Analysis and Comparison of Business Intelligence Tools Most Preferred by Companies in Turkey

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***Abstract*— With the development of technology and the increase of the data sources, the size and variety of data collected from these sources has increased considerably. Thus, individuals and institutions have become able to store more data. However, it has become an important need to make meaning from this large and valuable data and transform into information and has become more complex. Business intelligence applications ensure that different types of data collected from different data sources are clustered and separated in a certain order and it provides the creation of reports by establishing a semantic relationship between these stored data. The aim of this study is identifying the business intelligence tools preferred by companies in Turkey. It is also aimed to give ideas to institutions and individual users so that they can choose the right business intelligence tool. Within the scope of the study, first of all, the general definition of business intelligence and the business intelligence applications preferred by the companies in Turkey in recent years are mentioned. Afterwards, the information obtained from the scanned scientific studies are analyzed and the findings are presented and then these tools were compared with the tables and it was aimed to give an idea to individuals and institutions. Scientific studies are very important in terms of revealing the current status of these business intelligence tools and seeing what kind of studies they can be used in the future.**

Index Terms— **Business Intelligence, Qlik, Power BI, SAP BO, Tableau.**

I. INTRODUCTION

STORING AND recording data and records has been one of the important needs since the past. Data recording has become much faster, less costly and safer with the development of technology and the increase in disk speed and size.

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In recent years, it has become possible to store large amounts of data in a computer memory, even in virtual machines that can be accessed remotely, and to access these stored data quickly. In this way, companies can quickly combine this data, which may not have mean on its own, and make sense of historical data and present it to their managers. For this reason, decision support systems have been developed. However, in the future, a new system was needed due to the difficulties in the use of decision support systems, visual deficiencies and incompatibility with applications, and this need was met by designing business intelligence systems [1].

IBM researcher Hans Peter Luhn first used the term business intelligence (BI). It is defined as the ability to make sense of the relationships of existing information to achieve a desired goal [2]. BI is a versatile process that includes techniques, processes and tools that facilitate faster and more effective decision making in businesses according to Sabanovic and Soilen [3]. BI is defined as a mix of collecting, cleaning and integrating data from different sources. It is the process of transforming raw data into useful and meaningful information for decision support purposes in very short time [4].

BI is the process of collecting the exact information in the right format at the right time which produces have a positive impact on operations and strategies in businesses for decision-making purposes [5]. It is critical in the sources where business data is kept, in order to access the data in a short time, process it quickly and make accurate predictions for the future for managers [6]. Business intelligence technology provides the opportunity to perform multidimensional analysis on data in cases where many factors need to be evaluated simultaneously [7]. It can turn into meaningful, summary reports that can be used in decision processes by enabling the search for qualified information, integrating data and obtaining meaningful findings with multidimensional analyzes in a data set consisting of different source [8-9].

II. BUSINESS INTELLIGENCE TOOLS

The need for business intelligence of companies has become important in terms of extracting analyzes from visual reports and visualizing their future plans and strategies. With the incoming demands, many features such as the number, variety and usability of business intelligence tools have increased and the decision to choose the BI tool to be used has become difficult [10]. Business intelligence applications make sense of

and analyze the data produced by the software, allowing possible risks to be seen and as a result, increase the success of the business and people. For this reason, companies should thoroughly examine their business intelligence applications and make the right choice [11].

While developing websites, these structures can be developed separately from each other by using models such as MVC (Model View Controller), as in the work of Akçay and friends. With this design model, opportunities such as code optimization, code extension, code reuse and code updating are offered [12]. While developing business intelligence projects, each layer can be separated and evaluated separately.

Business Intelligence architecture consists of Data Extraction, Data Transformation, Data Loading, Data Warehouse Layer, Metadata layer and End User Layers [13]. All these layers can be gathered together with the help of business intelligence tools.

185 job postings were listed on the website of kariyer.net [14], which is one of the most used job and employment web site in Turkey, when business intelligence was typed into the search section in Turkish as 'İş Zekası' on January 8, 2022 [15]. It was seen that the newest of these ads was published on the query day and the oldest one 54 days ago. These advertisements were published by various companies in various sectors such as banking, textile, insurance, alcoholic beverage and food. Two of 185 advertisements are the same advertisement. As it was observed that 45 advertisements were irrelevant so that they were removed from the list. And 49 of the remaining postings did not include any business intelligence tool which are not mentioned. As it is shown in Table 1 more than one business intelligence tool can be named in an advertisement, 47 included Power BI, 39 included SAP, 35 included Qlik, 17 included Tableau, 11 included SSRS, 9 included Oracle BI, 9 included Microstrategy, 3 included Cognos 3 contained IBM Data Stage, 1 contained looker and 1 contained superset.

As a result, it was observed that the name of a business intelligence tool was mentioned 175 times. When calculated as a percentage, we can see that these tags contain Power BI with a maximum of 27% is shown in Fig. 1.

A. Power BI

1) About Power BI

Power BI is a cloud-based reporting service developed by Microsoft that enables the creation of reports that make sense of meaningless data [16]. Power BI is intended for users to create their own reports and dashboards without the help of any IT staff. This tool offers the ability to create data warehouses, organize data, and create visual dashboards from that data. One of the best benefits of Power BI is that custom visualizations can be uploaded through its Marketplace app. With Power BI, data from different data providers can be easily retrieved, visualized and shared with other users [17].

Power BI can use different data sources. It can make connection with databases like PostgreSQL, Microsoft SQL, Oracle SQL. Also, it can make connection with cubes like SQL Server Analysis Services or with some folders directly like txt, csv etc. [18].

Power BI consists of three core elements, Power BI Desktop (a Windows desktop application), Power BI Service (an online software), and Power BI mobile (for mobile devices). It also has two another component, Power BI Report Builder which enables developing paginated reports that can be shared in the Power BI service and Power BI Report Server which is an in-house report server where you can publish your Power BI dashboards created via Power BI Desktop. The process starts by connecting to different types of data sources and creating reports in Power BI Desktop. This report is then published and shared from the Power BI Desktop app to the Power BI service. [17].

TABLE I
THE NUMBER OF BUSINESS INTELLIGENCE TOOLS IN ADVERTISEMENTS

BI Tool Name	Number of Posting
Power BI	47
SAP	39
Qlik	35
Tableau	17
SSRS	11
Oracle BI	9
Microstrategy	9
Cognos	3
IBM Data Stage	3
Looker	1
Superset	1

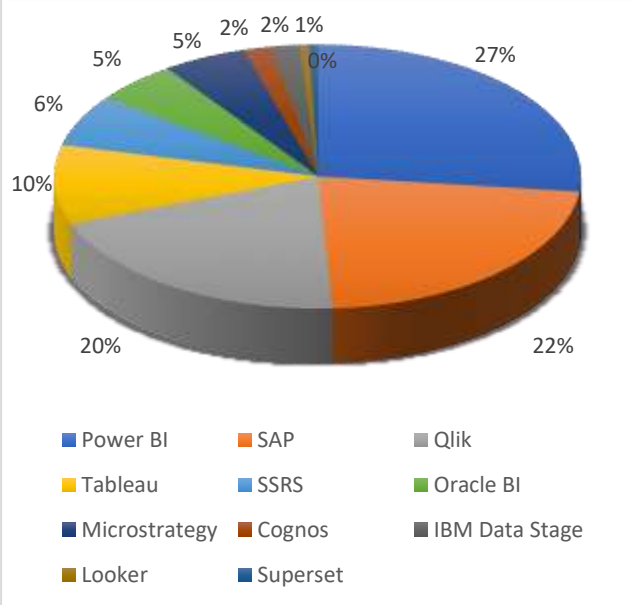

Fig.1. Percentage of business intelligence tool names in advertisements

With dashboards, multiple data can be visualized in a single interface. Tree maps, gauges, combo or funnel charts and fill maps can be used to visualize. The cloud-based Power BI service provides a secure connection without having to move data from Microsoft SQL Server to the cloud. Data can be imported and modeled with Power BI Designer. Real-time control panel can manage updates. Thus, instant and secure connection can be established to data local or in the cloud [10].

2) Power BI versions

In order to share dashboards and reports, license must be purchased. There are 3 different license options for Power BI

Service which are Power BI Pro, Power BI Premium Per user and Power BI Premium Capacity. Power BI Pro provides licenses to users to share data across the organization after converting or visualizing data into a report. Power BI Premium per User allows the use of advanced artificial intelligence features in addition to all the features available with Power BI Pro. Power BI Premium per Capacity provides data management and enterprise access without per-user licenses. Publishing content to Power BI Premium capacity requires a Power BI Pro license, while viewing content does not require a license [19]. Table 2 shows the comparison of these versions [19].

TABLE II
COMPARSION of POWER BI VERSIONS

	Power BI Pro	Power BI Premium Per user	Power BI Premium Per capacity
Mobile app access	✓	✓	✓
Paginated (RDL) reports	✗	✓	✓
No license required per user	✗	✗	✓
On-premises reporting with Power BI Report Server	✗	✗	✓
Model size limit	1 GB	100 GB	400 GB
Refresh rate	8/day	48/day	48/day
Advanced AI (text analytics, image detection, automated machine learning)	✗	✓	✓
Dataflows (direct query, linked and computed entities, enhanced compute engine)	✗	✓	✓
Maximum storage	10 GB/user	100 TB	100 TB

3) Literature Background of Power BI

Rajesh et al. proposed a data science approach to minimize the time it takes to transfer a player from one team to another depending on the skills and costs of the players. He stated that this would help a football team increase its popularity and profits and create a brand-new club with new players. Using Power BI and Python, performed a statistical analysis of player performance based on capabilities for a new set of gamers while minimizing cost. They suggested that such approaches and analytical results could be useful for building a team of selected players [20].

Ferreira and friends presented research on the design and development of a practical predictive monitoring system. The three main parts are vibration data acquisition, data analytics, and presentation of a report. The data collection is made by STM32F446RE microcontroller. They generated a report using all available information using Microsoft Power BI. Finally, they stored the information using a cloud-based Azure Storage Account [16].

Hewko and friends wanted to analyze the last 6 years of professional basketball data using knowledge discovery tools. The aim was to give an idea of how teams won and what separates these winning teams from the losing teams. They analyzed regular season game data using MSSQL, Microsoft BI, R, and Power BI to find previously unknown trends between winning and losing teams. They used decision trees, Naive Bayesian and association rules. They used defensive and offensive rebounds, blocks, steals, turnovers, 2-point field goal percentage, and 3-point field goal percentage as input for analysis. The results showed that teams with more defensive rebounds won more games, while teams that earned average offensive rebounds lost more games. They claimed this was because teams with more offensive rebounds missed more shots [21]. Desai and colleagues aimed to help companies selling electronic devices increase productivity and customer satisfaction using Microsoft Power BI [22].

B. SAP

1) About SAP Business Objects (SAP BO)

SAP BO Business Intelligence is a package available for creating visual reports using data and sharing these reports with other people [23]. SAP BO s is a business intelligence application for a business designed for use by companies and employees. It consists of several reporting applications that allow users to visualize the results of their analysis using data from various sources. It provides an easy, personalized and dynamic connection to all necessary structured and unstructured data of the institution's relational database. It aims to simplify reporting and analysis for staff so that users can create, publish, share and use as primary access for analysis within different products without the need for input from data analysts. The data used with it is not integrated at the application layer, but at various back-end resources [24].

Web Intelligence (Webi) is allows users to analyze, generate reports, distribute generated reports on BO or PDF or XLS etc. It is a Web browser tool that allows exporting in format. Crystal Reports is a reporting and data analysis tool that allows from various data sources. Business Objects Dashboards is a data visualization tool that allows creating visual tables from reports. SAP Lumira is a visualization tool that allows users to analyze data and create dynamic visual dashboards and analytics applications. SAP BusinessObjects Explorer is a data exploration tool that allows searching large-scale data and creating visual tables from this data. Query as Web Service (QaaWS) is a tool that enables Users to create and publish web services for use in SAP's reporting tools. In addition to existing products, SAP Business Objects is constantly improving its

product line with new integrations, enhancements and new products and constantly supports its portfolio with up-to-date technology [24].

2) Lumira Versions

SAP Lumira Desktop has two editions which are Personal and Standard Edition. Personal edition is the version that can be used for free. CSV, XLS and XLSX and cloud data in SAP HANA One can be connected using this version. Standard Edition is paid, with this version you can connect to various data sources [25]. The comparison of these two versions is shown in Table 3 [26].

TABLE III
COMPARISION of SAP LUMIRA VERSIONS

	Lumira Desktop Personal Edition	Lumira Desktop Standart Edition
Access of xlsx and csv files	✓	✓
Access of other data sources	✗	✓
Data combination and data transformation	✓	✓
Create storyboards	✓	✓
Edit storyboards	✓	✓

3) About SAP Analytics Cloud

SAP Analytics Cloud is a tool which is designed specifically for the cloud by SAP to access data and let in analytics straight over business processes to quickly comeback immediate insights into action. It enables real-time Innervisions and exploration of data with self-service data exploration abilities. It offers accurate, locally connected, logical data and tools for data management. It allows to compare data from different data sources, create effective data visualizations and develop instant reports. It can be used directly from a web browser without installation a new program on your computer [27].

4) SAP Analytics Cloud Versions

SAP Analytics Cloud offers three different licensing options which are trial, business intelligence and planning. The comparison of these two versions is shown in Table 4 [28].

5) Literature Studies Using SAP

Nazarov et al. conducted a study using the SAP Analytic Cloud in Russia to propose models that build predictive analytical models. They suggested that it could ultimately help improve the situation with the development of small and medium enterprises in Russia [29].

Nararya and friends claimed that conclusions could be drawn regarding the application of the predictive analysis model in the SAP Analytics Cloud digital service for the functional dashboard design in the finance module [30].

Nazarov et al. investigated the possibilities of creating data mining models with the help of SAP Analytics Cloud using the data of legal entities and individual entrepreneurs in the Russian Federation, and aimed to determine the effect of state support against COVID19 on the commercial activities of small and medium-sized enterprises [31].

C. QLIK

1) About Qlik

Qlik is a software company founded in Sweden in 1993 and is a provider of Qlik View and Qlik Sense tools for BI. Previously called quick, it later became Qlik [18].

Qlik Sense is an interactive self-service visualization and exploration tool for analyzing, interpreting and visualizing data sources. The drag and drop features of the interface are good for quick creation of dashboards, data visualization and reports. Desktop, server and cloud versions are available. Qlik Sense Desktop is for end users to develop visual dashboards on a their computers. It is free for personal usage. Qlik Sense Enterprise is for organizations which can have big data sources. Qlik Sense Cloud supports is using for data visualization by cloud technology. It provides broad assistance through forums, education materials, webinars and video tutorials [10].

Qlik is memory-based tools for this reason all data is loaded into Random Access Memory. QlikView can connect many different data sources such as ODBC data sources or can connect with folders directly like xlsx, txt, csv and its their data folders called QVD (QlikView Document) files. QlikView and Qlik Sense are free for an individual user. One of the main advantages is that existing selections are saved as bookmarks for later use and users can easily access the bookmarks. Data visualization in QlikView is in the form of charts. Different chart types can be used, such as Bar charts, Radar chart, Line chart, combo chart, Grid chart, Pie chart, Funnel chart, Scatter chart etc. [18].

Qlik View can easily analyze very large datasets, combine data from various sources, and make data quickly accessible via Resource-specific APIs. End users can visualize the data in the browser using plug-ins. The first step is to extract data from specific sources and integrate it into Qlik. Incorrect data fields are cleaned and outliers are identified and preprocessed in the second phase. In the third phase, users are simplified with drag and drop visualizations for reports. Finally dashboards can be shared with other users [18]. Being in-memory tools, reports as excel and pdf, large consultant network, powerful mobile applications, dashboard technologies, simple development cycle and solid integration can be counted as the advantages of Qlik. A good system configuration is required to access large datasets, the need for trained developers, lack of centralized security, difficulty of deploy analytics, and old interface can be evaluated as disadvantages of Qlik [18].

TABLE IV
COMPARISION of SAP ANALYTICS CLOUD VERSIONS

	SAP Analytics Cloud Trial	SAP Analytics Cloud Business Intelligence	SAP Analytics Cloud Planning
Data Modelling	✓	✓	✓
Data Visualizations	✓	✓	✓
Data Exploration	✓	✓	✓
Augmented Analytics	✓	✓	✓
Live Data Connectivity	✓	✓	✓
SAP BPC integration	✗	✗	✓
Schedules	✗	✗	✓
Currency Translation	✓	✗	✓
Schedule publications	✗	✓	✓
Integrated planning with SAP S/4HANA	✗	✗	✓

2) Qlik Versions

There are two versions of Qlik Sense which are Qlik Sense Business and Enterprise. The first one is a cloud solution developed for use across groups and teams. Qlik Sense Enterprise SaaS is developed for operational usage. The comparison of these two versions is shown in Table 5 [32].

TABLE V
COMPARSION of QLIK SENSE VERSIONS

	Qlik Sense Business	Qlik Sense Enterprise SaaS
Qlik AutoML	✗	Unlimited ML experiments and 2 ML models included.
Reporting Service	✗	100 reports / month included.
Smart visualizations	✓	✓
Visual data preparation	✓	✓
Single Sign-On	✗	✓
Usage monitoring	✓	✓
API integrations	✓	✓
Support	✓	✓
Qlik SAP Connector	✓	+
Geocoding	✓	+

3) Literature Background of Qlik

Kiula and friends conducted a research using the data of an insurance company in Kenya between 2014-2018. QlikView is recommended as a simple and shareable business intelligence application. It was also suggested that it can be used for data analytics and visualization [33]. The healthcare/insurance industry analysis was performed on data from three healthcare/insurance industry ERPs in Kenya. Based on data access and monthly comparison, data were obtained from the intersection of the three systems for March and April 2018. The comparison and summing are done using functions from QlikView and Microsoft Excel. Inconsistencies of significant monetary value were observed in the data between the three systems. Data analytics using common Microsoft Excel and QlikView tools is proposed to identify inconsistencies and limitations in healthcare/insurance ERPs [34]. Ilieva and friends worked on proposing a method for measuring and analyzing services rendered in information technology

helpdesk teams. The aim of the study was to monitor and optimize these services. QlikView was used to realize this. The results show the satisfaction of the customers with the helpdesk services were carried out and visualized with QlikView [35]. Delgado and friends developed, a web software using SQL server database and QlikView business intelligence tool. As a result, it has been suggested that a system has been developed that can help make the right decisions in order to increase the efficiency of the health institution studied and this system can be used in similar enterprises [36].

D. Tableau

1) About Tableau

Tableau was founded in 2003. It is one of the essential tools for data analytics and data visualization. It can be learned easily even without any prior programming knowledge. The amount of data analyzed in Tableau depends on memory capacity. Tableau can connect and access data from different data sources prior to data analysis. SQL, TXT, CSV is some of the data sources which can be access and also Tableau could be accessed from cloud systems such as Azure and Big Data [18].

Connecting and visualizing data is one of the key features 0of this tool. Sharing of data is facilitated via web and mobile [10].

It has a user-friendly interface, being easily integrated with third-party software, providing mobile support for dashboard reports, user forums, customer service, and low cost can be considered as advantages. Difficulty in initial data preparation and the tables do not provide all statistical features can be considered as disadvantages [18]. Tableau Desktop has two different editions; Professional which supports all data sources and connects to Tableau server for web-based analytics and Personal supports xls(x), accdb and csv formats of data sources and does not have server support. Both editions can be used for academic or commercial [10]. Tableau Server is a mobile online business intelligence solution. Tableau Online can be used for publish reports with Tableau Desktop. Tableau Public is for interactive data visualization on the web. By connecting to data, it can create dashboards and can be published directly on the web. Tableau Reader is a free desktop application that can be used to view dashboards developed in Tableau Desktop [10].

2) Tableau Versions

In order to publish the work done on the cloud or server, it is necessary to have one of three different versions which are Tableau Creator, Tableau Explorer, Tableau Viewer. The comparison of these three versions is shown in Table 6 [37].

3) Literature Background of Tableau

Musunuru et al. made an analyze with using donation data from the database of AidData.org. They applied the Hadoop data and displayed the results [38]. Mahatma et al. presented a data visualization approach using Tableau and stated that it allows effective creation of dashboards [39]. Erazo and friends determine the degree of indoor air pollution using time series for data collection and to perform the relevant analysis of this data, its consequences and action to prevent exposure risks to pollutants [40].

TABLE VI
COMPARSION of TABLEAU VERSIONS

	Tableau Creator	Tableau Explorer	Tableau Viewer
Manage users and permissions	✓	✓	✗
Server administration	✓	✗	✗
Set data quality warnings	✓	✓	✗
Download summary data	✓	✓	✓
Download full data	✓	✓	✗
Create and publish new data sources	✓	✗	✓
Publish and run flows	✓	✗	✗
Schedule flows	✓	✓	✗
Export data (.tde, .hyper or .csv)	✓	✗	✗
Download visualizations as images (.pdf, .png)	✓	✓	✓

III. COMPARISON OF BI TOOLS

Table 7 shows the comparison of SAP Lumira, SAP Analytic Clouds, Power BI, Tableau and Qlik business intelligence tools. When Data Source Connections are compared, it is seen that although they are not developed by SAP as seen in Table 7, connections to SAP ERP and SAP HANA can be made from Power BI, Tableau and Qlik applications [41].

While it is observed that ODBC connection cannot be made through SAP's business intelligence products, it is observed that there is no JDBC connection over Power BI and Tableau. There are some restrictions on making JDBC connection over Qlik application, but there are also restrictions on making direct data source connection to social media applications via SAP BI applications. As seen in Table 8, although they are not applications developed by SAP, direct connections can be made from Power BI , Tableau and Qlik applications to SAP BW Bex

and SAP BW Info Provider data sources. In addition, it is possible to connect to SAP BW Live/Import data sources as restrictions. However, in order to use SAP BOBJ universes as data sources, it is necessary to use SAP BI applications [41].

Table 9 shows the data modeling capabilities of the tools. All of them have append, union, join, merge, dimension, measure, hierarchical capability and data type conversion features, but there are some restrictions to be able to use join, merge and hierarchical capability in SAP Analytic Cloud [41].

Visualization is one of the most important things in BI tools. Since the data models built in the background are not visible to the end user, they may be unimportant for them. In Table 10, visualization options were compared. It is observed that Circle view and Grant visual can only be used in Tableau, Card and Multi Card visuals can only be used in Power BI, Gauge visual only in Power BI and Qlik, Funnel visual only in Power BI and Tableau [41].

TABLE VII
COMPARSION of BI TOOLS with DATA SOURCE CONNECTIONS

Data Source Connections	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Social Media(Twitter,Facebook)	+	+	✓	✓	✓
ODBC	✗	✗	✓	✓	✓
JDBC	✓	✓	✗	✗	+
SAP Cloud Apps	✗	✓	✗	✗	✗
SAP ERP	✓	✓	✓	✓	✓
SAP S4/HANA	✓	✓	✓	✓	✓

TABLE VIII
COMPARSION OF BI TOOLS with SAP DATA SOURCE CONNECTIVITY

SAP Connectivity	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
SAP BW Bex Queries	✓	✓	✓	✓	✓
SAP BW Info Provider	✓	✓	✓	✓	✓
SAP BW Live/Import	✓	✓	+	+	+
SAP BOBJ Universe Access	✓	✓	✗	✗	✗

TABLE IX
COMPARSION of BI TOOLS with DATA MODELING

Data Modeling	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Append/Union	✓	✓	✓	✓	✓
Join / Merge	✓	+	✓	✓	✓
Dimension and Measures	✓	✓	✓	✓	✓
Hierarchical Capabilities(Date/Geo vs.)	✓	+	✓	✓	✓
Data Type Conversion	✓	✓	✓	✓	✓

As can be seen in Table 11, the ability to leave comments on the report is available in all tools, but there are limitations in SAP Lumira and Qlik. Notification and adding alerts are available for SAP Analytics Cloud, Power BI and Tableau tools. It is also very important that the reports made in BI tools can be downloaded and distributed, and that they can be transmitted to other users by mail or other methods without the need to connect to BI environments. For this, reports made in BI tools can be downloaded and distributed in various formats. Reports can be imported as excel, csv and pdf in all the tools we compared, while importing in ppt format is possible in Power BI and Qlik applications [41]. The data which is very important for companies and should not go out from report. It is a great responsibility to ensure the security of this data. Table 12 gives comparisons about security. Companies or individual users want to try the tool before purchasing it. Availability of trial versions is also presented in Table 13 comparatively [41].

TABLE X
BI TOOLS COMPARSION of BI TOOLS with DATA VISUALIZATION

Data Visualizations	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Line	✓	✓	✓	✓	✓
Bar	✓	✓	✓	✓	✓
Stacked Bar	✓	✓	✓	✓	✓
Column	✓	✓	✓	✓	✓
Circle View	✗	✗	✗	✓	✗
Area	✓	✓	✓	✓	✓
Scatter	✓	✓	✓	✓	✓
Histogram	✗	✓	+	✓	✓
Stacked Column	✓	✓	✓	✓	✓
Stacked Area	✓	✓	✓	✓	✓
Pie	✓	✓	✓	✓	✓
Waterfall	✓	✓	✓	✓	✓
Scatter	✓	✓	✓	✓	✓
Bubble	✓	✓	✓	✓	✓
Gauge	✗	✗	✓	✗	✓
Bullet	✗	✓	+	✓	✗
Spark Line	+	+	+	✓	✗
Box Plot	✓	✓	✗	✓	✓
Tree Map	✓	✓	✓	✓	✓
Gantt	✗	✗	✗	✓	✗
Funnel	✓	✗	✓	✓	✗
Distribution Plot	✗	✗	+	✓	✓
Line and Bar (Combo)	✓	✓	✓	✓	✓
Donut	✓	✓	✓	✓	✓
Marimekko	✓	✓	+	+	✗
Parallel Coordinates	✓	✗	✗	✗	✗
Text Table / Cross Tab	✓	✓	✓	✓	✓
Time-Series	✓	✓	+	✓	✓
Word/Tag Cloud	✓	+	+	✓	✗
Numeric Point/KPI	✓	✓	✓	✓	✓
Card/Multi Card	✗	✗	✓	✗	✗
Bubble Map	✓	✓	✓	✓	✓
Symbol Maps	✓	✓	✗	✓	✗
Flow Map	✗	✓	✗	+	+

After the product is purchased, training support and assistance in case of any problem are very important in order to learn and use this product more accurately. Companies that are good at these issues can go one step ahead. Comparison of training and support is given in Table 13 and Table 14 [42-47].

There are different languages used in different countries, and users may want to use these tools in their native language. Language support comparison is as in table 15 [42-47].

TABLE XI
COMPARSION of BI TOOLS with EXPORT CAPABILITY

Exports and alerts	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Comment/Annotation	+	✓	✓	✓	+
Windows Desktop App	✓	✗	✓	✓	✓
Broadcasting	+	✓	+	+	+
Notification / Alert	✗	✓	✓	✓	✗
Export to Excel or csv	✓	✓	✓	✓	✓
Export to ppt	✗	✗	✓	✗	✓
Export to PDF	✓	✓	✓	✓	✓

TABLE XII
COMPARISION of BI TOOLS with SECURITY AND TRIAL

Security and Trial	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Security	Role based security is maintained in the BI Platform.	Role based security is maintained within the tool itself	User is linked to their Office 365 account.SSO and gateways need to configured for data refresh..	Each user has a username and password linked to Tableau	All authentication is managed by Qlik Sense Proxy Service(OPS).The OPS authentication is regardless of Qlik Sense client type for all users.
Trial	Free for 30 days	Free for 30 days	Power BI Desktop is free.	Tableau Creator is free for 14 days. Tableau public and reader are free.	Qlik Sense cloud and Desktop are free. Qlik View Personal edition is free.

TABLE XIII
COMPARSION of BI TOOLS with SUPPORT

Support	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Email/Help Desk	✗	✓	✓	✓	✓
Knowledge Base	✗	✓	✓	✓	✓
Phone Support	✗	✓	✓	✓	✓
24/7 (Live Rep)	✓	✗	✓	✓	✓
Chat	✗	✓	✓	✓	✓
HQ Location	Germany	Germany	USA	USA	USA
Ownership	NYSE:SAP	NYSE:SAP	Microsoft	Tableau Software	Qlik
Discussion	SAP Lumira Community	Official SAP Analytics Cloud Community	Microsoft Power BI Desktop Community	Tableau Desktop Community	Official Qlik Sense Community

TABLE XIV
COMPARSION of BI TOOLS with TRAINING

Training	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
In Person	✗	✗	✓	✓	✓
Live Online	✓	✓	✓	✓	✓
Webinars	✓	✓	✓	✓	✓
Documentation	✓	✓	✓	✓	✓

Other strengths and weaknesses of the tools are presented in tables in Table 16 [41]. Even if companies examine all the features and choose the most suitable vehicle for them, if the budget is not enough, they can afford to cut down on some features. Therefore, price can be one of the most important criteria. In Table 17 [19,28,32,37,48], price comparisons of the products are given. Access to this price information was made on September 3, 2022 with a computer used over Turkey, and prices may change in the future and differ from country to country.

TABLE XV
COMPARSION of BI TOOLS with SUPPORTED LANGUAGES

Supported Languages	SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
guages	Czech, German, English, French, Hungarian, Japanese, Korean, Portuguese, Russian, Spanish, Turkish, Chinese (Simplified)	Czech, German, English, French, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish, Chinese (Simplified)	Arabic, Bulgarian, Catalan, Czech, Danish, German, Greek, English, Estonian, Basque, Finnish, French, Hebrew, Hindi, Croatian, Hungarian, Indonesian, Italian, Japanese, Korean, Latvian, Lithuanian, Malay, Dutch, Norwegian, Polish, Portuguese, Romanian, Russian, Slovak, Slovenian, Spanish, Serbian, Swedish, Thai, Turkish, Ukrainian, Vietnamese, Chinese (Simplified)	German, French, Japanese, Korean, Portuguese, Spanish, Chinese (Simplified)	German, English, French, Italian, Japanese, Korean, Dutch, Polish, Portuguese, Russian, Spanish, Swedish, Turkish, Chinese (Simplified)

TABLE XVI
BI TOOLS COMPARSION FOR OTHER FUTURES

SAP Lumira	SAP Analytic Cloud	Power BI	Tableau	Qlik
Interoperability with SAP Lumira Designer	Cloud based solution for BI.	Free desktop and integration with office 365 like Microsoft Teams.	New tool for extensive data prep.	Extensive scripting ability within applications
SDK component for custom data Access and visualization	Intuitive collaboration and commenting features	Good connectivity to Microsoft and Azure based data sources	Ease of use and robust data connectivity with support to advanced functions	Powerful in-memory engine with data indexing
Live BW connectivity using native BICS data services	Subscription model with regular updates from SAP	Natural language processing with Q&A features	API's for customizations and collaborate features in server	Extensions in qlik nprinting.

TABLE XVII
BI TOOLS COMPARSION FOR PRICES

Product	Price
Power BI Desktop	Free
Power BI Pro	$9.99 Per user/month
Power BI Premium Per user	$20 Per user/month
Power BI Premium per capacity	$4,995 Per capacity/month
SAP Lumira Personal edition	free
SAP Lumira, Standard edition	$185 per user
Qlik Sense Business	$30USD/user/month. Billed Annually.
Qlik Sense Enterprise Edition	Contact QlikView Pricing per user on Subscription or Perpetual basis
SAP Analytics Cloud Trial	Free for 30 days
SAP Analytics Cloud Business Intelligence	30 EUR per User / Month
SAP Analytics Cloud Planning	Price upon request
Tableau Creator for Cloud	70$ user/month
Tableau Explorer for Cloud	42$ user/month
Tableau Viewer for Cloud	15$ user/month
Tableau Creator for Server	70$ user/month
Tableau Explorer for Server	35$ user/month
Tableau Viewer for Server	12$ user/month

IV. DISCUSSIONS

As a result, considering the data taken from a job posting site in Turkey in the first week of 2022, it has been observed that the most used business intelligence tools of companies are Power BI, SAP Business Intelligence tools, Qlik Business Intelligence tools and Tableau. When these 4 business intelligence tools are compared over the tables like chapter III, it has been observed that each business intelligence tool has its own advantages and disadvantages. However, it has been concluded that when choosing the business intelligence tool they will use, companies should consider what field they operate in, why they need a business intelligence tool, and whether mobile access is important. It also emerged that companies have to decide whether visuality, speed, variety of available data sources, export capacity, security or cost were more important and make a choice accordingly.

V. CONCLUSION

In this study, the most used business intelligence tools were determined with the help of the data obtained from a job posting site in Turkey and it was aimed to facilitate the decision making of the companies when choosing the business intelligence tool to be used by making comparisons on them. In future studies, the number of these job posting sites and the date range of the postings may be increased.

The research can be expanded not only on a country basis, but also worldwide. By conducting a survey with the companies using these business intelligence tools, their satisfaction can be researched and the companies that will make a choice can be helped more.

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