

DEVELOPMENT OF BUSINESS INTELLIGENCE FOR INTEGRATION OF FINANCIAL REPORTING SYSTEM IN PT XYZ

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Abstract: The research aims to determine the relationship between two or more variables. Data collection with Literature and field research with questionnaires. The result of the research that is more influential in BAPPEDA Pemprov DKI Jakarta is the Business Intelligence variable, so it needs to be prioritized and given special attention to its implementation in the field. The research method used is associative research, designing Data Warehouse architecture, planning Data Warehouse sources, dimensional data modeling, filling in Data Warehouse. And the results of this study can be used as a reference for further follow-up with the DKI Jakarta Provincial Government BAPPEDA to be prioritized in the near future. The conclusion from the results of this study is that a transaction data warehouse designed using PDI (Pentaho Data Integration), is very helpful in collecting transaction data from original transaction data that already has a database and only as OLTP (Online Transactional Processing) data so that can be used as data OLAP. (Online Analysis Processing) so that it is analyzed using OLAP.

Keywords: Business Intelligence; Financial Reporting System; PT XYZ.

INTRODUCTION

Business Intelligence is a new technology for understanding the past and predicting the future. The technology intended here is one capable of collecting, storing, accessing and analyzing data to help decision makers come up with better decisions. Business Intelligence is a data-driven decision support system. Various advantages in the application of Business Intelligence, namely to collect, store, analyze and provide access to data to help users make accurate decisions by carrying

out various activities including, decision support systems, querying, reporting, OnLine Analytical Processing (OLAP), statistical analysis, forecasting, and data mining for data analysis. Figure 1.1 below shows that the idea of Business Intelligence has evolved over the past forty years and will continue. It can be seen that Business Intelligence focuses on data mining and knowledge discovery. This is an important aspect of Business Intelligence (Siswono 2013).

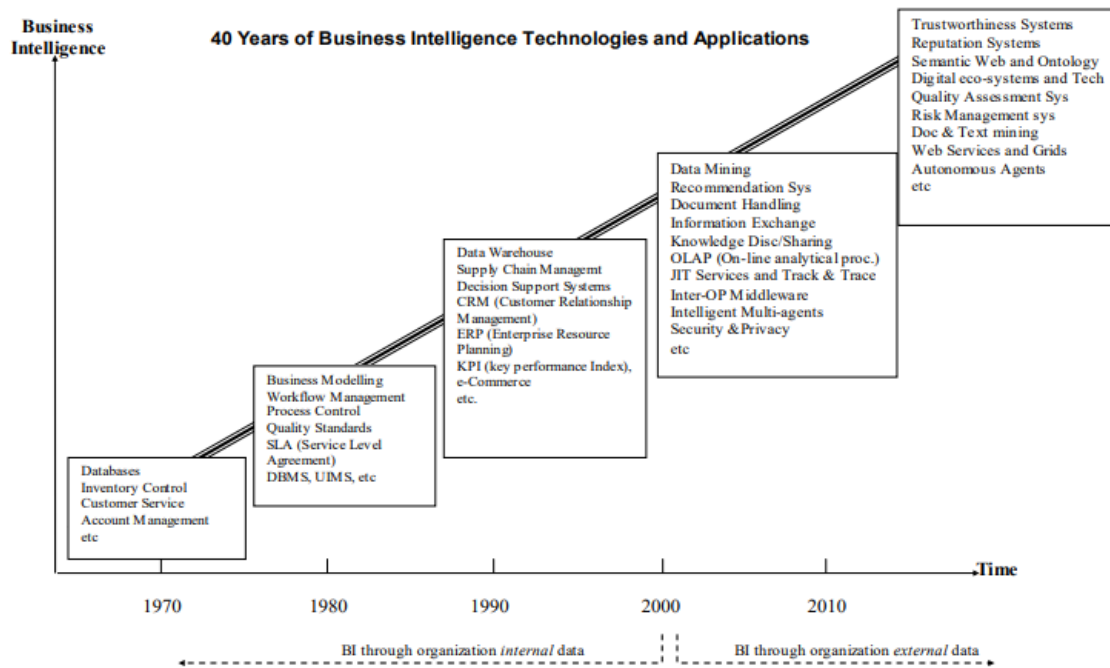


Figure 1. Development of BI Technology and its applications (Chang et al., 2006)

Present at the beginning of 2019, PT XYZ which is a subsidiary of XXX group introduced PT XYZ as a technology-based express delivery company that is ready to be the first choice for consumers in meeting the needs of sending goods. Realizing its existence in the digital era, PT XYZ implements the latest technology development in every service offered. Not

only that, determined as a trusted and reliable partner to connect the entire Indonesian market, PT XYZ implements an integrated logistics system supported by integrated transportation infrastructure.

To support the company's business processes, PT XYZ uses NETSUITE as an Enterprise Resource Planning (ERP) application to record company costs and

revenues and an E-bill application to manage corporate revenue-related transactions. In the case of PT. XYZ, currently processes transaction data and visualize the data to become a report is still done manually using the Microsoft Excel application. Currently, the data entered by ERP is only in the form of transaction data reports containing all company transactions in a certain period. PT XYZ requires transaction data reports to assist in planning and controlling costs, determining the cost of goods shipped and making management decisions. Based on the results of an interview with the management of PT XYZ, there are several problems related to the process, including:

1. The data obtained from the output of the E-bill application mentioned earlier is still raw data and takes 1-2 weeks for

the process of processing data into information because it is done manually.

2. Technology that is still limited uses Microsoft Office as a tool to process data while companies have many large data sources.
3. The speed and accuracy of processing data has not been maximized because the data has not been fully integrated between departments.
4. Decision making is less accurate and fast because it is still not supported by a tool that supports decision making.

PT XYZ needs a BI application that provides monitoring information related to total order reports and revenue estimates to improve management effectiveness and efficiency in strategic decision making.

Table 1. Processes Running Now in PT XYZ1

STEPS	TIME REQUIRED	CONSTRAINTS
Downloading Transaction Data from E-Bill	3-5 days	The more customers and more transactions, the longer it takes to download data
Transaction Data unified	3-5 days	The more files you download, the more time it takes to unify all files in 1 (one) large file
Process Transaction Data using Microsoft Excel formulas	2-3 days	files sometimes not responding or even force close by themselves
Uploading processed Transaction Data into NETSUITE	1-2 days	Upload data one at a time
Presenting transaction data that has been processed in the form of graphs	1-2 days	files sometimes not responding or even force close by themselves

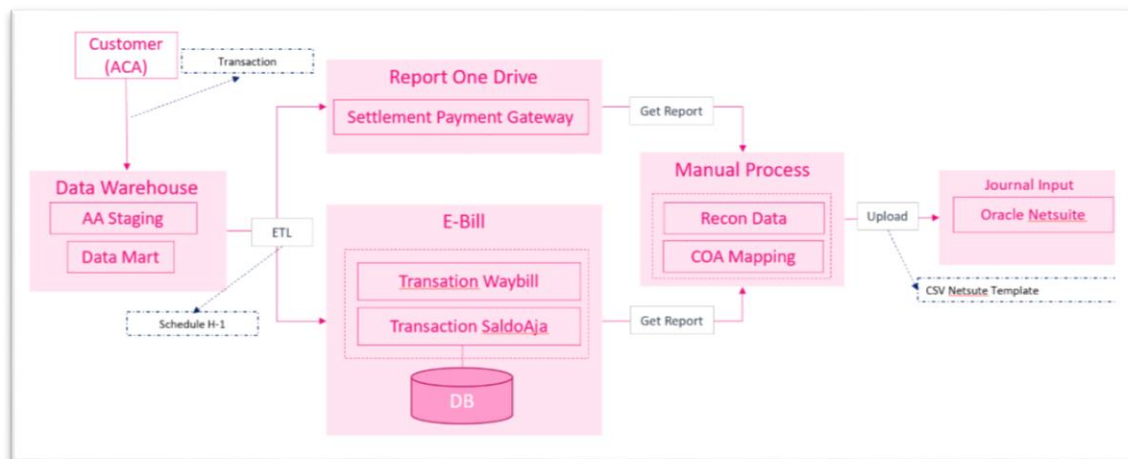


Figure 2. Processes Running Now in PT XYZ2

Therefore, BI application development can be a solution to assist companies in monitoring business processes, especially related to company financial performance. Development includes the design and implementation of BI solutions ranging from architecture, data warehouses, ETL processes and visualization in the form of dashboards. The reason BI is used as a solution is because BI can be used by many organizations to compile ERP information, and other data repositories for quick and effective decision making (LUFTY ABDILLAH 2020). And also because the purpose of BI is to provide information about the business at that time to managers and allow them to make decisions that can solve a problem or take an opportunity.

The methodology used in this study uses the BI roadmap approach (Moss and Atre 2003). The BI roadmap approach is used because it is agile and adaptive to changes in BI product building and is fully aimed at supporting BI development. In BI technology, there is a data integration process: Extract, Transform, Load (ETL)

which can help the process of converting the Online Transaction Processing (OLTP) system into Online Analytical Processing (OLAP).

MATERIALS AND METHODS

The research method used is associative research, which is research that aims to find out the relationship between two or more variables. Data collection with Literature and field research with questionnaires. The results of more influential research in the BAPPEDA of the DKI Jakarta Provincial Government are variable Business Intelligence so it needs to be prioritized and paid special attention to its implementation in the field. And the results of this study can be used as a reference for further follow-up by prioritizing by the DKI Jakarta Provincial Government BAPPEDA in the near future.

The research methods used include designing a Data Warehouse architecture, planning a Data Warehouse source, dimensional data modeling, and filling in the Data Warehouse. This research concluded that the development of the

Data Warehouse model at the Bisa Sarana Informatika academy was designed according to the needs to support strategic decision making. The Data Warehouse model that is built can provide strategic information that can support the academic

evaluation and planning process in the academic field, with the help of Business Intelligence, Data Warehouse information can be presented with various dimensions according to needs.

RESULTS AND DISCUSSION

Identification Data Marts

The second process is data mart identification, where data marts are a subset of the Data Warehouse, usually

consisting of a single subject area. Then it can be analyzed grouping by data mart, according to the user and the needs of the reporting report as needed.

Table 2. Identification data March

Data Mart	Characteristics	Source Data Mart
Data Mart 1	Transactional Data	ps_shipment_ar
Data Mart 2	Invoicing Data	tx_payment_invoice
Data Mart 3	Settlement Transaction from External	tx_payment_fsi
Data Mart 4	Reconciliation of Internal and External Settlement Data	ps_collection

Non-Functional Requirement

The fourth process is Non-Functional Requirement, where this process is more about the security, performance, availability and maintenance of the system that has been created. Things that are the basis of security include User Group Creation, Access Rights Settings, Audit Trail. Performance Recalculation of related reports after the adjustment manual can be completed under 10 minutes for each reporting. Availability System can process BI data on a schedule, BI data is available and can be accessed by users no later than 08:00 am. Maintenance in the form of BI data dackup needs to be done periodically

properly.

User Requirement

The fifth process is User Requirement, BI reporting applications must have access control and user roles. The function of the user role is to be able to manage all functions in the application, Can manage reports such as pulling back the data needed such as create update deletes, can check the results of reports made by user makers and send reports to management. Harmony reporting apps must have access controls and a user role. Here it is divided into three parts, namely:

Table 3. User Requirements

Action	User Role		
	Admin	Maker	Approver
Create User Group	X		
Create User	X		
Create Parameter	X	X	
Parameter Aprover	X		X
Create Data	X	X	
Adjustment Data	X	X	
Report Aprover	X		X
Send Report	X		X

The functions of the user role are:

1. Admin: Can manage all functions on the application.
2. Maker: Can manage reports, such as retracting required data, such as create update delete.
3. Approver: Can check the results of reports made by user makers and send reports to the Authority.

System Requirement

The sixth process is System Requirement, which is a specification that defines the functions that must be possessed by the information system to be built such as infrastructure specifications. The system used is a cloud database with the following details.



Figure 3. System Requirements

System Design

The seventh process is System Design, this stage is a stage of system development that defines functional needs, preparation for implementation design, and describes how a system is formed which can be in the form of depiction, planning and sketching or arrangement of several separate

elements into a whole and functioning, including configuring the component's software and hardware of a system. There are five stages that are carried out based on system design drawings, namely:

1. Data Source
At this stage the data source used is a Database on PostgreSQL Server,

Database PT XYZ (SQL Server) and Excel User

2. Data Preparation

At this stage preparing the data to be pulled from the source, then loaded into DWH, this is included in the ETL (Extract Transform Load) process. The BI tools used at this stage are SSIS.

3. Data Storage

At this stage, prepare a Data Warehouse that is stored in a cloud database and filled in by data extracted from the data source and mapped according to the results of the analysis.

4. Data Analysis

At this stage is a very important stage, because at this stage researchers make a cube which later this cube can do analysis, calculation and linking data. The BI tools used at this stage are SSAS (SQL Server Anaysis Services).

5. Data Access

This stage is the finalization stage

where the data that has been processed from stage 1 to stage 4 will be presented in the form of reports and applications. The tools used are SSMS (SQL Server Management Studio), namely Harmony.

Development of a Prototype

Prototype is one of the system life cycle methods that is based on the concept of a working model. The goal is to develop the model into a final system. The stages of the Prototyping Method include:

1. Needs analysis

At this stage the developer identifies the software and all the system needs to be created.

2. Build prototyping

Build prototyping by creating temporary designs that focus on presenting to the user (e.g. by creating inputs and output formats).

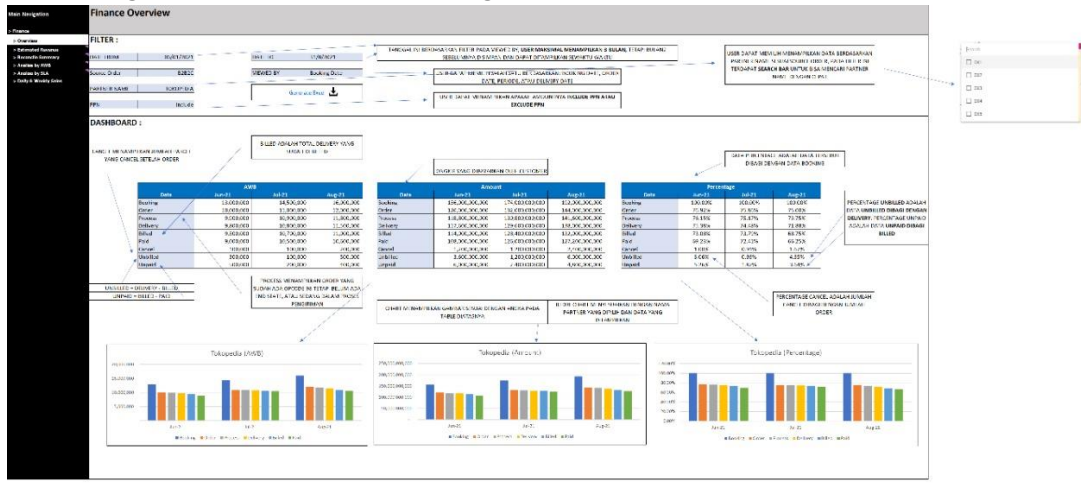


Figure 4. Prototype Intelligence Dashboard

The Intelligence dashboard consists of a bar chart and a table. The bar chart depicts the number of numbers according

to the table that is on it.

3. Evaluation of prototyping

This evaluation is carried out to find out whether prototyping is in accordance with user

expectations.

4. Encoding the system
At this stage the approved prototyping will be converted into a programming language.
5. Test the system
At this stage, it is done to test software systems that have been tested by creating SIT (System Integration Test) documentation
6. System Evaluation
Software that is ready to be finished will be evaluated by the user to find out whether the system is as expected by creating UAT (User Acceptance Test) documentation
7. Using the system
Software that has already been tested and approved by customers is ready to use.

Implementation and Control

a. Development of Data Warehouses and Data marts

After the data mart is formed, then determine the process of developing a data warehouse according to the needs of the data mart, then here will determine the dimensions with related facts in the formation of the data warehouse in accordance with the data mart.

1. Dimensional Modeling

Dimensional modeling is the process of forming dimensions and facts and star schema, where the formation of star schema is in accordance with the Vercellis method. At this stage, it is the stage of determining the dimensions related to the facts that have been adjusted by the needs of the data mart according to business requirements, so that there is no data redundancy in the dimension.

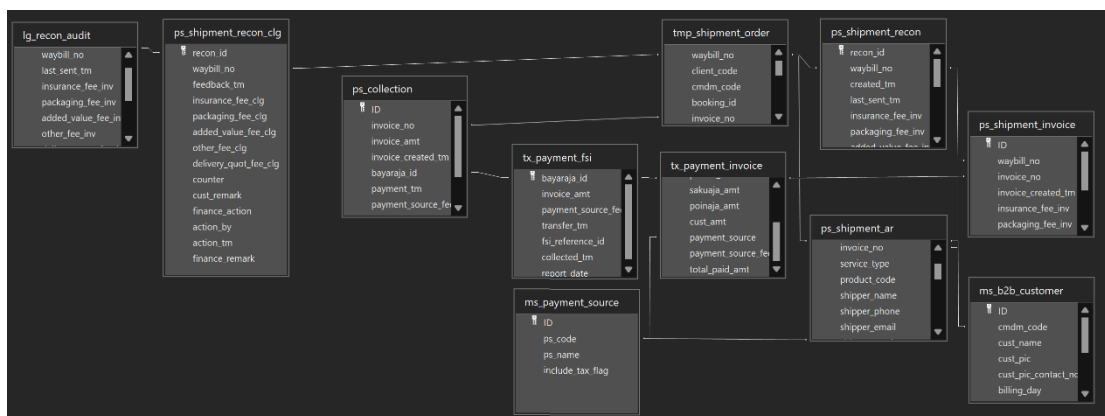


Figure 5. Entity Relationship Diagram

2. Physical design.
Physical design consists of 2 categories, namely the physical design dimension and the

design dimension, which is the process of forming metadata in the database, by detailing all the attributes of each dimension

and facts that have been designed in the previous stage. And also determine the database used for data integration on related dimensions and facts, so the need to adjust the data to the database to be used is to pull the staging data, after doing data staging is to analyze the data into dimensions and facts. After the Fact and Dimension analysis for the database is carried out, the query process is carried out during the Data Warehouse processing process in the SQL Server Integration Services application and the formation of queries for each of the Staging and Data Warehouse packages according to needs.

3. System Architecture

The system of architecture emphasized at this stage is the emphasis of a conceptual model that defines the structure, behavior, and views of more than a system. A system architecture may consist of system components, visible external properties of component components, and relationships (e.g. behavior) between them. It can provide a plan from which the product can be obtained, and a developed system, which will work together to implement the system as a whole. In the system architecture, there are 4 stages

of the system that will run and will be integrated with each other. The first is the source system stage consisting of several parts including DAD and EXCEL Parameters. The second stage of entering the data source is entered in the database. The third stage is the Extract Transform Load (ETL) process and the fourth stage is the formation of a data warehouse

System The architecture of forming a data warehouse is to take from several sources in order to form the required data warehouse, it can be described as follows:

1. In the first stage, the data source used from several sources, namely:
 - a. Order Management System (MySQL Server),
 - b. SGS (MySQL Server),
 - c. FVP (MySQL Server),
 - d. EXCEL Parameters (Excel) Data from payment gateway
 - e. EXCEL Parameter (Excel) Data from user upload
2. In the second stage, the data source is entered in a staging database on a server that is different from the source with the MySQL Server engine which holds all the source data originally.
3. In the third stage, the data staging process is carried out to extract transform load (ETL) to avoid dirty data,

namely duplicate data, and redundancy so data cleansing needs to be carried out.

4. At the fourth stage is the formation of the data warehouse.

b. Development of ETL Tools

The main focus of this phase is to develop procedures for validating data that has been extracted and moving data in the form of a Data Warehouse. The development of ETL tools here uses the SSIS (SQL Server Integration Services) application, the function of SSIS is a tool used to perform the Extract, Transform, and Load (ETL) process and is classified as a Business Intelligence feature. In relation to Business Intelligence, SSIS is a feature used to pull data from ERP, relational databases, or files for the results to be then saved into the Data Warehouse. While ETL is a process to collect data from various sources (Extract), clean it (Transform), to then save it into another system (Load). The development of the system as a whole is an actual implementation of the analysis and design carried out. In this phase of the project, researchers designed data warehouses (fact tables and dimensions) and ETLs. In addition to the SSIS application at this stage, it also uses the SSAS (SQL Server Analysis Service) application, which is one of the Business Intelligence

tools. Analysis Services is a technology for OLAP (Online Analytical Processing) and Data Mining. OLAP administration procedures are carried out in SQL Server Management Studio including Viewing data and creating multidimensional expressions.

OLAP used is Drill down and Pivot (rotate). Drill down represents the data in more detail while pivots visualize operations that rotate the axes of the data as an alternative in the presentation of the data.

c. Development of Metadata

Metadata describes the content, quality, conditions, and other characteristics of a piece of data written in a standard format. In this case, the reporting metadata format standard used by PT XYZ refers to the standard metadata provided by the management. Metadata itself has several functions, including identifying data, grouping similar data, distinguishing data according to certain criteria and providing important information related to data.

d. Development of Applications

The method to verify data in Data Warehouse is to prepare reports in Analysis Services SQL Server Management Studio or use a BI application and compare it with reporting data managed by users which is later reported to management.

At this stage, the scheduler process for pulling the data warehouse is carried out along with the schedule carried out to generate data in the application

sourced from the data warehouse every day at 00.30.

Process Flow is a step or stage in submitting a report from the beginning to the end.

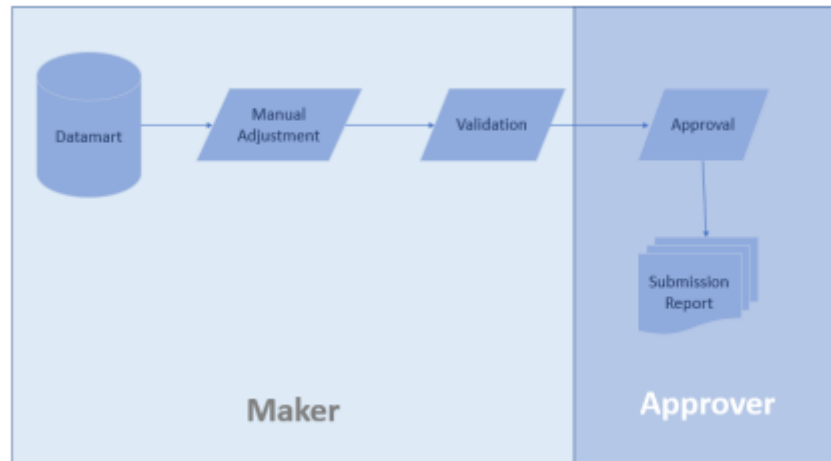


Figure 6. Process Flow Data Reporting (DINA IKRAMINA SETIANI 2020)

There are five stages in the data reporting flow process, namely:

1. Datamart

In the data mart stage, where the data displayed is a display of data source that has been generated by a scheduler that matches the selected date period.

2. Manual Adjustment

In the manual adjustment stage, it is a process of displaying and processing data sources that have been adjusted according to the date period. In the manual adjustment there are Create, Edit, Delete and Import features.

3. Validation

In the validation stage, it is a process of displaying and processing data according

to reports and periods for validation. In validation there are features Create, Edit, Delete, Import (import data from excel), Validate (used to validate data), Rollback (to move data to the initial stage), Retrieve (used to replace data according to the column selected from the previous data).

4. Approval

At the approval stage, display data according to the report and the period for the approval process. In approval, there are features Approve (to approve data will be processed to the next stage), Reject (to reject data in the process to the next stage), and Rollback (to

return data back to the initial stage).

5. Submission

In the Submission stage, displaying data in accordance with the report and data period that has been approved for processing and is ready to be presented to management. In submission there are Submit features (to

process data into CSV form), Download (to display the finished list created), Rollback (return data back to the initial stage).

To access the features above, there is a role (access rights) for each user. This means that each user level has different access rights, depending on the authority of the user given. The following are the role access rights to the available users:

Tabel 4. Role Process Flow

Feature	Role (Hak Akses)
Datamart	Maker
Manual Adjustment	Maker
Validation	Maker
Approval	Approver
Submission	Approver

e. Release and Testing

The main purpose of system testing is to ensure that the resulting system is in accordance with the previously specified requirements. Testing this system is very important, therefore a process documentation is made to record all activities that have been carried out during the Business Intelligence application development process including the integration of reporting systems. This documentation can be in the form of a User Manual Book, Business Requirement Definition (BRD), Functional Specification Document (FSD), Integration Testing System

(SIT), User Acceptance Testing (UAT). Later this documentation can be used as a guide for users and teams involved in this project and those who are not involved in this project. After making documentation, a validation process is carried out involving related users in this reporting project to check and provide the purpose that the information system has been implemented correctly and in accordance with user needs and intended use.

The following is an example of a report that has been tailored to the needs of the user:

Figure 7. Reports that have been tailored to user needs

Result Discussion

From the discussion above, it can be obtained about the efficiency and effectiveness of reporting from the previous process where for internal parties PT XYZ downloads data in several files then combines it into a file. Then the file is processed in order to get the necessary information. This process runs 1-2 weeks. With the Harmony application, the report process at PT XYZ becomes shorter and simpler. The data displayed in Harmony in real time, there is no need to process data, so that the input process to NETSUITE is

more effective and efficient and level management can monitor regularly because it has implemented Business Intelligence development.

With the Harmony application, the reporting process conveyed by PT XYZ to the management level already uses a portal that is integrated with metadata. Harmony is one of the reporting features that is integrated directly into the management level, so information can be received faster and will make the reporting process faster and more accurate.

CONCLUSIONS

It can be concluded that the development of Business Intelligence at PT XYZ is as follows:

1. The conclusion of the results of this study is that the transaction data warehouse designed using PDI (Pentaho Data Integration), is very helpful in collecting transaction data from the original transaction data that already has a database and only as OLTP (Online Transactional Processing) data so that it can be used as OLAP (Online Analysis Processing) data so

- that it is analyzed using OLAP.
2. In addition, in this study for transaction data reporting designed using PRD (Pentaho report Designer), it is very helpful in making transaction reports and can be adjusted to the needs, so that problems that often occur in terms of dependence on report acquisition are expected not to occur again.
3. The transaction dashboard, designed using Pentaho CDE (Community Dashboard Editor), is very helpful for leaders in analyzing data to study the trends of transactions carried out in XYZ companies, and can be used to

support decision making and can also be a measure of company performance.

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