources.
- Transformation: Transformation is changing the data format to be the same between one data source and another.
- Load: Load is a process for entering data into the data warehouse.

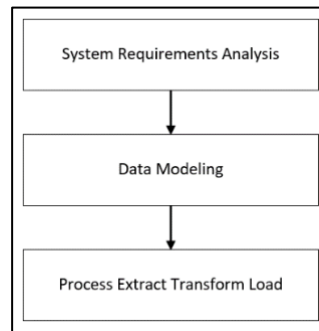


Figure 2. Research Framework

#### IV. Results and Discussion

##### A. System Requirements Analysis

The functional requirements needed to design Business Intelligence at the Toko Cerme are the system can display the number and total sales based on time, product, and employee.

##### B. Data Warehouse Modeling

The first process in the data warehouse design uses step nine Kimbal: Choosing the method (selection of business processes). The business processes currently running at the Toko Cerme can be seen in the [Table 1](#) below:

Table 1. Business Process

Business Process	Description
Sales Analysis	Sales transaction information is processed using Microsoft Excel

The following process is Choosing the grain, which includes sales analysis at the mirror shop. The sales analysis can be seen in the Identify and conform dimension stage based on time, products, and employees. Which can be seen in the following [Table 2](#):

Table 2. Dimension

Dimensions	Description
Time	Information can be viewed by time (year, month, day)
Product	Information can be viewed by product
Employee	Information can be viewed by employee name

Then choose the fact (define the fact table) previously determined see in [Table 3](#). The following is a fact table to meet the needs of the Toko Cerme:

Table 3. Fact Table

Facts	Description	Dimension
Sales Facts	There is information about the number and total sales at the Toko Cerme	Time, Products, Employees

The following process is to store precalculations in the fact table (storing calculations temporarily). The fact table contains the initial estimates contained in the fact table. The data stored on the fact of sale is the total rupiah on the deals that have been made. Then proceed with Rounding out the dimension table (complete the dimension table) that was previously determined. The following are the details of the dimension [Table 4](#):

Table 4. Completing The Dimension Table

Dimension	Attribute	Type (Length)	Description
Time	sk_waktu	varchar (63)	the primary key is the time dimension
	year	integer	save the year of sales
	month	integer	save the month of sales
	day	integer	save sales day
Product	id_produk	integer	primary key product dimensions
	nama_produk	varchar (63)	save the product name
	harga_produk	integer	store product prices
	id_karyawan	integer	employee dimension foreign key
Employee	nama_karyawan	integer	store employee names
	id_karyawan	integer	primary employee dimension
	nama_karyawan	varchar (63)	store employee names

From the results of the fact table and dimensions created, the next step is to create a Data Warehouse schema. The scheme the author uses is the Snowflake Schema, where several interconnected tables function to store sales history. The Figure 3 below shows the schema of the data warehouse:

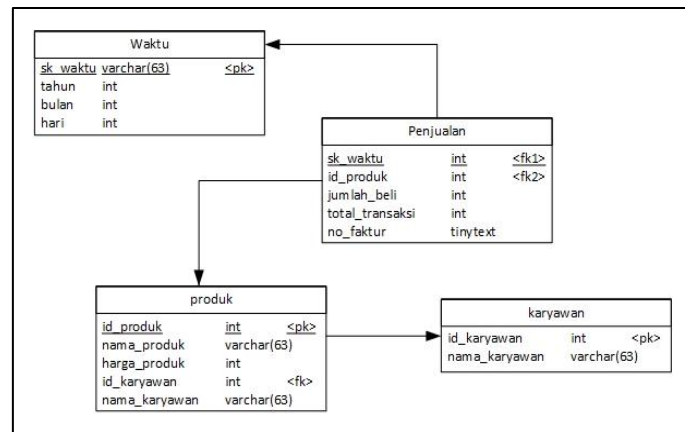


Figure 3. Schematic of Snowflake

The stage of choosing the duration (the duration of the stored data warehouse), the data used by the author for making the data warehouse is two days within one month in 2019. The author takes data from sales transaction data at the Toko Cerme. The next stage is slowly changing the dimension track. At this stage, it is used to observe changes that occur in the dimension table, which can be traced slowly. In the existing data at the Toko Cerme, employee data will be able to change slowly due to employee changes. In addition, the data of goods will, of course, always change following the flow of goods supply. This process can be done by looking for changing attributes and generating alternatives so that the values of the old and new features can be accessed together on the same dimension. The last one is deciding the query priorities and the query modes. At this stage, the physical design of the data warehouse will be carried out by determining the queries using the Extract, Transform and Load (ETL) process.

C. ETL Design

ETL is the process of entering data into the data warehouse. This ETL aims to process and combine data according to the needs of the Toko Cerme, which will later be stored in the data warehouse. The author uses Pentaho Data Integration to carry out the ETL process. In this research, there are several ETL processes to transform transactional data into time dimension ETL, product dimension ETL, employee dimension ETL, and sales facts ETL.

- ETL dimension of time

This time dimension ETL process transforms the date of the sales into a time dimension where the attributes of the time dimension are sk\_time, year, month, and day. Here is the time dimension ETL process see in Figure 4:

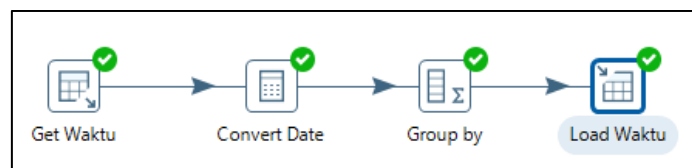


Figure 4. ETL Dimension of Time

- Employee dimension ETL

The ETL process for this employee dimension transforms employee data into an employee dimension with employee id and employee\_name attributes. The Figure 5 following is the employee dimension ETL process:

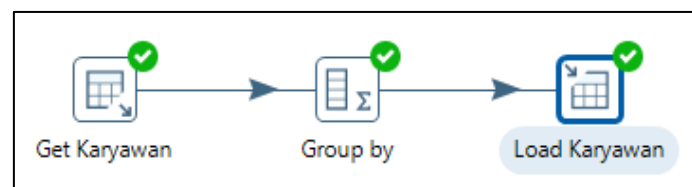


Figure 5. Employee Dimension ETL

- *Product dimensions ETL*

This product dimension ETL process transforms product data into product dimensions with product\_id, product\_name, product\_price, employee\_id, and employee\_name. The [Figure 6](#) following is the product dimension ETL process:

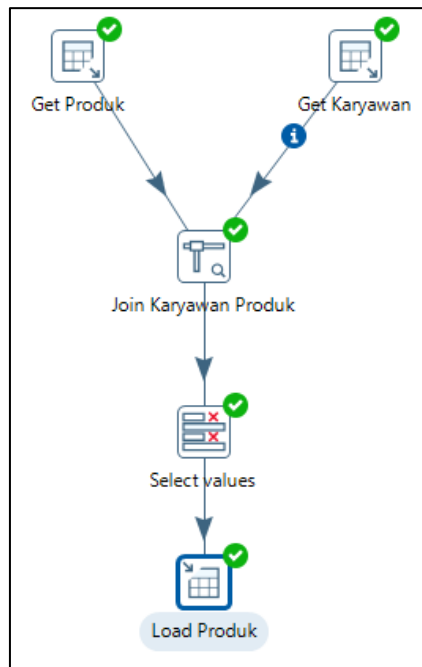


Figure 6. ETL Product Dimensions

- *ETL sales facts*

This sales fact ETL process transforms sales transaction data into sales facts with the attributes year, month, day, employee\_name, product\_id, product\_price, purchase\_amount, total\_transaction, and no\_invoice. Here is the sales fact ETL process see in [Figure 7](#):

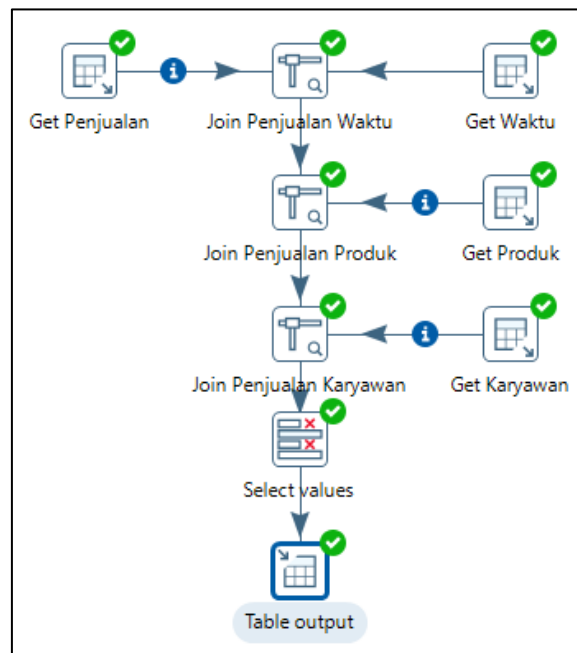


Figure 7. ETL Sales Facts

## V. Conclusion

From the research that the authors conducted, it can be concluded that the results of this study are the creation of a data warehouse and business intelligence design using the nine steps Kimbal method. At the same time, Pentaho Data Integration (PDI) is a tool. The design is used as a reference in producing information relating to sales transactions.

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