CHAPTER II

LITERATURE REVIEW

2.1 Inductive Study

There are several previous kinds of research about Business Intelligent. Banerjee & Mishra (2015) conducted study on executives of a major food retailer in India and explored their perspectives on supply chain management practices, competitive advantage, and firm performance; to assess the importance accorded to the application of Business Intelligence (BI) in their operations. Nine dimensions for SCM practices and four dimensions for competitive advantage are identified which are found to strongly relate to each other. The dimensions of SCM also strongly relate to firm performance. Though information sharing with suppliers and their inclusion in strategic decision-making emerge as key dimensions of SCM, their impact on competitive advantage is perceived to be insignificant by retailers.

Fink et al., (2017) developed and tested a research model of BI value creation that is firmly anchored in both streams of research. The analysis draws on the resource-based view and on conceptualizations of organizational learning to hypothesize the paths by which BI assets and BI capabilities create business value. The research model is first assessed in an exploratory analysis of data collected through interviews in three firms and then tested in a confirmatory analysis of data collected through a survey. They initially assess the model with qualitative data collected in three organizations, then test the hypotheses with cross-sectional data collected from managers.

Vajirakachorn & Chongwatpol (2017) studied a way to integrate a BI framework to manage and turn data into insights for festival tourism in Thailand. They translated massive data about products tourist purchase, services they experience, destination choices they valuate, and accommodations they select at the events into meaningful information in order to increase satisfaction and boost revenues and profits. They combined the architecture of database management, business analytics, business performances management, and data visualization.

Lennerholt et al., (2018) studied about the implementation challenges of Self-Service Business Intelligence which focused on the literature review. Power users which are the IT will have problems when the usage of frequency from traditional BI increases. Then the Self-Service Business Intelligence (SSBI) approach has created that can enable users to be more self-reliant and less dependent on power users. Although the approach of SSBI promises more benefits compared to a traditional BI system, many organizations fail to implement SSBI. Then in their paper also being discussed six SSBI challenges that related to "Access and use of data" and four challenges related to "Self-reliant users". Awareness of these ten challenges can help practitioners to avoid common pitfalls when implementing SSBI, as well as to guide SSBI researchers in focusing their future research efforts.

Bordeleau et al., (2018) studied using systematic literature review with two objectives in mind: understanding value creation through BI in the context of Industry 4.0 (I4.0) and identifying the main research contributions and gaps. The results show most studies focus on real-time applications and integration of voluminous and unstructured data. For business research, more is needed on business model transformation, methodologies to manage the technological implementation, and frameworks to guide human resources training.

Gowthami & Pavan Kumar (2017) conducted a study about the comparison study of the development of enterprise dashboard using few most popular Business Intelligent (BI) Tools which are SpagoBI, Power BI, Tableau, Qliksense, and Jaspersoft. All the tools that have been compared are SSBI Tools. It was based on the ease of use, support in terms of training and minimal initial cost. At the end of the result, a sample dashboard has been developed using one of the tools which are Power BI to demonstrate the feasibility of the same for the Business data visualization.

Vamsi & Bose (2018) studied a novel process-based framework and proposed to enable an end-to-end analysis of technology-driven performance measurement system (PMS) implementation in an organization. To validate their proposed framework a case study-based approach was employed. The framework has been used to study PMS implementation in a large manufacturing firm in India. The analysis of the case provides key lessons about successful planning, execution and adoption of a BI based PMS as well

as identification of critical success factors (CSF) in the implementation of PMS, that would be of interest to organizations planning to implement a similar system.

D'Arconte (2018) studied the implementation of BI applied in small size for-profit companies. They tried to find a way to apply it in small size companies focusing on two critical aspects, namely customer's profitability and their satisfaction level that, especially if considered in their reciprocal interaction, may have a great impact on companies' outcomes though using simple technologies.

Schlesinger & Rahman (2015) conducted a study about Self Service Business Intelligence in disruptive technologies. They proposed an approach to the reorganization of consumption data using a comprehensive semantic layer for Self-Service Business Intelligence to provide a uniform business view of the data including all business terms and conditions. They identified the key terms, definitions, and nomenclatures of enterprise business data based on practical experience in Self-Service Business Intelligence project implementations.

Radenkovic et al., (2018) studied about harnessing BI in smart grids: A case of the electricity market. They analyzed the analytical aspects of smart grids and offers insight into the development of BI. They designed a BI solution for the Serbian electricity market operator "Elektromreža Srbije". The research results showed that the proposed approach led to more effective market management in data-rich smart grid environments, while still being dynamic enough to adapt to frequent rule changes in the still-developing grids and their markets.

Gaardboe et al., (2017) assessed the BI in Public Hospitals. In this study, it was empirically tested on 12 public hospitals in Denmark. The study aimed to investigate the factors that contributed to BI success. The result of this study showed that there are several factors affect the success of BI, it provided empirical support for the role of user satisfaction as a mechanism that mediates the relationship which are information quality, system quality, and individual impact.

(Sidiqui & Mukhi, 2011) conducted an independent study that dealt with the comparison among the available BI tools. They conducted a comparison study between Microsoft SQL Server and the Pentaho Open Source. The study gives the insight view of leading BI tools and proposes BI solution as ease of use along with some considerations

which are: BI deployment challenges in an organization, the complexity of BI tools and interfaces, cost of BI software and per-user licenses, difficulty accessing relevant, timely or reliable data. The study provided a better understanding of BI tools with respect to Industry requirement at that time.

Shrivastava et al., (2018) studied the comparative study of BI tools in the market. They conducted a report based on several studies that performed the comparison and deep analysis of BI tools. The survey report analyzed the literature review study of each author and their own objective. They concluded that there are quite BI tools in the market and have to consider based on the purpose of business and organizations.

Based on several previous researches studied above, it can be seen that the application of BI can be used in various fields such as education, economics and business, tourism, and government especially in the business itself for increase their sales.

The purpose of BI is to facilitate an organization in the decision-making process so that the application of BI is a useful thing to do at this time. Back to the previous research above, there have been no studies regarding the comparative or comparison study of Self-Service Business Intelligence Tools while in this era the SSBI tools are the main software not only for startup and SME companies but also for the big and advance enterprises.

The research position is shown in Table 2.1. This table shows the position of this research and other related research.

Table 2.1. Research Position

No	Author	Year	Research Focused						Object		
			Self-Service BI	Comparison Study	Business Intelligence	Performance Measurement	Design & Development	Critical Success Factors	Manufacture	Retail	Service
1	Banerjee & Mishra.	2015			√	√				√	
2	Fink et al.	2017			√		√				
3	Vajirakachorn et al.	2017			√	√	√				√
4	Lennerholt et al.	2018	√		√			√			
5	Bordeleau et al.	2018			√			√	√		
6	Gowthami & Pavan Kumar	2017	√	√	√	√	√				
7	Vamsi & Bose	2018			√		√	√	√		

8	D'Arconte	2018			√			√			
9	Schlesinger & Rahman	2015	√		√		√	√			
10	Radenkovic et al.	2018			√		√				√
11	Gaardboe et al.	2017			√	√		√			√
12	Sidiqui & Mukhi	2011	√	√	√	√	√				
13	Shrivastava et al.	2018		√	√	√	√				
14	Rafif	2019	√	√	√	√	√				

2.2 Deductive Study

2.2.1 Information System

Information is the base-decisions within the value chain, making enterprises dependent on the implementation of modern information systems (IS) to stay competitive (Al-adaile, 2009). Traditionally, organizations implement information systems to solve internal business problems. As a result, a lot of information systems have become common sights in organizations. With the advancement of technologies that are outward in orientation (Rees & Hopkins, 2009), organizations see the need to integrate information systems with new technologies. Previous research stated that the aim of information systems integration is to maximize business performance, productivity, and improvement (Bhatt, 2000).

2.2.2 Definition of BI

BI is defined as systems which collect, transform, and present structured data from multiple sources (Negash, 2008). Thus, a BI system can be called a decision support system (DSS). BI provides historical, current, and predictive views of business operations. Common functions of BI technologies are reporting, online analytical processing, analytics, data mining, business performance management, benchmarking, text mining, and predictive analytics.

According to Gartner (2019) **Business intelligence (BI)** is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance.

According to Rouse (2019) Business intelligence (BI) is a technology-driven process for analyzing data and presenting actionable information to help executives,

managers, and other corporate end-users make informed business decisions. BI encompasses a wide variety of tools, applications and methodologies that enable organizations to collect data from internal systems and external sources, prepare it for analysis, develop and run queries against that data, and create reports, dashboards and data visualizations to make the analytical results available to corporate decision-makers, as well as operational workers.

BI tools are seen as a technology that enable the efficiency of business operation by providing increased value to the enterprise information and hence the way this information is utilized. A good BI definition must encompass both business purpose and technical functionality. BI systems require, at a minimum, four specific components to produce BI. These components are (Olszak and Ziemba, 2006):

1. Data Warehouses

   A subject-oriented, collection of data used to support decision making in organizations

2. ETL (Extraction Transformation Load) Tools

   Processes and tools used to extract data from legacy systems and external sources then transforming and pre-processing the data into a useful format to load into data warehouse structures.

3. OLAP (On-Line Analytical Processing) Techniques

   Provides multidimensional, summarized views of business data and is used for reporting, analysis, modeling and planning for optimizing the business. OLAP techniques and tools can be used to work with data warehouses or data marts designed for sophisticated enterprise intelligence systems.

4. Data Mining

   Tools specifically designed to identify patterns, relationships, and rules within the data warehouse.

2.2.3 Self-Service Business Intelligence

Self-service Business Intelligence is a concept that was proposed by Claudia Imhoff and Colin White. Imhoff & White (2011) stated that self-service BI is a facility in BI environment that enables BI users to become more reliant and less dependent on the IT department. Moreover, Self-service BI can also be called as Do-It-Yourself BI (DIY BI)

which shows that the environment provided is easy to be accessed, analyzed and shared with less IT dependency.

There are four main key objectives of Self-service Business Intelligence: make BI tools easy to use, make it easy to access source data, make BI results easy to consume and enhance, and make DW solutions fast to deploy and manage.

2.2.4 Drivers for Self-Service Business Intelligence

The emerge of BI has gained a lot of attention to a business user. There are some drivers that drive the BI developers to strive for self-service BI (Imhoff & White, 2011):

1. Constantly changing business needs
2. IT is an inability to satisfy new requests in a timely manner
3. The need to be a more analytics-driven organization
4. Slow or untimely access to information
5. Business user dissatisfaction with IT-delivered BI capabilities.

2.2.5 Self-Service BI (SSBI) vs Traditional BI

Although SSBI has lots of advantages which don't be offered by traditional BI, it doesn't mean that SSBI could substitute the traditional BI. These 2 approaches support each other in many areas. For instance, the target of these 2 approaches are different, SSBI is suitable for business users who want to have less dependency on IT solution while traditional BI concerns in contrast.

SSBI emphasizes on providing an easier tool to use with less IT involvement and usually, it is a pre-defined package. SSBI let business users have direct access to the data source, which enables better and faster access than the traditional way. In addition, SSBI allows end-users to create personalized reports and analyses. IT professionals are no longer one of the key users in SSBI.

On the other hands, traditional BI is implemented according to the organization's own needs typically managed by IT professionals or a BI center. In traditional BI, IT department is not only a supportive role to help business users to understand what kind

of data is available but also one of the key roles in all tasks related to data from extracting to loading.

2.2.6 Parameters

Comparative studies must have references to compare one to another which is parameters. There is an expert who builds parameter to choose BI Tools, Rick Sherman. According to TechTarget (2019), Rick Sherman is the founder and managing partner of Athena IT Solutions, a consulting firm based in Maynard, Mass., that provides data warehousing, BI and data management services. He also teaches BI and data warehousing classes at Northeastern University's Graduate School of Engineering, as well as on-site training courses for corporate clients.

This expert has more than 30 years of experience with data warehousing and decision support systems, his first project was in 1987. He has been designing and implementing relational databases for decision support systems for even longer, beginning with using Oracle in 1982. He has worked on more than 50 data warehouse and data mart implementations across many industry groups, sourcing data from a variety of business applications.

Sherman’s background from various technology such as software engineering, IT, project management, people management and consulting expertise. These varied perspectives have enabled him to view data warehousing and BI projects from various sides of the table.

Prior to starting Athena IT Solutions, he was a director at Pricewaterhouse Coopers. He also ever worked in Digital Equipment Corp., Project Software and Development (MRO Software), Norton and Bristol-Myers Squibb. He has also been an independent consultant specializing in data warehousing. He has an MBA and a B.A. in Engineering from Rensselaer Polytechnic Institute and has completed most of the course work for a Master degree in Computer Science.

According to Sherman (2015), there are categories to simplify and classify the features and functions as:

1. Must-haves

This classification should be unambiguous. In other words, if the product doesn't have this particular feature and meet specific requirements, it should be eliminated from further consideration.

2. Nice-to-haves

Although nice-to-have features aren't required, they're often the differentiators when selecting a product.

3. Will not use

Many BI products have a laundry list of features that a company may never use. In that case, don't waste time examining those aspects of the products during the evaluation process.

For Overall BI Tools, the following are often must-have features parameters such as:

1. **Data sources.**

Access to various databases and file types, such as comma-separated values files, text, Excel, and XML, are basic staples of all BI tools. Increasingly, BI tools are providing access to specific applications, such as Salesforce or NoSQL databases. Specific needs will determine if these features are must-haves.

2. **Data filters and drill-down.**

The product should enable you to filter the contents in a tabular report or visualization by data values. Filtering is provided by features such as drop-down menus, search filters, and slicers. The product should also enable the user to drill down from summarized to more detailed data and then drill up -- i.e., go back to where they started. This is essential in both tabular reports and visualizations.

3. **Web-based client user interface.**

The product's client user interface for the BI consumer role should be web-based. This has become an industry best practice, as it's more cost- and resource-effective for administration, support, and deployment than desktop-based interfaces. It's a nice-to-have feature if the BI application creator and administrator roles are also web-based versus a desktop-based client application.

4. **Independent and interconnected mashups.**

When the BI style enables a single-screen display of multiple visualizations, including tabular reports, the software should allow these visualizations to be either independent of each other or interconnected. If they're interconnected, data filters and selections will affect all the visualizations; for example, if a particular attribute is selected, all the visualizations will share that attribute.

5. **Visualizations.**

BI tools must provide a bar, line, pie, area, and radar chart types, as well as the ability to mix and match various combinations.

6. **Security**

All BI products require both user and user role-based security, designating who can create, modify, publish, use and administer the BI applications. Some may require the BI product to integrate with the operating system or other pre-existing security applications. BI security often involves using the product's security along with a combination of mechanisms from the operating system, networks, databases, and the source system.

7. **Microsoft Office data exchange.**

The product must be able to import and export data with Microsoft Office products, especially Microsoft Excel.

8. **Print and export.**

The product must enable you to export print visualizations and tabular reports to PDF or other graphics. Tabular reports need to be exportable to text files at a minimum and, preferably, to spreadsheets.

For Specific Self-Service Business Intelligence Tools, there are several must-have features that are specific to Self-Service BI use cases. These are unique because they provide more data management functionality for the business person creating an analytical application than for an informed consumer who is relying on prebuilt BI applications with prebuilt integrated data. These features include:

1. **Select data for analysis.**

BI tools must enable the user to select the data used in decision-making analysis and present it as a pivot table-style interface where dimension attributes are placed in rows and columns, measures are selected, and filters are applied.

2. **Data blending.**

The product must permit the user to blend data from various data sources. This includes accessing the data and mapping or creating relationships with data from multiple sources.

3. **Create measures.**

The product must enable the user to create and save measures or calculations for use in the analysis. These are also referred to as performance measures or key performance indicators.

4. **Create hierarchies.**

The product must enable the user to create dimensional hierarchies, such as by geography or product, to the group and summarize data. This establishes the drill-down paths.

5. **Save queries and analysis.**

The product should enable the BI user to save the data filters, selections and drill-down paths used in decision-making analysis so they can be reused.

For overall BI tools, there are some nice-to-have features to be the parameters. These features are often the differentiators when selecting BI software.

1. **Create and publish by business users.**

The product must enable the user to save and share his or her analysis with other BI consumers.

2. **Context-based filters.**

Filters will list only the choices that have values that fit the current selection of facts and dimensions.

3. **Context-based visualizations.**

Only visualizations or chart types that are relevant to the data selected will be listed as options.

4. **Advanced visualizations.**

More advanced visualizations include heat maps, scatter plots, bubble charts, histograms, geospatial mapping and combinations of each of these, such as bubbles on a map. The best mapping capabilities will leverage city, state and country attributes in the data rather than force the inclusion of longitude and latitude.

5. **Collaboration and social interaction.**

BI tools enable the creation of a business community that can share and discuss their decision-making analysis. This would include annotating analysis to share observations and social media, which can enable discussion threads or chats.

6. **Storyboarding.**

Business analysis often involves a process or workflow to analyze different data from different perspectives. Storyboarding enables a series of reports or visualizations to be tied together in a workflow that can be shared.

7. **Microsoft Office real-time data integration.**

Beyond simple import and export, the product should provide real-time data integration with Microsoft Office products, which enables business people to embed analytics from the BI tool into a PowerPoint or Excel presentation, for example, and refresh it automatically as the data is updated.

8. **Mobile version.**

BI tools should be able to differentiate between viewing BI applications on a web browser on a mobile device versus a mobile BI application.

9. **In-memory analytics.**

The product should pull data into an in-memory or locally cached data store. In-memory columnar is an increasingly popular feature that enables very fast analytics once the data is loaded.

10. **Offline updates.**

BI tools, when storing copies of the source data in online analytical processing (OLAP) cube or in-memory columnar data store, should enable business users to schedule automatic data updates.

11. **Performance monitoring.**

BI applications that monitor report and data usage enable a BI group to improve analytical performance for the business, eliminating bottlenecks and enabling users to assess infrastructure needs.

12. **Business Intelligence (BI) platform administration.**

Although all BI software should provide code and version management, there are many application development features, such as team development and user administration, that are useful for larger BI deployments.