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The Influence of Business Intelligence Dashboard in Decision-Making Process: A Case Study in Government Agency

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Abstract

With the rapid development in big data and business intelligence platforms, the government is required to keep up with the technology in managing the organization's data to give excellent public service. The government as a policy maker should make policies and make a decision based on data rather than just the manager's intuition. The investment in a business intelligence platform should ease in doing routine and simplify the decision-making process. The objective of this study is to know employee perception on the data visualization available in Indonesian FDA and list the possibilities to improve it. The data used are from primary and secondary data. The primary data get from employee surveys while secondary data is from company reports and other sources on the internet. The analysis using quantitative analysis with ANOVA. Data visualization using color can increase willingness to read and people can faster grab the sense from visuals. This will help a manager digest all the data to make a decision. After conducting the study, the result showed that a business intelligence dashboard could help the employee in providing a brief overview of real-time data in general when needed. The dashboard capability that the employee thinks important is data filtering. Having a business intelligence dashboard can help managers make the decision process faster and more precise.

Keywords
decision-making; data visualization; strategic dashboard; business intelligence; government agency

I. Introduction

Industry 3.0 was driven by information, communication technology development. The invention of the computer, internet, and electronics development enabled the industry to do automation. (El-Askalany, 2019) The industry already uses automated machines with information technology but still has human interference. Automation can increase performance by increasing the product. Automation also plays a role in maintaining efficiency in the industry. As a result, information technology (IT) has become a major part of a company's daily business. The budget for IT spending varied in each industry sector, financial services put the highest spending for IT in the 75th percentile with 11,4% while the 25th percentile spent 4,4%. (Statista, 2021)

President Instruction Number 3 the Year 2003 about National Policies and Strategies on E-government Development triggered both central and regional governments in preparing public service based on ICT development. The impact of that instruction is more application builds like e-billing, e-procurement, e-reporting. Thus in 2018, the government released Presidential Regulation of The Republic of Indonesia Number 95 the Year 2018 about Electronic-Based Government System with the spirit to build good governance that is clean, effective, transparent, accountable, and quality and reliable public services. One year after, the Presidential Regulation of The Republic of Indonesia Number 39 the Year

2019 about One Data was released. This regulation was more focused on managing the data to get the current and valid data to make decision-making. Data management will lead to accurate, up to date, integrated, able accountable, easily accessible data that will make the process in planning, implementation, evaluation, and control development better and right on target.

Companies strive to become data-driven organizations that will lead the organization to produce better decision-making. A data-driven organization is one where decisions are commonly made using a wide variety of data, both inside and outside the organization. Effectively a data-driven organization expands its data user from a few trained and trusted individuals to everyone in the organization. Staff own and manage data and develop analysis and visualizations of data that is sharable. The data people do not hesitate to collaborate on the use of data, provide feedback, opinions, and share knowledge about the data they are using. (Chessell et al, 2018)

Data as a raw cannot depict the situation in the organization. So, it is important to be able to present the data into something people can understand. Data visualization makes it possible to understand the huge amount of information we have access to. It is impossible for people who read the data to reasonably process the amount of data to which we have access thanks to software, portals, and information. We need to visualize this data, streamline it and shape it. And this can't be in text format; it needs to be in a visual format.

Research Objectives

Evaluate through feedback from user is important to improve the service in public service. This including giving data service to internal users. Therefore, researchers intend to see the effect of data visualization in one government agency. The overall objective of the research is to review and improve the optimal use of a data visualization using a business intelligence dashboard among different unit in Indonesian FDA. The specific objectives are to 1) provide feedback from user; 2) provide feature that important for user; and 3) provides suggestion for data business intelligence dashboard improvement.

This study is organized into five sections. Section one captures the introduction, section two highlights the literature review about previous researchers, section three explains the research methodology and limitation, section four discusses the result, and section five captures the conclusion.

II. Review of Literature

Hansoti (2010) in her study doing analyzes the use of business intelligence dashboards for decision-making processes among various departments in a manufacturing organization using a questionnaire. She suggests adding an open-ended question along with the questionnaire since it will give the user opportunity to give advice or recommendation for improvement. Through an open-ended question in the questionnaire, we can get insight from the users regarding the improvement of the dashboard.

Data is the core of the information system in the organization. It is represented many different things as digitized reality. Data can have many formats but is usually categorized in structured, semi-structured, or unstructured data. Kearby, Gerber, and van der Merwe stated that as data grows at a tremendous rate thus, it is becoming harder for an organization to store, curate, manage, manipulate, and process data into any useful information due to its volume and diversity. (Kearby, Gerber and van der Merwe, 2016)

Decision-making is the essence of managerial practice that indicates the importance of both research and experiential evidence for making professionally sound managerial

decisions in an organization. Baba and HakemZadeh define evidence-based decision-making with a multi-level phenomenon expressed at the individual level, influenced by cross-level constructs at an individual, organizational, and institutional level independently and interactively. Figure 1 shows that evidence was a combination of judgment, education, and experience of the manager that will influence the decision in the end. The decision-making is also influenced by the managers' preferences and values as well as stakeholders' preferences within institutional, organizational, and individual contexts. (Baba & Hakem Zadeh, 2012)

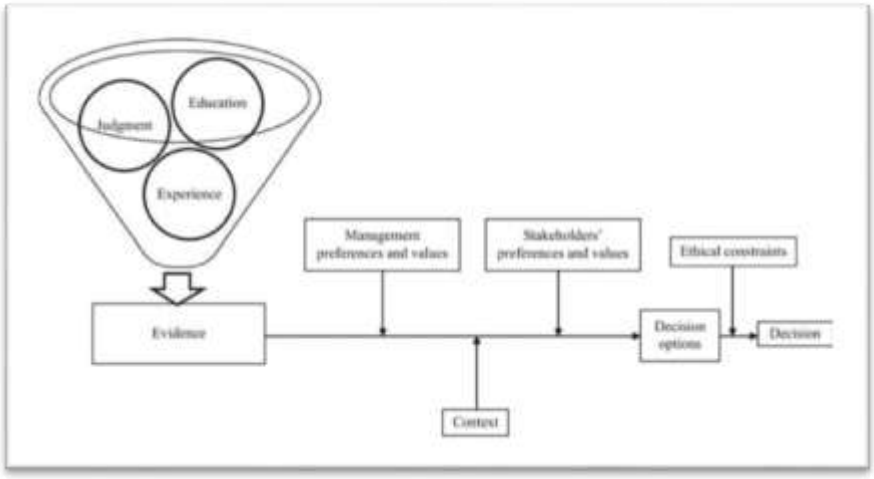

Figure 1. *Model of evidence-based decision making*

Dashboard or data visualization is a summary of the data presented in graphical forms such as diagrams, charts, curves, etc. that can provide a unique and powerful means to present the information (Few, 2006) The manager will get the picture of the situation in the organization by seeing the dashboard. The decision process was made by the manager because of the data presented in a dashboard or other means or form. Only a well-designed dashboard created to the needs of the user can help the manager decide with appropriate results.

III. Research Method

The research method is a scientific way to obtain data with certain purposes and uses, in this study is to be able to answer the research objective. This study uses a quantitative method. The quantitative method is a traditional method that the data using numbers or statistics count in concluding. (Sugiyono, 2019)

The study collects primary data through conducting surveys. In conducting a survey, respondents are required to be the one who already sees the Indonesian FDA's dashboard. After collecting the primary data from the survey, it will be processed using analysis of variance that can show variance between and within groups. The respondents were divided into 3 (three) groups based on their working unit and expected to answer all the questions in the survey.

The secondary data was collected through a company report that is available on the website, internal data, news articles, and other sources on the internet

The limitation of research is this study focuses on three units within the central office of the Indonesian FDA that have different business processes. This study was conducted in late 2021, which might result in different conclusions if taken in another period.

IV. Results and Discussion

4.1 Functionalities of Dashboard

The author uses a survey to explain the business situation in the field of data visualization. The questionnaire was divided into 2 (two) parts, first questionnaire is to get the user's perspective on the feature of the dashboard as a comparison between a group. Continue with second part of the questioner which consists of 8 (eight) multiple choice and 1 open question regarding recommendations for improvement. The data from the survey was analyzed using an analysis of variance (ANOVA) test for testing the differences between the features used by three units.

The total respondents in the period of the survey are 18 respondents, with a composition of 11 (61%) females and 7 (39%) males. Based on the working unit, Group I have 5 (28%) respondents, Group II have 6 (33%) respondents, and Group III have 7 (39%) respondents, with 9 (50%) of respondents have more than 10 years working experience.

The author tries to capture the user's perspective through the first survey and see the priority in each group regarding functionalities in a dashboard that derive the comparative analysis. Focusing on 5 functionalities in the question is Historical data displays, Data filtering capabilities, Integration with Data Lake (other applications from outside the unit), Data Visualization and analytic (chart, graph, etc.), Customization. The respondent asks to answer using a scale from 1to 5 (1=Strongly Disagree, 5=Strongly Agree) so the answer will draw a comparison. The responses from the respondent for each functionality within a particular group were used to produce a mean response for each group. Table. 1 below, shows the summary of statistical analysis that was carried out on the responses gathered from first questionnaire.

Table 1. Summary of first questionnaire

Functionalities	Group I		Group II		Group III		
	Mean	Variance	Mean	Variance	Mean	Variance	P-value
Historical data displays	4,8	0,2	4,67	0,27	4,29	0,90	0,44
Data filtering capabilities	5	0	5	0	4,71	0,24	0,19
Integration with Data Lake (other application from outside the unit)	4,40	0,80	4,83	0,17	4,71	0,24	0,49
Data Visualization and analytic (chart, graph, etc.)	4,80	0,20	5	0	4,57	0,29	0,20
Customization	4,4	0,30	4,67	0,27	4,43	0,29	0,65

According to the result in Table 1, all the P-value in each functionality is higher than 0,05 (>0,05) that shows that there is no significant difference between three different groups or in other words Group I = Group II = Group III. Figure 2 shows the comparative analysis of the most priority functionality within the three-group.

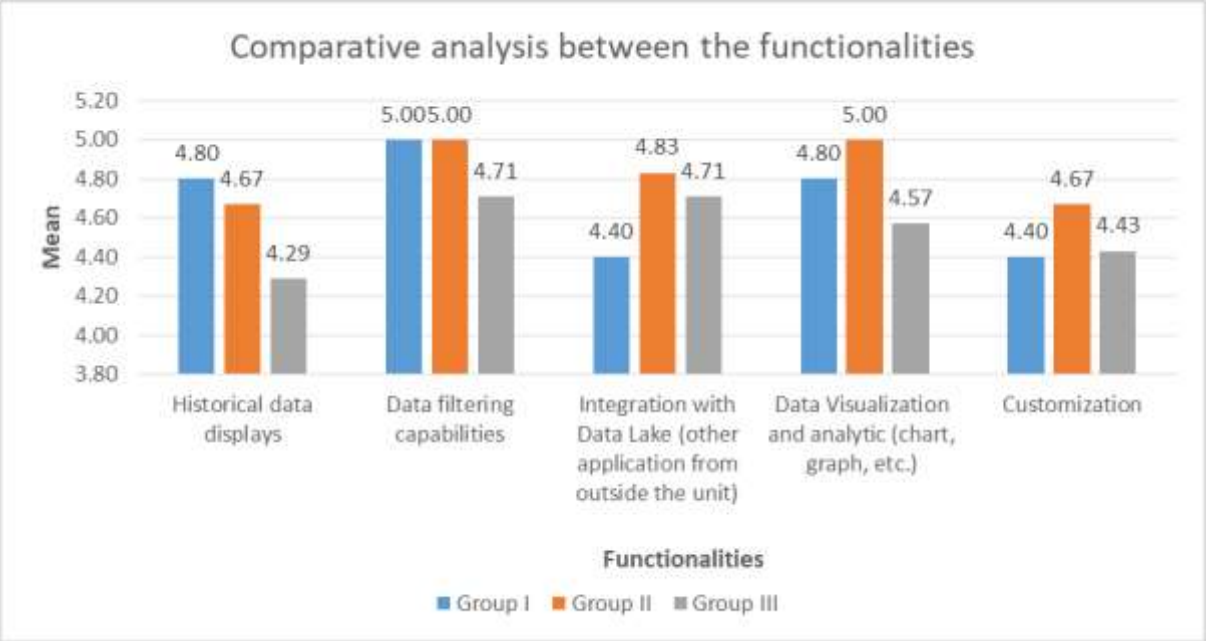

Figure 2. *Comparative analysis of the functionalities across three-group*

Figure 2 shows that all the unit groups had the same priority in functionalities, that is Data Filtering capabilities. But the Group II had the same mean (mean = 5) for 2 functionalities, Data Filtering and Data Visualization and analytic. Three top priorities for Group I are Data filtering capabilities, Historical data display, and Data Visualization and analytics. For the Group II and Group II, the top three priorities are the same functionalities that are Data filtering capabilities, Data Visualization and analytics, and Integration with Data Lake.

4.2 Dashboard Effectiveness

In second questionnaire, the survey consists of 8 close-ended questions and 1 open-ended question. The closed-ended question focuses on evaluating the effectiveness of the dashboard in the decision-making process using a Likert scale of 1 to 5 (1=Strongly Disagree, 5=Strongly Agree). The open-ended question was intended to see users' perspectives regarding the dashboard. The overall value from the survey was tested using the Anova test. The test result from three groups can show the comparison of the effectiveness of the dashboard. Responses for eight questions were added to yield a total number for each respondent within a group. The totals for all the respondents within each group were used to yield a mean response for the groups. The result from the Anova test in second questionnaire was shown in Table 2

Table 2. The Anova Test on the second questionnaire

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.716	2	2.358	0.244	0.787
Within Groups	145.062	15	9.671		
Total	149.778	17			

The mean in response to the statistical result will give a comparison of the usability of a dashboard in the decision-making process. Table 2 show that there is no significant difference between the group at the level 0,05. The mean of the total value for Group II 36,8, Group II 35,7 and Group I 35,8. Consider those three groups have effectively in using data visualization based on the mean from 8 questions that near-maximal value 40.

V. Conclusion

Conclude from the background question of the survey that most respondents (94%) consider themselves as highly computer literate people, only one person answered that she is not highly computer literate. But only 10 respondents or 56% that ever learned or were familiar with any programming or scripting languages. This is also the same number of respondents that ever heard or worked with Data Lake/Data Warehouse. This shows that the respondents from IT technical functional staff and drug and food technical functional staff are represented in this study.

Regarding the use of the data, most respondents (94%) answer that they need data frequently for analyzing and making decisions, only one person answered that she does not need data frequently for analyzing and making decisions. Most respondents (94%) only used the dashboard to monitor their unit performance indicator, only 1 person answered that he uses data in considerations to make policies (decision-making).

For the dashboard functionalities, all groups have the same opinion, that data filtering is the most important functionality that should be incorporated into the dashboard. This can describe that sometimes they need a more specific report. For example, in Group II, the dashboard presents the number of registration documents, because the top management only needs those data to be visualized. But the middle management also needs a report on the number for specific type registration documents.

The dashboard was built to support and facilitate the top management in making a policy quickly and precisely. The dashboard contains data and strategic information from all units in Indonesian FDA. The three-group gave a similar answer regarding whether the dashboard can speed up the decision-making process.

Recommendation from the open-ended question in second questionnaire: 1) use single source such as data lake and avoid from excel file etc. 2) Review the dashboard features and design in collaboration with the user. 3)

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