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A Review of Popular Business Intelligence Tools

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ABSTRACT

In this study, we reviewed the users' feedback on 7 popular Business Intelligence (BI) tools that are widely used in industry. We first compared the users' preferences on selecting BI tools according to the firm sizes and the time they used the tools. Additionally, we employed ANOVA test on users' reviews from actual use of these tools to differentiate between the BI tools based on user rating, ease of use (EOU), functionality, and customer support measures. Overall, the results indicate that there are statistically significant differences between BI tools according to these measures. Finally, we provided some insights and suggestions to the vendors on the BI tools based on our analysis results.

Keywords

business intelligence tools, data analytical tools, business analytics, competitive advantage

INTRODUCTION

In the age of information, we are immersed in a large amount of data from all directions. Especially, with the incomprehensible speed of nearly a zettabyte per year, data is flooding into our lives. The most exciting aspect of this is not only the data size itself, but also the Business Intelligence (BI) tools we are gaining to make the data meaningful. Business Intelligence (BI) is a general category of applications and technologies we use to collect, access, and analyze data to assist in the decision-making process (Maaitah, 2023). Companies have started analyzing the high volume of data to shape the business strategies that respond to the changing needs of customers and business visitors (Harb, Shang, & Al-Musa, 2020). The utilization of these BI tools to gain a competitive advantage in business seems to become crucial to business success.

BI has gained a lot of attentions in the past decade due to the role it plays in organization's financial success and competitive advantage, serving as a measure to assess its operational efficiency ((Lateef & Keikhosrokiani, 2022; Hayajneh & Harb, 2023). Organizations can utilize BI tools to gain a better understanding of the business environment and enhance decision-making capabilities (Harb & Alhayajneh, 2019), including the identification of new collaboration areas, acquiring fresh customers, and uncovering novel opportunities (Huang et al., 2022).

However, previous studies (e.g., Rahahleh & Omoush, 2020; Hayajneh & Harb, 2023) have indicated that there is a shortage in research and development focused on exploring various BI tools and software. Thus, this research aims to review the popular BI tools in the market to provide insights into their strengths and weaknesses. Although Srivastava et al. (2022) reviewed fifteen BI software using user ratings based on different rating websites in order to identify the best BI software based on calculating the mean value. The current research, in contrast, aims to delve deeper by exploring the significant differences among BI tools based on factors such as functionality, ease of use, and customer support. This would provide nuanced understanding of the strengths and weaknesses of each BI tool. Our goal is to understand the reasons that affect users' decisions in selecting these BI tools, as well as the users' perception of these tools. As such, we will answer the following two research questions:

- What are the popular BI tools by firm size and tenure of usage?
- Are there any statistically significant differences among popular BI tools based on users' reviews?

This research contributes to the body of knowledge in BI by reviewing BI tools based on actual users reviews from practical use. Users reviews based on the actual use can provide rich information and insights about a product of service (Guo, Barnes, and Jia, 2017). Practically, this study contributes to the BI tools providers by offering important insights into the significance of users' satisfaction and overall rating regarding BI tools across various dimensions such as functionality, ease of use (EOU),

and customer support. This can provide BI providers with a better understanding of the design features, capabilities of BI tools, and the quality of customer service.

RESEARCH METHODOLOGY/RESEARCH DESIGN

This study aims to review the popular BI tools using online reviews and identify the factors that influence users' decision in selecting these tools. To this end, the research methodology employs descriptive analysis approach and analysis of variance to answer the research questions based on the analysis of the online reviews posted by users who have experienced the BI tools in their organizations. The study methodology includes the following steps: (1) online reviews collection, (2) perform descriptive statistics, and (3) use ANOVA test to identify if there are significant differences among the BI tools in term of user rating, functionality, EOU, and customer support.

Data Collection

The online reviews used in this research was collected from a website called "Software advice"[1] in August 2023, a consultancy and online reviews platform that enables users who have experience with certain software to share their feedback. Various research studies used this website to gather online reviews for various software (e.g., Chowdhury et al., 2021). In this research, the authors used the "Software Advise" website to obtain users reviews on data visualization tools, including Tableau, Microsoft Power BI, MicroStrategy Analytics, Qlik, SAP Business Objects BI Suite, Google Data Studio, Sisense Analytics, Tibco Spotfire, Domo. The total users' online reviews gathered about these tools is 4849 reviews. However, due to the small sample reviews for MicroStrategy Analytics and Tibco Spotfire (< 100 reviews), we decided to exclude these two BI tools from further analysis. The final total number of reviews is 4867 and includes the following categorical variables: (1) firm size and (2) time used as well as the following numeric variables: (1) User rating, with values ranging from 1 to 5, where 1 is the smallest and 5 is the largest, (2) Functionality, rated from 1 to 5, (3) Ease of Use (EOU) from 1 to 5, and (4) Customer Support, also rated from 1 to 5. It's worth noting that we excluded the variable 'a value of money' from the analysis since this data wasn't available for all BI intelligence tools.

Further, the sample reviews distribution for the BI tools is as follows: Microsoft Power BI 29%, Tableau 43%, Qlik .07, SAP 0.02, Sisense 0.07, Domo 0.06, Google 0.06. Due to the unequal sample size of reviews across BI tools, we divided the dataset into two sets: the first set, including Microsoft and Tableau, and the second set, comprising the remaining 5 BI tools.

Data Analysis

Descriptive statistical analysis of different BI tools based on firm size and time used was employed to answer the first research questions. As shown in Figure 1, the first chart (firm size) indicates that the highest percentage of BI tool users, including Microsoft, Qlik, SAP, Tableau, and Domo, represents enterprise organizations.

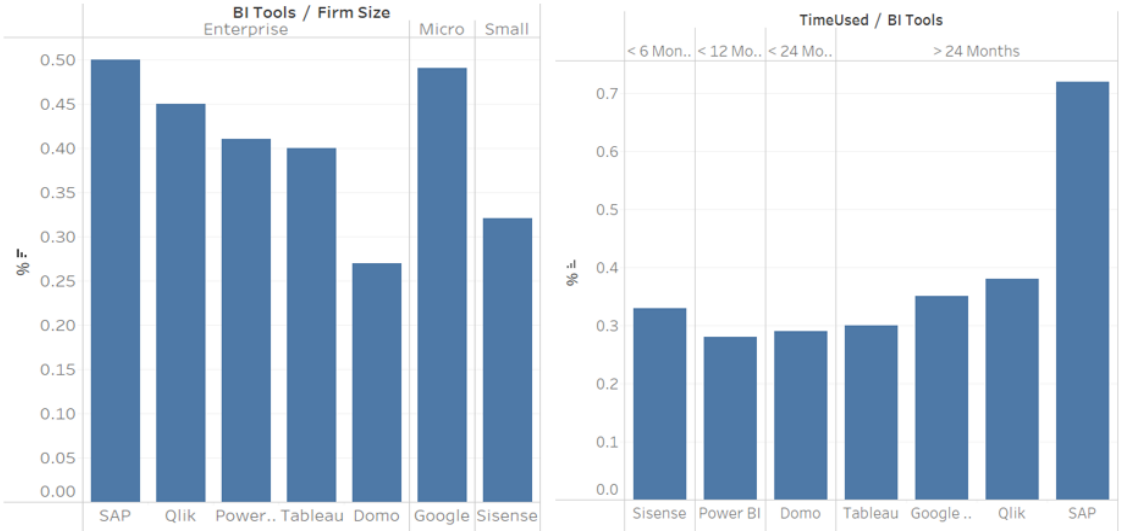

Figure 1. The statistical analysis of BI tools firm size and time-used

[1] https://www.softwareadvice.com/

In contrast, the largest percentage of Sisense reviewers represents small firms. Additionally, 49% of Google Data Studio reviewers are from micro-businesses. To categorize the size of the firm provided by the reviewers into micro, small, medium, large, and enterprise, we followed (Torres et al., 2015) classification. This result indicates that Microsoft, Qlik, SAP, Tableau, and Domo are more popular in enterprise businesses with more than 1001 employees in our dataset. The second chart represents that the highest percentage of the users in the online reviews dataset used Tableau, google studio data studio, Qlik, and SAP for more than two years, whereas other tools were used for shorter durations. The long term usage finding may indicate that users have assimilated these tools into their work processes and become as integral part of their work. It also may imply the loyalty level of users to vendors, especially for SAP more than 70% users use the tool for more than two years. However, this benefit might stem from SAP enterprise information systems, which positively impact user loyalty. However, Qlik has also high percentage of time used. This tool is considered as a BI tool leader in the market and its focused on data integration and analytics as well as AI capabilities (Richardson et al., 2020).

PRELIMINARY STUDY

The one-way analysis of variance (ANOVA) analysis on four measures (user rating, EOU, functionality, customer service) to answer the second research question:

ANOVA can be used to compare the means and find whether there are any significant differences of two or more independent groups. One of the key assumption of this test is the homogeneity of variances (Parra-Frutos, 2013). This assumption presupposes that the dataset has variance are equal across groups. To verify homogeneity of variances assumption, we performed Levene test ((Parra-Frutos, 2013). The result of this test shows that our first tools set dataset meets homogeneity of variances. Thus, we employed ANOVA test. Table 1 presents the summary of ANOVA analysis results. As shown in Table 1- First Tools Set ANOVA results, there are significant differences between the group means for first tools set in two measures (functionality and customer support) as the significance value is 0.000 and 0.045 respectively (i.e, p-value < 0.05). This means that there are statically significant differences in the mean of functionality and customer support between the Microsoft Power BI and Tableau. The mean results of functionality and customer support show that Tableau has higher score in both measures. The functionality measure, mean difference, indicates that Tableau surpasses Microsoft Power BI by 0.11, and it outperforms it by 0.09 in the customer support measure.

		Sum of Squares	df	MeanSquare	F	Sig.
Overall_Rating	Between Groups	.057	1	.057	.143	.705
	Within Groups	1396.259	3494	.400		
	Total	1396.316	3495			
EOU	Between Groups	.302	1	.302	.364	.546
	Within Groups	2897.111	3492	.830		
	Total	2897.413	3493			
Functionality	Between Groups	7.161	1	7.161	14.126	.000
	Within Groups	1320.028	2604	.507		
	Total	1327.188	2605			
Customer_Support	Between Groups	2.757	1	2.757	4.007	.045
	Within Groups	2110.028	3067	.688		
	Total	2112.785	3068			

Table 1: First BI Tools Set- ANOVA

		Statistic[a]	df1	df2	Sig.
Overall_Rating	Welch	3.646	4	475.431	.006
EOU	Welch	10.892	4	464.049	.000
Functionality	Welch	6.380	4	364.127	.000
Customer_Support	Welch	31.276	4	383.827	.000

Table 2: Second BI Tools Set- Welch: Robust Tests of Equality of Means

In the second tools set dataset, Welch ANOVA was conducted instead of a one-way ANOVA due to the unequal variance among groups (Welch, 1951). In other words, when the homogeneity of variances assumption is not met, performing Welch test is a good approach for ANOVA analysis. Table 1 presents summary of Welch ANOVA results. As shown in Table 2- Second Tools Set-Welch ANOVA, there are significant differences between the group means in all measures as the significance value is 0.000 (i.e, p-value < 0.05). This means that there are statically significant differences in the mean of user rating, EOU, functionality, and customer support between second tools set. Because second tools set have unequal means in the four measures and the number of tools is greater than two, we performed Tukey Post Hoc test (Ruxton & Beauchamp, 2008). This test determines which BI tools differ from each other. Because the result table contains comparisons of each individual tool with the remaining six different tools, we summarize the results as follows. The BI tools that are statistically different in user rating variable are Qlik view and Domo (Mean difference = 0.184, p-value= 0.032), Sisense and Domo (Mean difference = 0.241, p-value= 0.000), Google Data Studio and Domo (Mean difference = 0.209, p-value =0.005). The results indicate that Domo has lower user rating than Qlik, Sisense, and Google Data Studio tools. The Post Hoc results also show that there are statistically significant differences among the following BI tools in EOU: Qlik View and Domo (Mean difference = 0.249, p-value =0.010), Qlik View and Google Data Studio (Mean difference = 0.229, p-value =0.019), SAP and Sisense (Mean difference = - 0.349, p-value =0.003), Sisense and Domo (Mean difference = 0.350, p-value =0.000), and Sisense and Google Data Studio (Mean difference = 0.330, p-value =0.000). The Post Hoc results of EOU reveal that Qlik outperforms than Domo and Google Data Studio, and Sisense performs better than SAP, Domo, and Google Data Studio. In term of functionality, there are statistically significant differences among the following BI tools: Qlik View and Google Data Studio (Mean difference = - 0.304, p-value =0.000), Sisense and Google Data Studio (Mean difference = - 0.304, p-value < 0.013), Google Data Studio and Domo (Mean difference = 0.284, p-value =0.001). The results indicate that Google Data Studio performs better than Qlik View, Sisense, and Domo in functionality measure.

The Post Hoc results of customer support measure indicates that Qlik outperforms Google Data Studio (Mean difference = 0.337, p-value =0.005), Sisense performs better than Qlik, SAP, Domo, and Google Data Studio (Mean differences = 0.446, 0.495, 0.0.642, 0.782 respectively at p-value= 0.000).

CONCLUSION

The findings of four measures. User rating, EOU, functionality, and customer service are seen great impact on users' decision on choosing different BI tools. The study findings reveal that no significant difference between Microsoft and Tableau in term of overall customer rating and EOU. According to the recent Magic Quadrant for Analytics and Business Intelligence Platforms (2023), both tools has received a leader quadrant in the market, widespread popularity, and robust roadmap. However, Tableau achieved slight higher rating with regard to functionality and customer support. Tableau continues to be a top choice for many customers and is significantly expand its product offerings in term of capabilities and analytics (Richardson et al., 2020). Second tools set data analysis results indicate mixed results across different measures. Particularly, Sisense performs well in EOU and customer support measures, Qlik also excels in EOU, while Google outperforms in functionality. It is worth noting that Domo has a lower rating score in all measures compared to other tools. Domo is considered as niche player and its product vision falls behind that of the leading in the market (Richardson et al., 2020). Thus, it is recommended that Domo may need to shift toward more advanced functionalities and analytics capabilities such as augmented analytics that would suit various businesses requirements. These findings provide useful insights and recommendations to BI tools vendors. Future studies can consider including other factors such as analyzing the switching reasons to certain tools, to provide through understanding of BI tools. Additionally, expanding the BI tools to include other important technologies such as augmented reality, machine learning, artificial intelligence would be an intriguing avenue for future studies.

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