

# Application Development of E-Commerce Business Intelligence Dashboard

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DOI: <https://doi.org/10.26438/ijcse/v7i8.7983> | Available online at: [www.ijcseonline.org](http://www.ijcseonline.org)

Accepted: 12/Aug/2019, Published: 31/Aug/2019

**Abstract**— Application of Business intelligence produces information that can be used as decision support. Companies in the E-Commerce require business intelligence applications to manage existing data to be useful. Manager using this information for decision in strategy or staff for operational support. In this study, researchers created a business intelligence dashboard application that can be used as a reference for e-Commerce companies in processing raw data to become useful information for decision. Development of business intelligence application based on business intelligence architecture. The business intelligence architecture consists of data source, ETL, data warehouse, Dashboard and BI users. Business Intelligence Application is created using Dashboard to display information. The results of this study are business intelligence dashboard application which has four dashboard options for e-Commerce companies. The summary dashboard displays a summary of information. The customer dashboard displays information based on the customer. The product dashboard displays information based on the product. Transaction dashboard displays information based on transaction. Module testing on dashboard is done using black box testing, the test results on four dashboards in the application, can function correctly.

**Keywords**—Business Intelligence, Dashboard, Decision, E-Commerce

## I. INTRODUCTION

E-commerce companies have a very large amount of transaction data, so they need the ability to analyze the data to produce information that used for decision support.

Business intelligence (BI) has been used as an umbrella term to describe concepts and methods to improve business decision making by using fact-based support systems. BI also includes the underlying architectures, tools, databases, applications, and methodologies. BI's major objectives are to enable interactive and easy access to diverse data, enable manipulation and transformation of these data, and provide business managers and analysts the ability to conduct appropriate analysis and perform actions [1].

Developments in terms of utilizing transaction data in the e-Commerce industry can be used in order to increase productivity, services, marketing, and create appropriate business strategies. This research explains the application of Business Intelligence Architecture that can be used to support business decision from operations to strategic locations that use attractive and easily understood visualization for management in the e-Commerce companies. This research consists of several parts, as follows, section I contains an Introduction about how important the application

of Business Intelligence Architecture in decision support, section II contains work related to Business Intelligence Dashboard in decision making, section III contains the methodology in developing application of E-Commerce Business Intelligence Dashboard, section IV is the results and discussion about the Application of E-commerce Business Intelligence Dashboard, and section V is the conclusion and future work about the paper.

## II. RELATED WORK

Previous researches about Business Intelligence Dashboard are described as follows:

- Business Intelligence Dashboard Implementation on a Travel Agency in Jakarta. The research was created by Euis Nina Saparina Yuliani, Heru Subawanto, and Anggi Oktaviani in 2017. This research was successfully transform raw data into information that is meaningful and useful by using BI tools [2].
- Business Intelligence Dashboard in Decision Making. The research was created by Bhumika Hansoti in 2010. This research helped in identifying the difference between the usages of dashboard across three departments and also identified additional features that should be added to the dashboard to improve its performance and effectiveness [3].

### III. METHODOLOGY

The research method is using Rapid Application Design. The structure of Rapid Application Development cycle is divided into three stages, shown in Figure 1.

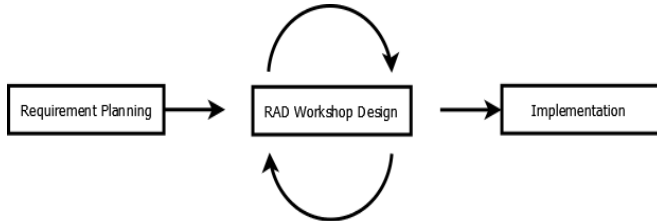


Figure 1. Rapid Application Development Phase [4]

The requirement planning stage has two processes namely architecture analysis and functional analysis. The RAD Workshop Design stage consist of UML system design with a case diagram. The implementation stage has 5 processes namely Data Source, ETL, Data Warehouse, Business Intelligence Dashboard, and Testing.

The architecture of Business Intelligence can be seen in Figure 2. Data source is a source of data used in Business Intelligence. Data Integration uses ETL for data processing that is ready to be entered into the data warehouse. Data warehousing uses Data Warehouse for centralized data storage, which makes data processing easier. Business Intelligence used is the Dashboard, for visualization of information from data processing in the data warehouse. BI Users are users of the BI application.

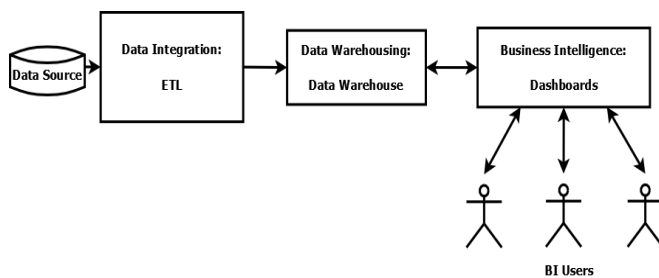


Figure 2. Business Intelligence Architecture [5]

The database is processed in the ETL process. The results of ETL process are stored in the Data Warehouse. The data in the Data Warehouse is used for BI Tools. BI Tools displays information that can be used by BI Users.

### IV. RESULTS AND DISCUSSION

#### A. Requirement Planning

The stages of the requirements planning phase are Architecture Analysis and Functional Analysis. This stage is carried out to conduct analysis needs to resolve existing problems.

Business Intelligence Dashboard Architecture is a suitable and appropriate architecture used to solve large data processing problems to produce information that can be used in decision support.

The functions in the BI Dashboard Architecture are:

1. Application can store data that is ready to be used for processing.
2. Applications can process data in the database to produce information.
3. Application can display information used for decision making.

#### B. RAD Workshop Design

Use case is a sequence of transactions in a system. The use case model is based on the interactions and relationships of individual use cases [4]. Use case diagram for application of e-Commerce Business Intelligence Dashboard can be seen in Figure 3.

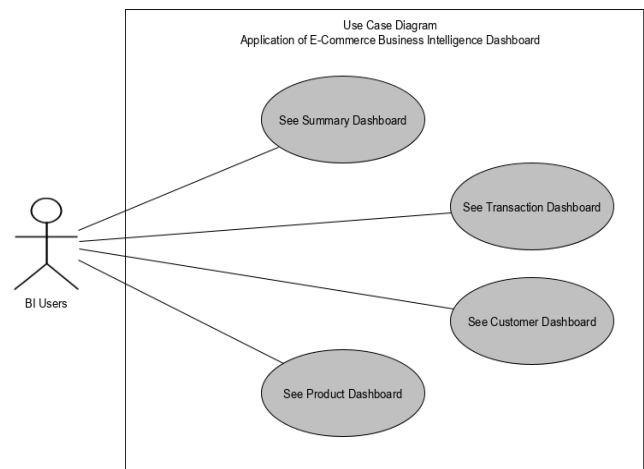


Figure 3. Use Case Diagram

#### C. Implementation

##### i) Data Source

Data source is a secondary data. The dataset was obtained through [www.kaggle.com](http://www.kaggle.com) with the title "Retailrocket recommender system dataset". The data source file can be seen in table 1.

Table 1. Data source

No	Data Source	About File
1.	category.csv	tree of categories in the "child-parent" form
2.	events.csv	Users' click stream data
3.	items_properties_part 1.csv	item properties part 1
4.	items_properties_part 1.csv	item properties part 2

ii) ETL (Extract Transform Load)

ETL process is used to select data that are significant in supporting decision [6]. The results of the ETL process can be seen in Figure 4. The results of ETL process are create table visitor and change value timestamp in timestamp format to date format.

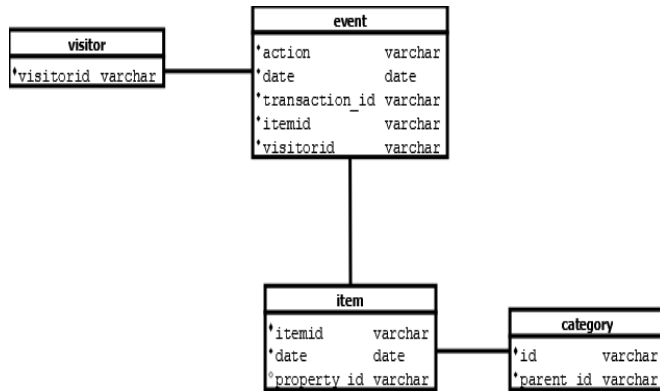


Figure 4. ETL Results

iii) Data Warehouse

Data warehouse is a central storage that collects and stores data from internal and external sources for strategic decision, queries, and analysis [6]. There are four table in data warehouse namely event, visitor, category, and item. Data warehouse modelling can be seen in figure 5.

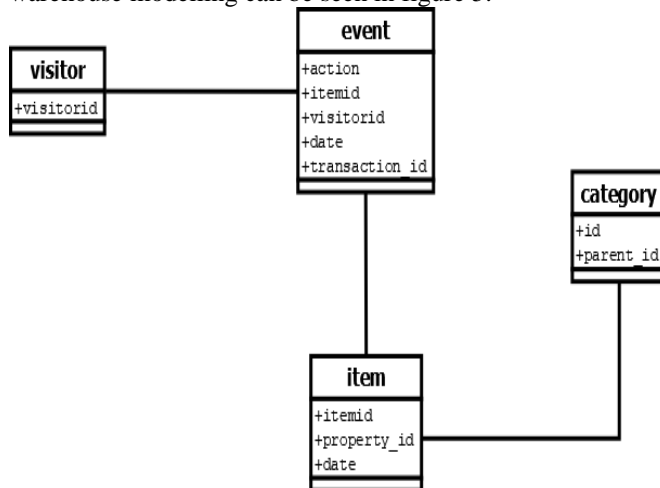


Figure 5. Data Warehouse

iv) Business Intelligence Dashboard

**Summary:** Summary page displays graphic or image information on the website page. The Summary page displays the side bar, the Business Intelligence dropdown menu in the side bar, the logo, and the summary information in the form of a graph including the number of customers, the number of products, the number of transactions, and summary by event. The summary page results can be seen in Figure 6.



Figure 6. Dashboard Summary

**Customer:** The results of the Customer page displays information in the form of pie charts. The Customer page will appear if the user selects “Customer” in the “Business Intelligence” dropdown menu in the side bar. On the Customer page there are a logo, side bar menu, and Business Intelligence dropdown menu in the sidebar and information in pie cart form. The information that is displayed includes customers who see the product and customers who put the product in the cart most often. The content can be seen in Figure 7.

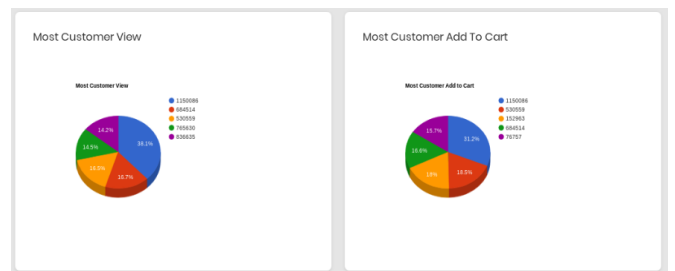


Figure 7. Dashboard Customer

Information of customer who did transactions most often can be seen in Figure 8.

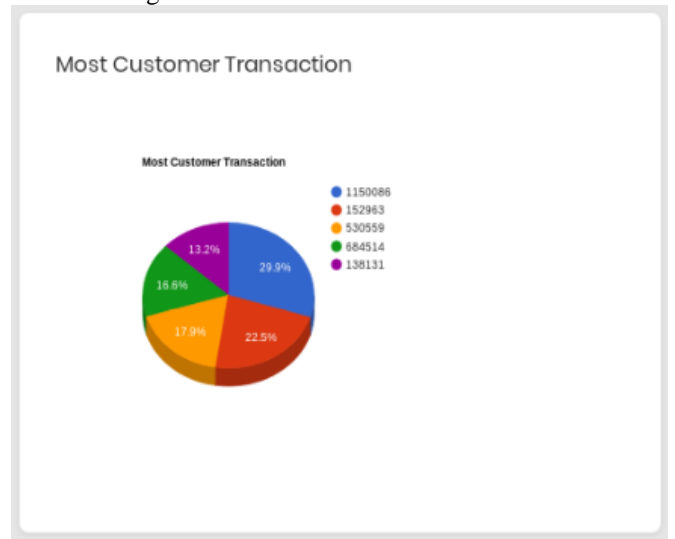


Figure 8. Dashboard Customer (continue)

**Product:** The results of the Product page displays information related to the product. The Product page can be seen if the user selects “Product” in the “Business Intelligence” dropdown in the side bar menu. On the Product page there are a logo, side bar menu, Dashboard “Summary” options, Dashboard “Customer” options, Dashboard “Transaction” options, and view the information from the query set in the form of graphs and charts. The Product page can be seen in Figure 9 which displays the information in about the products that are most often seen and added to cart.

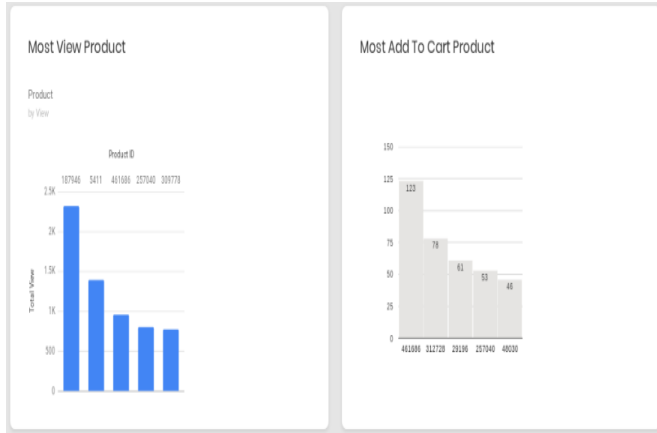


Figure 9. Dashboard Product

Figure 10 is an advanced product page that contains information of the most often purchased products and products by category.

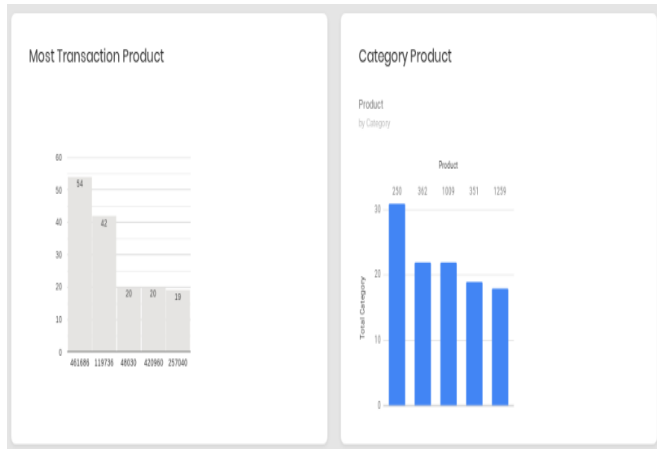


Figure 10. Dashboard Product (continue)

**Transaction:** The results of the Transaction page displays the information related to the transaction. The Transaction page can be seen if the user selects “Transaction” in the “Business Intelligence” drop down menu. On the Transaction page the user can see the logo, choose another page on the side bar, and see information about the transaction. Figure 11 shows Transaction information by customer.

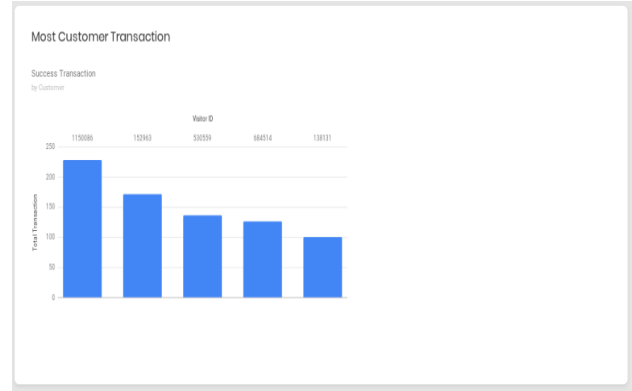


Figure 11. Dashboard Transaction

The results of the Transaction page displays information about the most frequently purchased products. It can be seen in Figure 16.



Figure 12. Dashboard Transaction (continue)

Information about the number of transactions summarized in weeks per month can be seen in Figure 13.

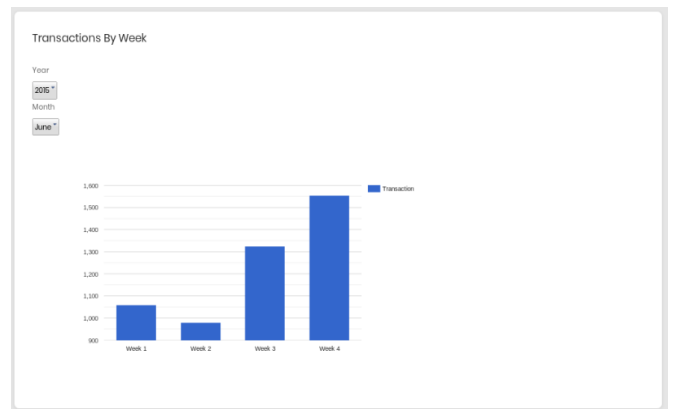


Figure 13. Dashboard Transaction (continue)

Testing of Dashboard Summary, Customer, Product, and Transaction Modules using black box testing method. The result of the black box testing can be seen in table table 2.

Table 2. Black box testing

Num ber.	Module	Expected Result	Result	Con clusion
1.	Dashboard Summary	The application displays the Dashboard Summary page, which displays information of the number of customers, number of products, and number of transactions.	The application displays the Dashboard Summary page, which displays information of the number of customers, number of products, and number of transactions.	Correct
2.	Dashboard Customer	The application displays the Customer Dashboard page, which displays Customer information based on Product and Transaction.	The application displays the Customer Dashboard page, which displays Customer information based on Product and Transaction.	Correct
3.	Dashboard Product	The application displays the Product Dashboard page, which displays Product information based on Customers and Transactions.	The application displays the Product Dashboard page, which displays Product information based on Customers and Transactions.	Correct
4.	Dashboard Product	The application displays the Transaction Dashboard page, which displays Transaction information based on Customers and Products.	The application displays the Transaction Dashboard page, which displays Transaction information based on Customers and Products.	Correct

## V. CONCLUSION AND FUTURE SCOPE

Business Intelligence Dashboard to manage data and display information has been successfully developed and created. The results of this study can be used as a reference for companies in the field of e-Commerce with retail industry in building Business Intelligence Dashboard. The information generated is divided by customer, product, and transaction.

Business Intelligence Dashboard application is created using BI architecture. The stages of application development is using RAD Method. The features contained in Business Intelligence Dashboard application are dashboard summary, customer dashboard, transaction dashboard, and product

dashboard. Testing of application is using black box testing method. There are 4 module testing, with 4 valid and 0 invalid results.

Application of Business Intelligence Dashboard in the future is expected to have integrated data automatically with data sources on each operational system into BI applications. However, each system must have a standard value for data processing and information visualization in the Business Intelligence Dashboard application.

Application of Business Intelligence Dashboard is expected to be built with a mobile application version, so that the mobility of use can be improved. As well as about data security and access rights to the application can be increased in the future.

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## Authors Profile

Muhammad Naufal Prakoso got his bachelor's degree in Information System at Gunadarma University in 2017. He is currently studying a master's degree in Gunadarma University and working as a back end developer in e-commerce company.



Nuryuliani got her bachelor's, master's, and doctoral degree in Information Technology at Gunadarma University. She has been a lecturer at Gunadarma University since 1999 until now. Her research interests are pattern recognition and handwriting analysis.

