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Ade Gafar Abdullah
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Preface

The 2nd ICIEVE 2017, the International Conference on Innovation in Engineering and Vocational Education, held on October 25-26, 2017 at Aryaduta Hotel, Manado, North, Sulawesi, Indonesia, is hosted by Universitas Pendidikan Indonesia (Indonesia), Universitas Negeri Manado (Indonesia), and Rajamangala University of Technology Thanyaburi (Thailand).

The conference was a platform for scientists, scholars, engineers, industrial professionals, and researchers to exchange, share, and discuss their innovation, experiences, research works and problem solving techniques in all issues in engineering and vocational education.

The participants of ICIEVE 2017 were from around the world with a variety of background, including academics, industry, and even well-known enterprise. In general, there were 140 papers discussing such various topics as engineering and technology innovation (mechanical engineering, chemical engineering, civil engineering, etc.), engineering education (basic science in engineering education, engineering education reforms, new technologies in education, etc.), and vocational education and training (industry-driven training programs and collaborations, lifelong learning – reskilling and upskilling, government and policy, etc.).

We would like to thank all of those who helped and supported ICIEVE 2017. Each individual and institution's support was very important for the success of this conference. Specifically, we would like to acknowledge the advisory board, scientific committee, and organizing committee for their valuable advice, help, suggestions, and support in the organization and helpful peer-reviewing process of the papers. This year, we would like to express our deepest gratitude for all the co-hosts of ICIEVE 2017, UNIMA, Indonesia, and Rajamangala University of Technology Thanyaburi, Thailand for the collaboration. We would also extend our best gratitude to keynote speakers for their valuable contribution for sharing ideas and knowledge in the ICIEVE 2017.

We sincerely hope that ICIEVE 2017 will be a forum for excellent discussions for improving the quality of research and development in relation to innovation in engineering and vocational education. We also hope that this forum will put forward new ideas and promote collaborative researches among participants. We believe that the proceedings can serve as an important research source of reference and the knowledge. Indeed, the proceedings will lead to not only scientific and engineering progress but also other new products and processes for better science and technology in vocational education.

The Editors
Dr. Ade Gafar Abdullah
Dr. Eng. Asep Bayu Dani Nandiyanto
Dr. Isma Widiaty
Dr. Verry Palilingan, M. Eng

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In-Memory Business Intelligence: Concepts and Performance

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Abstract. This research aims to discuss in-memory Business Intelligent (BI) and to model the business analysis questions to know the performance of the in-memory BI. By using, the Qlickview application found BI dashboards that easily accessed and modified. The dashboards are developed together using an agile development approach such as pre-study, planning, iterative execution, implementation, and evaluation. At the end, this research helping analyzer in choosing a right implementation for BI solution.

1. Introduction

In-memory business intelligence relies on the technology of In-Memory Database System (IMDS) which is developed precisely to meet demands of performance and resource availability on embedded systems [1]. Memory as temporary storage has functions to supplying data and saving data helps the work of CPU to be faster [2]. Growth in innovation technology influence memory in consequence of data management area. Information system as part of data management area takes opportunity and adopts the concepts of In-Memory Database to In-Memory BI [3]. The impacts of In-Memory Database refer enterprise applications [4]. Business Intelligence is one of them and In-Memory BI adopted the technology framework [5]. If traditional BI loads data from hard disk, In-Memory BI loads data from memory [6]. In recent research review [7], which reports a systematic review of published papers about different data visualization tools that are implemented for Business Intelligence by different organizations for the purpose of business analysis. Past research has paid attention to comparative analysis of in-memory analytic tools and has not created models to evaluate these criteria. Our current research addresses these needs in the field of evaluation of the In-Memory BI performance. The In-Memory BI containing all advantages of In-Memory Database technology. Consideration of In-Memory BI performance raises the following questions: R1. Related to implementing In-Memory BI: How In-Memory BI helps user to get better decisions? ; Does In-Memory BI solution answer the business analysis questions? R2. Related to data model of In-Memory BI: Does user need to consider data model when using In-Memory BI? R3. Related to BI technical requirement [8]: Does In-Memory BI consider about security? ; How about capacity of In-Memory BI? This research was carried out to find answers to the above questions and to provide a case study in order to create BI solution using In-Memory BI application. Although the application type of In-Memory BI now days have many variations, this research focuses on in-memory associative index.

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2. Methods

By following agile development approach, we investigate and describe how In-Memory BI works related to the implementation, data model and technical requirement. The model and the user interface are developed together using Qlikview Project Methodology (QPM). This methodology includes the following phases: 1) Pre-study; 2) Planning; 3) Iterative execution; 4) Implementation; 5) Evaluation in Figure 1 [9] [10].

The first stage was Pre-study that includes the following main steps: define initial business objectives and scope, identify initial business requirements and data requirements, prepare enterprise platform. In the second stage, a project planning was conducted with three main stages there are project management planning, prioritized business requirements and defining the data staging requirements (QVD files for larger deployment), define enterprise platform and plan application cycles. The third stage is iterative execution phase that includes the following steps: build, test, user review and refine. Build step includes: build data reload process (configuring of the connections, create incremental load script), data model design, data provisioning, and user interface development. The four and five stages of the research method are implementation and evaluation.

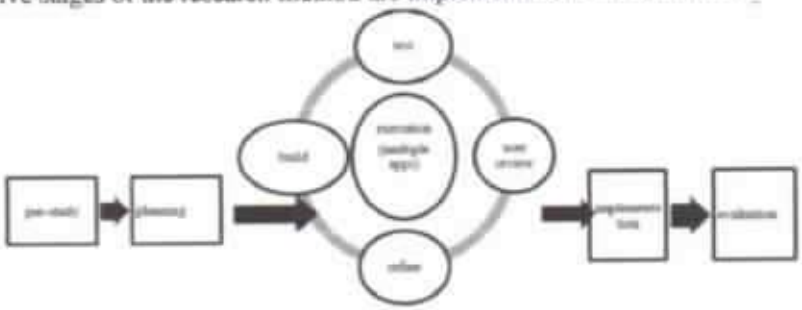

Figure 1. Qlickview Project Methodology [9].

3. Results and discussion

There are many variation of In-Memory BI application. In-Memory application itself divided into 5 main types such us In-Memory OLAP, In-Memory ROLAP, In-memory inverted index, in-memory associative index and in-memory spreadsheet [11][12]. As shown in table 1 the Qlickview application categorized as in-memory associative index and this research using the tool in order to model BI solution to knowing the performance of In-Memory BI. And the data that used for experiment is "NorthWind" database [13].

Before model the BI solution, business analysis questions were made. There are two questions to generate BI solution are: 1) How much of each product category U.S customers order by quarter in 1997? ; 2) Who are top three sales representatives? .Figure 2 shown answer of business question 1 and figure 3 shown answer of business question 2. Figure 2 shown turnovers by time and demography also turnover by products category and suppliers where the dimension used are year, quarter and country. The dimension that used in answering question no.2 are employees name, year order, sheep country, and turnover.

3.1. Implementing In-Memory BI

Implementation of In-Memory BI will help user to get better decision because reporting, querying and analysis become faster since the entire index is in memory. They also treat user in providing an attractive interface. It creates BI solutions easily and considers data complex of details business analysis questions with prepared lots of function for chart, script and dimension. The results above show that answering business analysis questions not a big deal. Moreover Qlickview application challenges user exploring dashboard and find a new analysis fact without re-aggregate.

3.2. Data model of In-Memory BI

According to Evelson that "reporting, querying, analysis can be done without any model constrains, for example any attribute can be instantly reused as fact or as a dimension and every query with an inner join can also show results of an outer join on every column means less modelling required than

an OLAP based solution" really happen since implement Nortwind database to Qlickview application [14] [15]. The experiments loads data from excel file, so for more convinced about data modelling need to do more experiment that load data from client server architecture.

Table 1. In-Memory BI Application Variations

In-Memory Applications Type	Description	Vendors
In-memory OLAP	Classic MOLAP cube loaded entirely In-Memory.	IBM Cognos TM1, Actuate BIRT.
In-memory ROLAP	ROLAP metadata loaded entirely in memory.	Micro Strategy
In-memory inverted index	Index (with data) loaded into Memory	SAP Business Objects (BI Accelerator), Endeca.
In-memory associative index	An array/index with every entity/attribute correlated to every other entity/attribute.	QlikView, TIBCO Spotfire, SAS JMP, Advizor Solutions (also OEMd by Information Builders).
In-memory spreadsheet	Spreadsheet like array loaded entirely into Memory	Microsoft (PowerPivot)

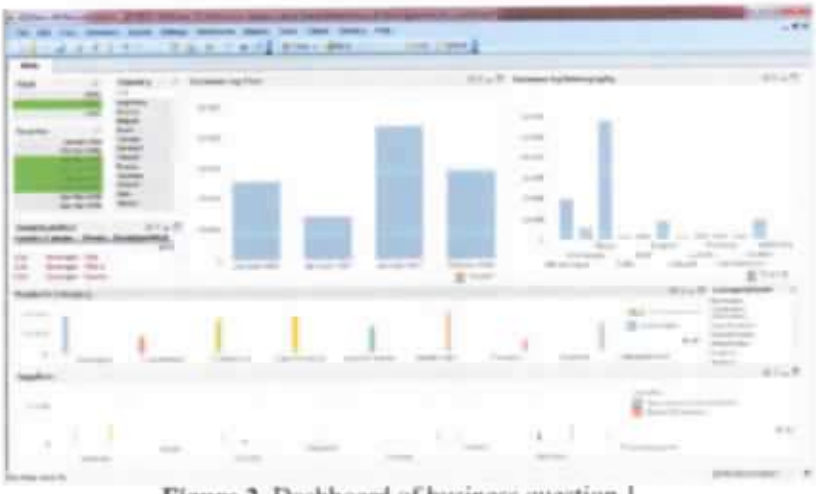

Figure 2. Dashboard of business question 1.

3.3. BI technical requirements

Security: Security is a big issue when deployed BI solutions. The issues regard to how data is accessed, where it is stored and who has access to the data [16]. The Qlickview application provide security mechanism that can be set up in two different ways: It can either be built into document script, or it can be set up through the use of Qlickview publisher. In details, it offers authentication and authorization relation to who can access the data. Unfortunately, they can't meet the completeness of

security. They do not provide security in data source level because the best secure location for data is on a centralized server.

Capacity: According to Qlickview research that Qlickview deployment able to handle many thousands of concurrent users and extremely large quantities of data [17]. Nevertheless, we are talking about technology, so all of this depends on memory technology innovation.

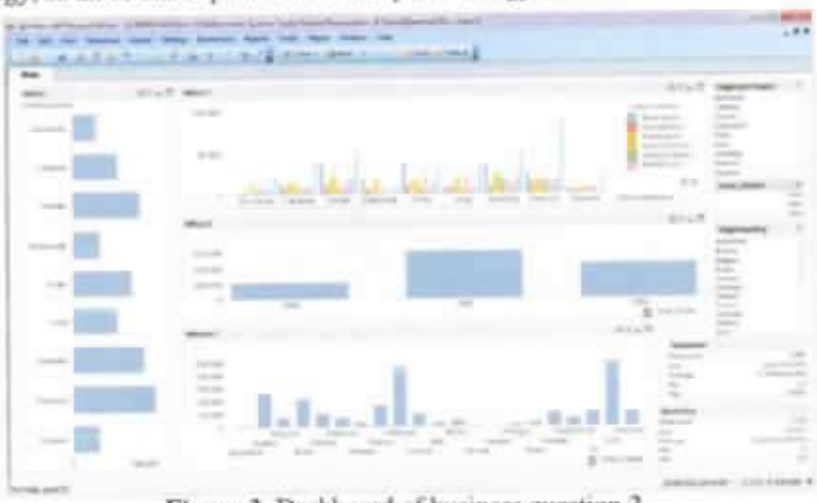

Figure 3. Dashboard of business question 2.

4. Conclusion

The conclusions that achieve are: In-Memory BI helps gaining BI solutions in fast access, storage and manipulation; In-Memory BI application (Qlickview) easy to implement even for complex data and details business analysis questions, eliminates re-aggregate, flexible to zoom in another analysis requirement, has dynamic sources, covers advance analytical, and greatly in data visualization; In-Memory BI application (Qlickview) has highly iterative process development decrease data modelling in BI solution but for client server architecture need to consider; In-Memory BI application (Qlickview) provides security mechanism in offer authorization and authentication; In-Memory BI application (Qlickview) do not provides security in data source level; In-Memory BI depending on amount of RAM.

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21	Proceedings of the 32nd Annual ARCOM Conference, ARCOM 2016	conference and proceedings	0.205	4	0	123	0	55	122	0.45	0.00	
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