

The Implementation of Business Intelligence to Analyze Sales Trends in the Indofishing Online Store Using Power BI

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Article History:

Submitted: 23-11-2023

Accepted: 28-11-2023

Published: 04-12-2023

Keywords:

Business Intelligence; Microsoft Power BI; Warehouse; ETL; Dashboards

Brilliance: Research in

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ABSTRACT

The growth of online sales businesses by utilizing E-Commerce is increasing rapidly. One way that can be used as a tool to face competition is to apply Business Intelligence as a basis for making the right business strategy decisions. Indofishing Shop is an online shop selling various fishing gear and equipment. So far, online sales transaction data processing uses Microsoft Excel, which has created problems with the need for more information to analyze product trends. This research applies Business Intelligence to detect data extracted and collected in a data warehouse. The data will be analyzed statistically and visualized using Microsoft Power BI. Data warehouse design uses Kimball's Nine-Step method. The results of this research are in the form of a visualization dashboard that is used to analyze sales trends for the most sold fishing equipment products from the Indofishing Shop. Diagram visualization helps Indofishing understand the trend conditions of the most in-demand products and the cities of origin of the buyers who buy the most products.

INTRODUCTION

The emergence of Internet technology today has made the sales process much easier. One technology that utilizes the internet is online sales via E-Commerce. The growth of online sales businesses by utilizing E-Commerce is increasing rapidly. Business competition is very tight with the emergence of new shops both from within the country and abroad. Companies must be able to manage the marketing of their products well through competitive offers to survive amidst intense competition (Pramartha et al., 2023). One way to be used as a tool in facing competition is by implementing Business Intelligence, which can collect, store, and provide access to data as a basis for making the right business strategy decisions.

Indofishing Shop is an online shop that utilizes Shopee E-Commerce. The products sold are various types of fishing gear and equipment. When founded in 2011, the Indofishing shop still implemented an offline sales system through its shop outlets. Since 2022, Indofishing has started trying to implement online sales by utilizing Shopee E-Commerce.

So far, online sales transaction data processing uses Microsoft Excel. It raises the need for more information to analyze product trends that customers are interested in to determine sales strategies. So, one way to overcome this problem is to apply Business Intelligence to detect data extracted and collected in a data warehouse. The data will be analyzed statistically and visualized using Microsoft Power BI.

Previous research related to the application of Business Intelligence includes research carried out by Faesal, et al which explains that the rapid development of technology provides many conveniences to the sales process, one of which is by applying the Business Intelligence framework as a center for processing sales data for Followers stores. The research results show that sellers can easily observe sales trends based on data visualization created by Power BI (Muhammad Hasan et al., 2023).

Annas, et al.'s research relates to the processing of sales data at a restaurant in Bali, where the sales data processing uses Microsoft Excel. The restaurant needs help obtaining information on past sales data to help make decisions and implement marketing strategies in the future. For past data to become information that provides value in the decision-making process, Power BI business intelligence (BI) software is needed to visualize data to display sales data information. This research produces a dashboard that contains information in the form of data visualization consisting of past sales reports so that the sales growth rate can be known (Purnama et al., 2022).

Sales data processing with Microsoft Power BI was also carried out in research by Jayanti, et al. The problem in this research is the need for more management information to determine stock inventory. Decision-making is always late because the right data does not support it, so Business Intelligence is needed to analyze and provide data access. The result of the research is that data related to the stock of goods that are most in demand can be identified so that there is no accumulation of goods in the warehouse (Purwantin et al., 2020).

Research conducted by Kevin, et al related to processing sales transaction data in the marketing division using



Microsoft Excel. Management cannot see sales statistics, so the company has difficulty monitoring the sales process. In this research, an ETL process was carried out with dashboard visualization results using Microsoft Power BI so that management can see sales information to assist decision-making (Steven, K., Hariyanto, S., dan Arijanto, 2021)

This research aimed to help the Indofishing online shop obtain sales trend graphic visualizations to determine marketing strategies. The results of this graphic visualization will help management make decisions regarding marketing strategies.

LITERATURE REVIEW

Business Intelligence

Business Intelligence is a process that can extract data where data is collected in a data warehouse and then analyzed statistically to help decision-making and increase company profits (Sulistyoningsih et al., 2023). Business Intelligence contains data, information, and knowledge that can be used as feedback and response to business problems (Budisantoso et al., 2022). Business Intelligence (BI) is a combination of structures, tools, databases, and approaches used to analyze data that will later be used in making business decisions (Abdillah et al., 2023). Information is an important part of implementing BI. Decision makers will gain deeper insight into business conditions to make decisions precisely and effectively. BI can increase a company's competitive advantage through data processing that produces information as raw material for making decisions.

Kimball's Nine Steps

Kimball's Nine Steps is a method initiated by Ralph Kimball used to develop a data warehouse and business intelligence technology (Anshari & Retno, 2023). The advantage of using Kimball's Nine-Step method is that the steps are easy to understand, keep the data warehouse running effectively, and have low development costs (Priono et al., 2021). The Kimball method consists of 9 steps, namely the process selection stage, the grain selection stage, the dimension selection stage, the fact data selection stage, storing fact data, completing the dimension table, determining the inflation duration, tracking changing dimension tables and deciding the query (Hasan & Febriandirza, 2021).

Power BI

Power BI is a tool for analyzing data and reporting developed by the Microsoft company. The processed data will be made into a report in visual form (Febiyanti et al., 2022). Some advantages of Power BI are real-time updating of data dashboards, safe, direct connection to data sources, and integration with other Microsoft services. Power BI is easy to use and simple in analyzing modeling with complex data combinations (Akbar et al., 2018). Power BI contains services, apps, and connectors that function as an analytical engine to make company business decisions. Power BI can visualize graphs interactively and attractively packaged in the form of a dashboard. (Novianti et al., 2022).

METHOD

The research method used is quantitative, where the data used in numerical form will be described descriptively. Meanwhile, the data warehouse processing method will use Kimball's nine-step method and data visualization using Microsoft Power BI. Kimball's Nine Steps is a method initiated by Ralph Kimball used to develop a data warehouse and business intelligence technology. This method consists of 9 main steps, namely:

1. Determining business processes, this first stage is determining the business activities that will be used to develop the data warehouse.
2. Determining granularity, this second stage selects data from the fact table to be analyzed.
3. Identification and adjustment of dimensions serve to describe something.
4. Determining facts, where these facts have data that will be displayed in the form of visualization
5. Storing temporary calculation results in a fact table, the data is reviewed before calculations are carried out to reduce the risk of errors.
6. Completing the dimension table: at this stage, the dimension table is equipped with attributes to make it easier for the user to understand
7. Determining the duration of inflation is determining the period for which data will be taken.
8. Tracking dimensions that are slow to change is an activity of tracking dimension tables experiencing changes.
9. Deciding priority queries, forming physical designs, and determining problems

The research flow in implementing research begins with data collection activities, needs analysis, a data warehouse design, and finally, data visualization. An overview of research activities can be seen in Figure 1 below.

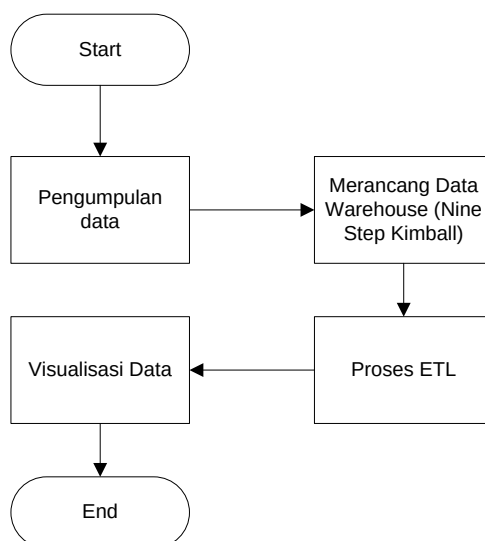


Figure 1. Flow of Research Activities

RESULT

This chapter will describe how the flow of research activities is carried out. The research begins with data collection and continues with processing data on fishing equipment sales transactions from Indofishing to obtain research output as a dashboard visualization.

Data collection

Direct interviews with Indofishing business owners carried out data collection. Observation activities are also carried out by observing the sales transaction data processing process. This research uses data obtained from sales transaction data reports in Excel format. Then, the data will be adjusted to be imported into Microsoft Power BI for analysis. Literature studies related to research were also carried out to support research data.

Designing a Data Warehouse

Based on the results of observations and interviews that have been carried out, the next stage is to design a data warehouse based on Kimball's Nine-Step method. The first step is determining the business processes needed to determine sales trends. Indofishing requires information that can describe sales trends with graphs or diagrams to show product sales performance. So, the business process needed is a sales process that requires data on the number of products and total sales.

The second step is to select a grain or data source from the fact table to decide which records will be represented. The prospective sales data records will display the number of sales and total sales. The third step is identifying and preparing a dimension table corresponding to the selected grain and recording. The dimension table can be seen in Table 1 below.

Table 1. Dimensions and Grain

No	Dimensions	Qty	Total Sales
1	Products	x	x
2	City	x	x

The fourth step is to select the facts that will be used to fill in the fact table. Fact data is determined according to the grain of the dimension table in the third step. The fact table used can be seen in Table 2 below:

Table 2. Transaction Facts

Transaction fact table
Id_TrSales
Id_Product
City_id
Qty
Total_Sales

After the fact table is created, the fifth step is to carry out the calculation process from the fact data that can be calculated. The sales Transaction table contains the calculation process data, namely the number of products and total sales. The sixth step is to complete the dimension table identified in the previous stage. The dimension table can be seen below:

Table 3. Dimensions table

Product dimensions	City dimensions
Id_product	City_id
Name_Product	Name_City

The seventh step determines the duration for collecting the data used. The data used is sales data from June 2022 to June 2023. The eighth step is to track whether there are changes in attributes in the dimension tables.

The final step is determining the query priority by selecting the data we created in the previous step. Queries are carried out on 3 types of transactions that will be visualized: sales per product and per city. The query results are as follows:

Table 4. Transaction

Transaction	Queries
Sales per product	Table.RenameColumns("#Removed Other Columns",{"Column2", "Product Name"}, {"Column3", "2022"}, {"Column4", "2023"})
Sales per city	Table.RenameColumns("#Changed Type3",{"Column1", "City Name"}, {"Column2", "2022"}, {"Column3", "2023"})

After the 9 steps have been identified, a data warehouse star schema design is created. The star schema image can be seen in Figure 2 below:

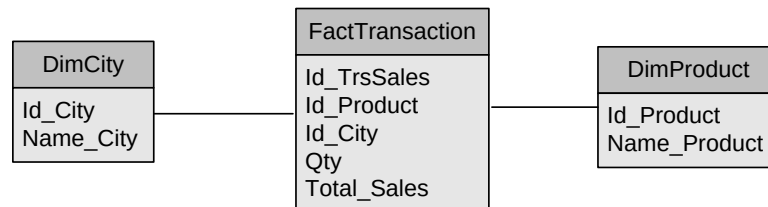


Figure 2. Star Schema Data Warehouse

The star schema data warehouse consists of 2 dimension tables, namely the DimCity table and the DimProduct table, where both tables are connected to one fact table, namely the FactTrabsaction table.

ETL process (Extract, transform & load data)

ETL (Extract, transform & load data) retrieves data from operational databases to be brought into the data warehouse. The process begins by preparing the required data from the database, and then the data is extracted. The extraction process consists of selecting data and checking whether the data is empty and has writing errors. After extraction, the data will be loaded into the destination database and saved. The ETL process scheme can be depicted in Figure 3 below:

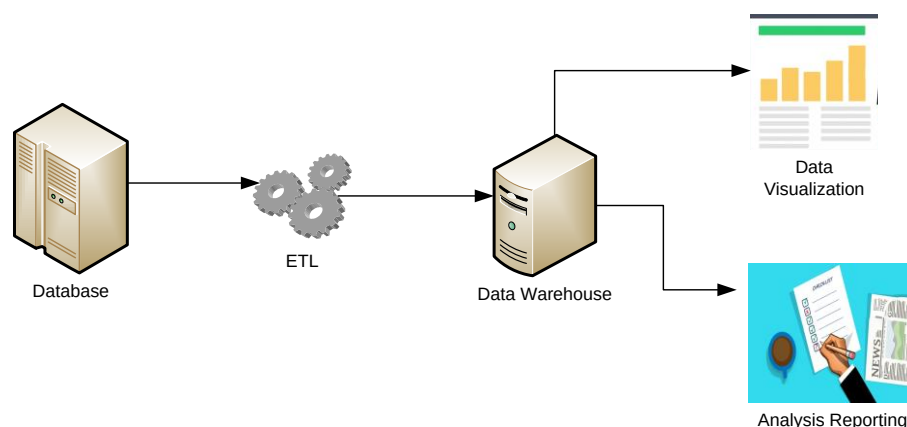


Figure 3. ETL schematic

The extraction process is carried out on the tables involved in the transaction, such as the city table and product table. If the extract process is complete for each table, the timestamp of the last extract process will be changed. The process continues by transforming data related to transactions to the staging table. The data in the staging table will be loaded into the fact table. When the data load is complete, the data in the staging table will be deleted.

Data Visualization

The visualization process uses Microsoft Power BI. Visualization is a technique used to convey information through visual objects (Nisa et al., 2023). The first stage is to create a new file and save it. Next, select Get data to get the data to be processed. The data tables taken are the Dim Product table and the DimCity table. After the tables have been selected, the next stage is to choose the diagram model that will be used to create the visualization. Select the value source from the data field, which will later be displayed in the visualization dashboard. After selecting the data, remember to set the dashboard display. The visualization dashboard describes sales into 2 categories: sales per product and per city. Based on this visualization, Indofishing can see the best-selling products on the market and the cities with the most buyers. The visualization dashboard display can be seen in the image below:

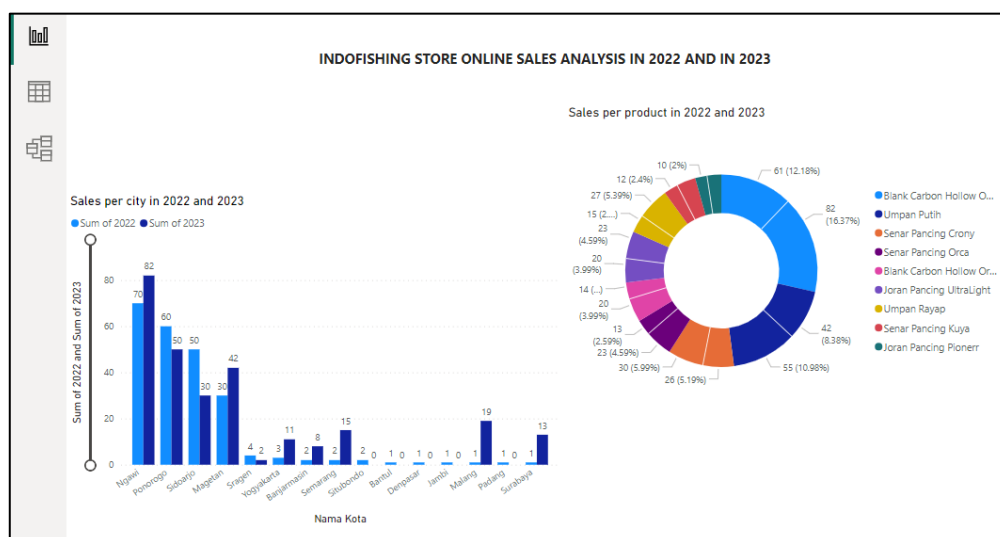


Figure 4. Microsoft Power BI Visualization Results

DISCUSSION

Based on the visualization results, the 4 types of products sold at the Indofishing shop can be seen. It can be seen that the Ogawa brand Blank Carbon Hollow products were sold 143 more than the Orchid brand. For bait products, whitebait is more popular than termite bait. There are 3 brands of string products, namely Orca, Kuya, and Crony, with the Crony brand being the most sold with 56 sales. Meanwhile, there are 2 brands for fishing rods, namely Pioneer and Ultralight. The Ultralight brand of fishing rods is the most popular, with 43 sold.

For product sales from 2022 to 2023, almost all products will experience an increase in sales, such as the Ogawa brand Blank Carbon Hollow increasing from 61 to 82. Whitebait products increased from 42 pieces to 55 pieces. Crony brand strings increased from 26 pieces to 30 pieces. Ultralight brand Fishing Rod products increased from 20 to 23.

Indofishing customers are spread across several cities throughout Indonesia. The total number of cities is 15 cities, consisting of the cities of Ponorogo, Ngawi, Magetan, Sidoarjo, Surabaya, Malang, Sitibondo, Bantul, Sragen, Semarang, Yogyakarta, Denpasar, Banjarmasin, Padang and Jambi. The largest number of buyers came from Ngawi City, with 70 buyers in 2022 and 82 in 2023.

CONCLUSION

This research produces a data warehouse design that can be used to extract data related to sales data per product and per city of fishing equipment products from Indofishing stores. The results of this research are in the form of a visualization dashboard that is used to analyze sales trends for the most sold fishing equipment products from the Indofishing Shop. Diagram visualization helps Indofishing understand the trend conditions of the most in-demand products and the cities of origin of the buyers who buy the most products.

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