Comparison of Business Intelligence Tools along with their Architectures and Components

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Abstract— Analytics and Business Intelligence is a rapidly increasing area in terms of Information technology since the amount of data and information to be gathered has increased substantially in the past few years. Recording information and gathering patterns and trends out of them is a difficult task and this is where business intelligence comes into picture. Not only the past, but also predicting the future trends becomes easy with the help of these tools. A lot of companies, like Pentaho, JasperSoft, KNIME, Vanilla etc. are in the race to provide the best tools for the users. In this paper, we have considered 3 tools- Pentaho, JasperSoft and Vanilla and made a comparison between them to figure out the best tool of the 3 available. All these tools are open source and can be freely downloaded from their respective websites. A trial version or a demo is also available on the site which makes them easy to use and analyze. The various aspects and components related to report generation are determined and studied and a proper conclusion is figured out by comparing all 3 of the tools.

Keywords—*business intelligence,business intelligence tools,analytics, report generation.*
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I. INTRODUCTION

Business Intelligence (BI) is a technology that is used to extract certain information from the vast amounts of data that is available with the organization. A company performs multiple functions and activities on a regular basis and these operations require data and also produce new data. All of this data has to be stored by the company for the current processing as well for future purposes. In order to save this data, the company uses data repositories, data bases and data warehouses. This data is considered to be raw data.

All these mechanisms store data in their respective formats according to the date, size, type and other related information. Now, data is present with the organization but using this data and performing maximum utilization out of it is a very difficult task. This is where business intelligence can be utilized.

Business intelligence technology is used to analyze the data and extract the required information out of it. This information can be used for decision making, forecasting business trends, increasing efficiency and gaining a competitive advantage. It can also help in identifying problems present in a business environment and provide optimal solutions for them. Thus, business intelligence can be very useful in generating greater revenues and gaining a competitive edge over the others.

Business intelligence is performed by business analysts, developers and professionals. The clients are also a part of this process after certain stages of development to make sure that their requirements are properly being adapted in the process.

Business intelligence requires certain tools that are used for analyzing the data and generating patterns out of them. These tools help in extracting information from raw data and gaining insights to make the business decision making faster and accurate. These tools contain a variety of options and functionalities that can be helpful for the users and provide a lot of insights in the data.

Different BI tools have different ways of extracting information and it depends on the organization as to which tool justifies its working and requirements. A lot of tools are available in the market such as JasperReports, Eclipse BERT Project, SpagoBI, TACTIC etc.

Hence, business intelligence can be very beneficial for the organization and it depends on the company as to how much correct information it can extract and absorb from the available raw data.

II. BUSINESS INTELLIGENCE TOOLS

This paper provides detailed information about the various Business Intelligence (BI) tools namely Pentaho, JasperSoft& KNIME.

A. Pentaho Business Intelligence Tool(http://www.pentaho.com/)

Pentaho [6][7] is the product of the company Pentaho Corporation that offers a range of functionalities to its users such as data integration, OLAP services, data mining, dashboarding, ETL capabilities and reporting. It is a suite of different types of report generation tools and applications such as Pentaho BI Platform, Pentaho Analysis Services, Pentaho Dashboard Designer, Pentaho Analyzer, Pentaho Interactive Reporting, Pentaho Data Access Wizard and Pentaho Mobile.

The following section describes the architecture and the components of the Pentaho tool:

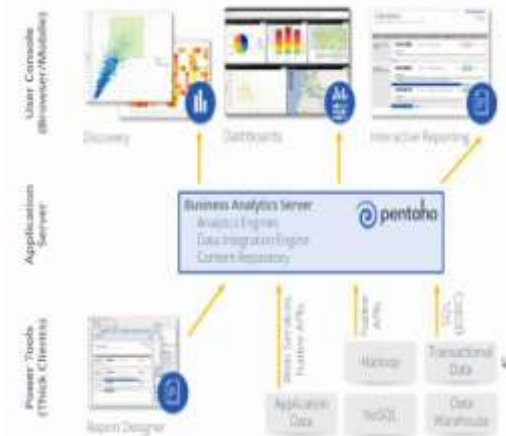### 1. Architecture of Pentaho Business Analytics [6]:

Figure 1- Architecture of Pentaho

The architecture consists of 3 different units: User console, Application server and Power tools.

The user console deals with the presentation layer of this architecture or the user interface where the user can easily interact with the application tool and provide the requirements and inputs that he needs from the tool. The user console consists of dashboards and interactive reporting. Dashboards are used to give a view of the data in different forms to the users. Interactive reporting is used to prepare the report for the user as per his requirements and inputs. The specifications and the demands of the user are specified in this unit. The output of the report generation process is also shown at this phase to the user.

The application server is the part where business analytics server is placed. This server consists of the following modules such as analytics engine, data integration engine and content repository. This is the unit where all the processing of inputs and outputs is performed. To perform the process, various power tools are used.

The power tools contain the application data, web services, native APIs, data warehouse and SQL functions. The input obtained from the user console is processed and various algorithms are applied on the data using SQL, APIs and transactional data. The input is then converted into output and displayed using the report designer. The report designer functions according to the format and needs of the user.

2. Components of Pentaho [7]:

a. Pentaho BI Platform:

It is also called Business Analytics Platform and is used to host contents created in server through plugins and files published from desktop applications. It ensures security, report generation, analysis and displaying dashboards.

b. Pentaho Dashboard Desginer:

It is an amalgamation of various components and key performance indicators (KPIs) that helps the user to perform his tasks, monitor business movements and helps in decision making. Drag and drop components, templates and GUI are used to provide inputs.

c. Pentaho Analyzer:

It is a plug-in that provides drag and drop web-based OLAP viewer. Filtering, sorting and exporting results table to different file formats are some of the basic functionalities of this analyzer.

d. Pentaho Data Access Wizard:

It is another plug-in that helps the user to create new data sources which can be used throughout the system and other databases. It displays the relationships among different data table columns, rows and fields. The entire workflow of the model can be determined using this wizard.

Figure 2- Report Generation using Pentaho

B. KNIME Business Intelligence Tool (https://www.knime.org/):

KNIME [4] is an acronym for Konstanz Information Miner. It is an open source data analytics, reporting and integration platform. It combines various nodes using its graphical user interface and performs various operations such as Extraction, transformation and Loading for data analysis.

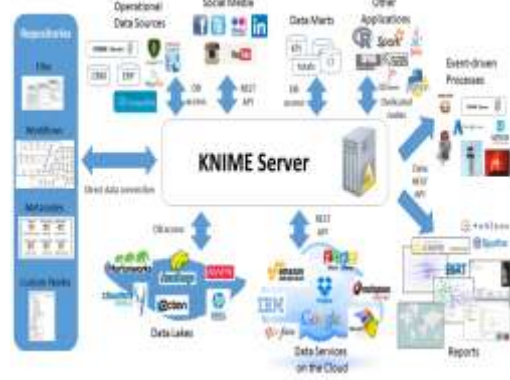### 1. The architecture of KNIME is as follows [5]:

Figure 3- KNIME Architecture

KNIME architecture is designed using various principles and methodologies of pipelining architecture. One of them is the interactive framework. The drag and drop option and simple data flow helps the applications to be created from multiple processing units.

Another principle feature of KNIME is the modularity where new data types can be easily added and can be used with the existing ones without any problems. This allows independent functioning and development of different algorithms. KNIME is also easily expandable which allows it to add new processing nodes and distribute them throughout the application with much trouble.

2. KNIME Components:

a. KNIME Report Designer:

It allows the designing of multiple reports based on the inputs provided and these reports can be further exported in different file formats such as pdf, doc, ppt, xls.

b. KNIME plug-ins:

KNIME provides various plug-ins which allows integration of methods such as text mining, time series analysis and image mining. It can easily function even when there are large amounts of data to be operated upon. This makes it more adaptable for processing of large volumes of information and gathering reports from them.
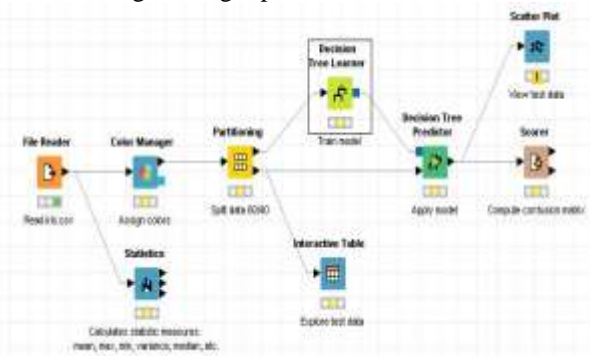

Figure 4- KNIME Workflow Designer Implementation

C. *JasperSoft Business Intelligence Tool (http://www.jaspersoft.com/):*

The JasperSoft [1][2] Business Intelligence Suite is a comprehensive Business Intelligence (BI) suite that provides robust reporting, report server, data analysis, and data integration for organizations that want to make faster, better business decisions.

The JasperSoft Business Intelligence Suite brings sophisticated reporting, interactive analysis, and shared services such as security, repository, and scheduling to everyone from casual business users to business analysts and executives.

1. *Architecture of JasperSoft Business Intelligence Tool [3]:*

Figure 5- Architecture of JasperSoft BI tool.

The architecture consists of 3 major units: Input, Processing and Output. The organizations data is collected from various data sources like SAP, Web Services and External Data. JasperSoft ETL extracts data from various data sources (Operational Sources), transforms it into the particular format and loads it in the data mart. Various tools like JasperStudio, JasperAnalysis and JasperReports performs operations on data stored in the data marts and produces the output in the form of charts, graph.

2. JasperSoft Business Intelligence Tool Components:

The JasperSoft Business Intelligence Suite includes several components for operational reporting, report server and interactive analysis (OLAP).

a.JasperReports – Reporting Library

JasperReports is a Java reporting library. The JasperReports library is the engine that processes and displays data in comprehensible, pixel-perfect printouts and Web reports.

b. JasperStudio – Graphical Report Designer

JasperStudio is a graphical report designer for JasperReports and JasperServer.JasperStudio simplifies the process of accessing data sources, defining and designing the report layout, and compiling reports.

c. JasperServer – Interactive Reporting Server

JasperServer is a stand-alone and interactive reporting server enabling delivery of mission critical information on a real-time or schedule basis to the Web to the printer, or to a variety of file formats.
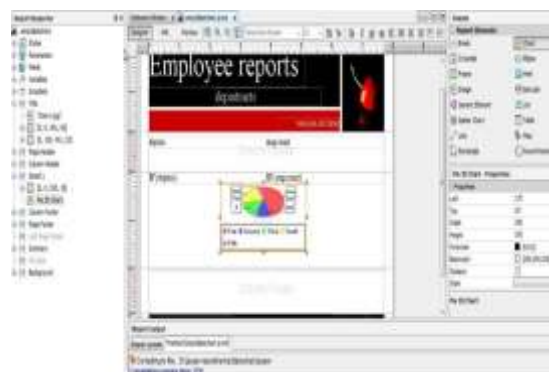

Figure 6- JasperSoft Report Generation

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III. CONCLUSION

After performing comparative study on 3 business intelligence tools such as KNIME, JasperSoft and Pentaho, we come across the following study:

Attribute	Pentaho	JasperSoft	KNIME
Programming Language Support			
Java	Yes	Yes	Yes
Operating System Support			
Windows	Yes	Yes	Yes
MAC OS X	Yes	Yes	Yes
LINUX	Yes	Yes	Yes
UNIX	No	Yes	No
Other Attributes			
Reports	Yes	Yes	Yes
Dashboards	Yes	Yes	No
Data Mining	Yes	No	Yes

Table 1- Comparative Study

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