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Performance comparison of reporting engine birt, jasper report, and crystal report on the process business intelligence

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Abstract. Referring to the Decree of the Minister of Industry and Trade concerning the Provisions on Submission of the Company's Annual Financial Statements, Chapter II, Article 2 explains that companies having the status of head office and being in the territory of the Republic of Indonesia are required to make the Company's Annual Financial Statements which causes the making of reports to be carried out effectively and efficiently. Report generation using tools to support business decisions is the basis of business intelligence. The number of reporting engine tools makes it difficult for users to choose the reporting engine that is suitable for business needs at the time of making the report. This study aims to compare the performance in terms of usability, compatibility and performance in the BIRT reporting engine, Jasper Report, and Crystal Report. The method used is experiments by directly interacting and reporting activities. The testing process starts from getting a database sample and using the RDBMS MariaDB to get the results from the creation of a report containing information in the report designer. The test was successfully carried out and it can be concluded that the three reporting engines have advantages and disadvantages that are typical in each aspect of testing. BIRT has advantages in usability and compatibility aspects, Jasper Report has advantages in all three aspects, but there are weaknesses in several test items, and Crystal Report has advantages in performance aspects. The test results will provide information and conclusions to the company to determine the reporting engine that matches the needs and supports business decisions.

1. Introduction

Information and communication technology at this time not only the needs of the general public to obtain information, establishing relationships with relatives or families, and became a means of entertainment. Information technology can help human activity to do the work in order to trim the time and work more effectively and efficiently. The work will be more easier when utilizing technological advances both in terms of utilization in the field of software or hardware in Personal Computer.[1]

According to decree of the Ministry of Industry and Commerce about annual financial report of the company, chapter II of article II, explained that head office of the company and was in Indonesia required to create annual financial report (LKTP).

Creating of LKTP is certainly by utilizing information and communication technology as a tool to reduce work time and reduce human error. The making of a report that was created with the help of information technology will give more accurate results.



The utilization of information technology in enterprises, directly related to business intelligence. The report on which business intelligence is based is a report that can help strategy and support business decisions. Data warehouse concepts on BI is very important for business strategy. The application of BI function to search and compare data from multiple sources, the method of moving data from separate sources is very important. The general process is "extract, transformation, and loading" or ETL Query processing is one of the stages of the ETL. [2] When the query successfully processed the query will be generalized in the form of spreadsheets and reports was created successfully. One example of software that is often used to make reports is a Microsoft Excel. But, behind the ease with which are obtained when using Microsoft Excel, quite a lot of difficulty perceived by the user when using Microsoft Excel to compile reports. Microsoft Excel becomes a problem when data grows (increases) and develops over time. Like the rows and columns that are added.[3]

This study aims to compare compatibility, performance, and usability of the reporting engine BIRT, Jasper Reports, and Crystal Report because the three applications support data adapters and have the same classification during the reporting process. At this time many reporting engine applications that function as tools to help business processes, and eventually will be used by end users, not only developers or programmers who can use a reporting engine. [4]

However, it is often difficult for end users to choose applications that suit their needs. Therefore, a comparison is needed in terms of performance from each of the reporting engines to find out the strengths and weaknesses and can be adjusted to the needs.

2. Parameter Testing, Framework of Thinking and Method

2.1. Parameter Testing

The test sample was made from epoxy rattan fiber composite material by hand lay up from woven rattan fiber then laminated with epoxy resin. The test sample is made according to the multiple data sources.

2.1.1. Usability Testing. Usability testing also have some criteria or can be said as a parameter testing. Some of these criteria are; (1). Learnability: describes how fast the novice user can develop basic capabilities to the product; (2). Memorability: refers to how well users can use the application after not using it for a certain time; (3). Efficiency: can measure how productive users interact with the application; (4). Error Tolerability: requires that the application help prevent users from making mistakes and giving the message (good error message) which is easily understandable by the user; (5). Likeability: a subjective measure of how well users enjoy using the product.[5]

2.1.2. Compatibility Testing. Compatibility testing are several aspects that can be said to be compatible applications or in accordance with other computerized elements. [6] Some of these aspects are; (1). Platform and Application Version: suitability between application and platform (operating system, web browser, or supporting application). Generally, compatibility information with other applications is listed on the package or startup screen. The user will check the compatibility with the operating system.; (2). Backward dan Forward Compatibility: backward and forward compatibility is the suitability or version of the application; (3). Data Sharing Compatibility: data sharing between applications is the strength of the software.

2.1.3. Performance Testing. Performance testing is designed to determine the actual system performance compared to what is expected. [7] Some of the aspects in the performance test testing are: (1). The time generated when the application executes a task; (2). The capacity used by the application; (3). The level of stability of the application at the time operated; (4). Environment.

2.2. Framework of Thinking

The technique of making the reports can be done in various ways, one of which implement a reporting engine. Reporting engine is a reporting tool that can be used to make reports. Until now, many business

software companies have created various reporting engines with different platforms (Java, Eclipse, and others).

The number reporting engine certainly makes the user difficulty to choose a reporting engine that is good to be used and in accordance with their needs. This study aims to compare the performance of the reporting engine based on aspects of compatibility, performance, and usability in order to know the reporting engine to suit your needs. To achieve the goal on this research, then this study requires the theory as a basis and support so that it can be done well.

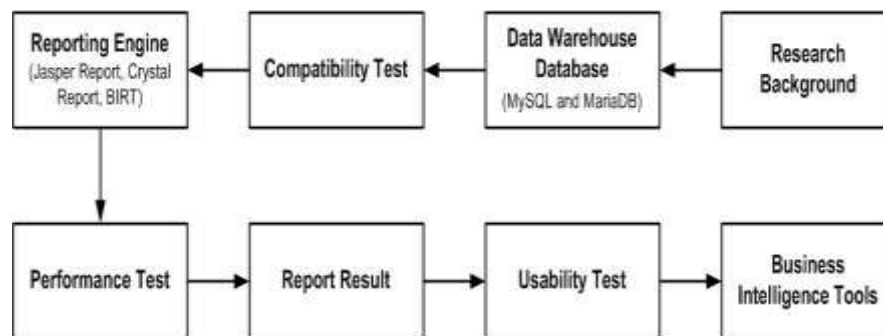


Figure 1. Framework of thinking

In Figure 1 is the plot and outline for the analysis and comparison of applications reporting engine (BIRT, Jasper Reports, and Crystal Report). The results of the research process are data that contains information to provide the reporting engine conclusions as needed.

2.3. Method

The research method used in this study is an experimental method. Process experiments with ways of interaction, activity reporting, and test the application directly reporting engine. Comparative and analytical processes performed well observed the performance of each reporting engine. Through the observation process it can be tested.

The process of research and comparisons made through several stages that are described in the figure 2.

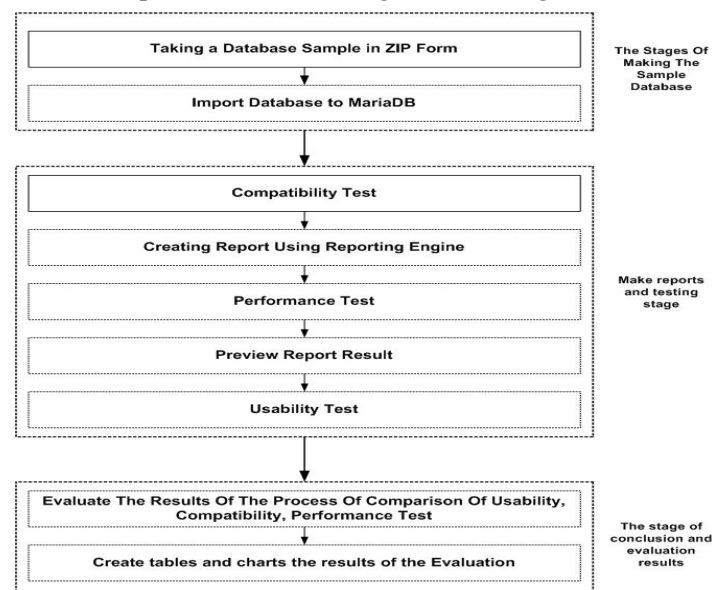


Figure 2. Research flowchart

2.3.1. *Making Sample Database.* The database that the sample database is taken for testing the reporting engine. The sample database used is the classicmodels database obtained from the web mysqltutorial.com

2.3.2. *Making Reports and Testing.* At this stage the download process is done, do the installation, the creation of the report, to get the end result. Testing conducted at the same time to measure the performance of each owned reporting engine.

2.3.3. *Conclusion and Evaluation Results.* From the analysis process is done, give the results of the evaluation in the form of three testing techniques on a reporting engine.

Evaluation results will make it easier for the withdrawal of the conclusions that will be utilized for user to select the reporting engine to suit your needs. Evaluation results using Table 1.

Table 1. Testing Form (Examples)

Testing	<i>BIRT</i>	<i>Jasper Report</i>	<i>SAP Crystal Report</i>
Based on ESP	Not available	Available	Available
Have DTP features	Available	Available	Available

3. Results and Discussion

3.1. Data Description

The sample database used in this study is a database file that is downloaded on the website of the MySQL Tutorial. Files that you have downloaded the .zip format has.

The next process after the sample database successfully imported into phpmyadmin and ready for use i.e. query processing will be performed or select tables, fields and records that will be displayed on the reporting engine. The data that will be displayed on the reporting engine is only the data needed and has information that has a role to support the business decision process.

Table 2 System Requirement Reporting

<i>Engine</i>		
<i>BIRT</i>	<i>Jasper Report</i>	<i>Crystal Report</i>
<ul style="list-style-type: none"> • Windows XP/Vista/7/8/10 32 or 64 bit • Red Hat Enterprise Linux 5.0 and 4.0 32 and 64 bit • SUSE Linux Enterprise Server 11 32 dan 64 bit • Ubuntu Long Term Support 10.04 32 dan 64 bit • Sun Solaris 10 32 bit • HP-UX 11i v2 32 bit • IBM AIX 5.3 32 bit • Mac OS X 10.5 32 and 64 bit 	<ul style="list-style-type: none"> • Windows 7/8/10, 32 or 64 bit • Linux , 32 or 64 bit • Mac OS X 10.8.5 to 10.9, 64 bit 	<ul style="list-style-type: none"> • Windows Server 2008 R2 • Windows Server 2012 • Windows Server 2012 R2 • Windows Server 2016 • Windows 7 SP1 • Windows 8.1 • Windows 10
Storage 200 MB	Storage 50 MB	Hardisk 2 GB install default language English, 4 GB for all install language


3.2. Analysis of Requirements Testing

Test process requirements analysis starts from checking the specs are owned by the reporting engine to data source supported by the reporting engine.

Table 2 describes the system requirement, which is owned by the respective reporting engine. The third reporting engine has advantages and disadvantages in each aspect (the operating system, storage, RAM, and more). After the system requirement PC according to the specifications which is owned by the reporting engine will then do the downloading, installation, process the connection with the data source, to the process of creating a report using data from the sample database.


3.3. Discussion of Research Results

The process is done on the previous stage as a step to do testing reporting engine based on three aspects, namely: compatibility test, performance test and usability test using symbols and colors of green, yellow, red for visualization the test results. The observation has been made will be used for charging the test form reporting engine on a table that has been created.




Usability Test			
	●	●	●
be able to download (the installation results in the form of a file that can be run directly)	the files should be extracted in advance	files can be directly executed	the files should be extracted in advance
	●	●	●
There is a package of supporting in a single file	have a package supporting	have a package supporting	have a package supporting
	●	●	●
has plugins for ease of use in other applications (can use other applications such as NetBeans and connecting with the plugin)	Eclipse	NetBeans	Microsoft Visual Studio
	●	●	●
There is a tour guide or tour app application reporting engine	Have tour app	Have tour app	Doesn't have tour app
	●	●	●
does not require additional drivers database	Need	Need	Need
	●	●	●
provides a ruler on the report for easy set up text	Have ruler	Have ruler	Have ruler
	●	●	●
does not require manual url database filling	Need	Not Need	Need
	●	●	●
menyediakan database classname pada saat pembuatan koneksi database	Available	Not Available	Not Available
	●	●	●
easy to make reports (there are feedback or error message)	Have Error Log	Have Error Message	Doesn't have error message













Figure 3 Usability test












Compatibility Test			
	●	●	●
supports good multiplatform aspects	Available on Windows, Mac, Linux, Sun Solaris, IBM AIX, and HP-UX	Available on Windows, Mac, and Linux	Just available on Windows
	●	●	●
use a small space / size storage	Hardisk 200 MB	Hardisk 50 MB	Hardisk 2GB default and 4GB all language
	●	●	●
use small RAM memory (minimum 4GB RAM)	RAM 1GB	RAM 1GB	RAM 2GB
	●	●	●
reporting engine freeware	freeware	freeware	commercial
	●	●	●
the ability to connect to the data adapter as a data source (IBM DB2, Oracle, JNDI, JDBC)	has 4 types of data adapters	has 14 data adapters	has as many as 35 types of data adapters
	●	●	●
supports source to file that has the format (XLS, CSV, XML)	can connect to 3 types of file formats	can connect to 4 types of file formats	can connect to 3 types of file formats
	●	●	●
connect with the source of various relational databases (SQL Server, MariaDB, DB2)	can be connected to 18 types of databases	can be connected to the 21 types of databases	Crystal Report not provide database

Figure 4 Compatibility test



Performance Test			
			
Enterprise Resource Planning)	not available	available	available
			
the template provides a report wizard which can be used to create reports	available	available	available
			
fitted designer is intuitive and a complete chart collection for the purposes of analysis	available	available	available
			
menyediakan fitur DTP (Direct To Print)	available	available	available

			
can perform a preview of the report with different formats (PDF, PPT, HTML)	can do a review report, with 7 kinds of format	can do a review report, with 16 kinds of format	can do a review report, with 2 kinds of format
			
provide diagrams for connecting between tables (links) or at the time of the design of the query	Not available	available	available
			
able to export a report in report output format type (PDF, HTML, CSV)	can perform an export report into 7 different formats	can perform an export report into 16 different formats	can perform an export report into 14 different formats







			
can save the report in the form of images (JPEG, PNG)	Unable to save the report in the format of a picture	can store reports in a format PNG	Unable to save the report in the format of a picture
			
rapid report execution process (Report Execution Time)	11.20 seconds 21.23 seconds	03.02 seconds 03.54 seconds	04.33 seconds 04.50 seconds

Figure 5 Performance test

4. Conclusion

Based on the results of the research and discussion that has been carried out, the testing process to the three reporting engines goes through the processing stage of data collection which will be used as material for making reports to create core table supporting information charts that can provide test results based on compatibility, performance and usability aspects.

Each aspect of the reporting engine testing has different items or parameters. The following is the conclusion of the reporting engine testing based on three aspects: (1). BIRT has sufficient test results on the usability test, enough compatibility tests, and bad performance tests. BIRT had the management of layout and design manually which allow a user to customize to your needs, as well as for the user or IT Support companies that have been accustomed to using the Eclipse application would be easier to operate the BIRT; (2). Jasper Report having good test results in third aspect (compatibility, performance, and usability). Reporting engine Jasper Report has an easy layout to be used by novice users and to the Division on the company would be easier to make reporting because Jasper Report supports delivery reports in a variety of formats; (3). Crystal Report have a bad test results on usability, compatibility and bad enough on performance. Crystal Report is an appropriate report structure at a time when printed with the structure of the report in report designer. For a company that has many branches and employees, as well as having a good financial more appropriate to use the Crystal Reports Crystal Report because it supports all types of data adapters and has applications supporting the Crystal Report Viewer for simplify the process of monitoring companies.

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