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Review Article

A Review paper on Business Intelligence

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A B S T R A C T

This review paper provides a comprehensive overview of the concept of business intelligence (BI) and its significance in modern organizations. It begins with a brief history of BI, followed by a discussion of its fundamental principles, components, and technologies. The paper then highlights the benefits of BI in decision-making, performance monitoring, and strategic planning. Additionally, it examines the challenges faced in BI implementation, including data quality issues, organizational culture, and technical limitations. The review concludes by identifying the emerging trends and future directions in BI, such as big data analytics, artificial intelligence, and cloud computing, and their potential impact on the field. Overall, this paper aims to provide a valuable resource for researchers, practitioners, and students interested in understanding the role and importance of BI in today's business environment..

Keywords:

Introduction

Business intelligence (BI) is a term used to describe the processes, technologies, tools that enable organizations to analyze data and transform it into actionable insights to support decision-making. BI has become an essential component of modern business operations, helping organizations to gain a competitive edge by improving their decision-making, increasing efficiency, reducing costs. This review paper provides a comprehensive overview of the concept of BI and its significance in modern organizations.

BI is a broad term that encompasses data mining, process analysis, performance benchmarking, descriptive analytics. BI parses all the data generated by a business and presents easy-to-digest reports, performance measures, trends that inform management decisions.

Data Mining

Data mining is a process used by companies to turn raw data into useful information. By using software to look for patterns in large batches of data, businesses can learn more about their customers to develop more effective marketing strategies, increase sales and decrease costs. Data mining depends on effective data collection, warehousing, computer processing.

1. Data mining is the process of analyzing a large batch of information to discern trends and patterns.
2. Data mining can be used by corporations for everything from learning about what customers are interested in or want to buy to fraud detection and spam filtering.
3. Data mining programs break down patterns and connections in data based on what information users request or provide.
4. Social media companies use data mining techniques to commodify their users in order to generate profit.
5. This use of data mining has come under criticism lately as users are often unaware of the data mining

happening with their personal information, especially when it is used to influence preferences.

Data Mining Techniques

Data mining uses algorithms and various techniques to convert large collections of data into useful output. The most popular types of data mining techniques include:

Association rules, also referred to as market basket analysis, searches for relationships between variables. This relationship in itself creates additional value within the data set as it strives to link pieces of data. For example, association rules would search a company's sales history to see which products are most commonly purchased together; with this information, stores can plan, promote, forecast accordingly.

- Classification uses predefined classes to assign to objects. These classes describe characteristics of items or represent what the data points have in common with each. This data mining technique allows the underlying data to be more neatly categorized and summarized across similar features or product lines
- Clustering is similar to classification. However, clustering identified similarities between objects, then groups those items based on what makes them different from other items. While classification may result in groups such as «shampoo», «conditioner», «soap», «toothpaste», clustering may identify groups such as «hair care» and «dental health»
- Decision trees are used to classify or predict an outcome based on a set list of criteria or decisions. A decision tree is used to ask for input of a series of cascading questions that sort the dataset based on responses given. Sometimes depicted as a tree-like visual, a decision tree allows for specific direction and user input when drilling deeper into the data
- K-Nearest Neighbour (KNN) is an algorithm that classifies data based on its proximity to other data. The basis for KNN is rooted in the assumption that data points that are close to each are more similar to each other than other bits of data. This non-parametric, supervised technique is used to predict features of a group based on individual data points
- Neural networks process data through the use of nodes. These nodes is comprised of inputs, weights, an output. Data is mapped through supervised learning (similar to how the human brain is interconnected). This model can be fit to give threshold values to determine a model's accuracy
- Predictive analysis strives to leverage historical information to build graphical or mathematical models to forecast future outcomes. Overlapping with regression analysis, this data mining technique aims at supporting an unknown figure in the future based on current data on hand

The Data Mining Process

To be most effective, data analysts generally follow a certain flow of tasks along the data mining process. Without this structure, an analyst may encounter an issue in the middle of their analysis that could have easily been prevented had they prepared for it earlier. The data mining process is usually broken into the following steps.

Step 1: Understand the Business

Before any data is touched, extracted, cleaned, or analyzed, it is important to understand the underlying entity and the project at hand. What are the goals the company is trying to achieve by mining data? What is their current business situation? What are the findings of a SWOT analysis? Before looking at any data, the mining process starts by understanding what will define success at the end of the process.

Step 2: Understand the Data

Once the business problem has been clearly defined, it's time to start thinking about data. This includes what sources are available, how it will be secured stored, how information will be gathered, what the final outcome or analysis may look like. This step also critically thinks about what limits their are to data, storage, security, collection and assesses how these constraints will impact the data mining process.

Step 3: Prepare the Data

It's now time to get our hands on information. Data is gathered, uploaded, extracted, or calculated. It is then cleaned, standardized, scrubbed for outliers, assessed for mistakes, checked for reasonableness. During this stage of data mining, the data may also be checked for size as an overbearing collection of information may unnecessarily slow computations and analysis.

Step 4: Build the Model

With our clean data set in hand, it's time to crunch the numbers. Data scientists use the types of data mining above to search for relationships, trends, associations, or sequential patterns. The data may also be fed into predictive models to assess how previous bits of information may translate into future outcomes.

Step 5: Evaluate the Results

The data-centered aspect of data mining concludes by assessing the findings of the data model(s). The outcomes from the analysis may be aggregated, interpreted, presented to decision-makers that have largely be excluded from the data mining process to this point. In this step, organizations can choose to make decisions based on the findings.

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Step 6: Implement Change and Monitor

The data mining process concludes with management taking steps in response to the findings of the analysis. The company may decide the information was not strong enough or the findings were not relevant to change course. Alternatively, the company may strategically pivot based on findings. In either case, management reviews the ultimate impacts of the business and re-creates future data mining loops by identifying new business problems or opportunities.

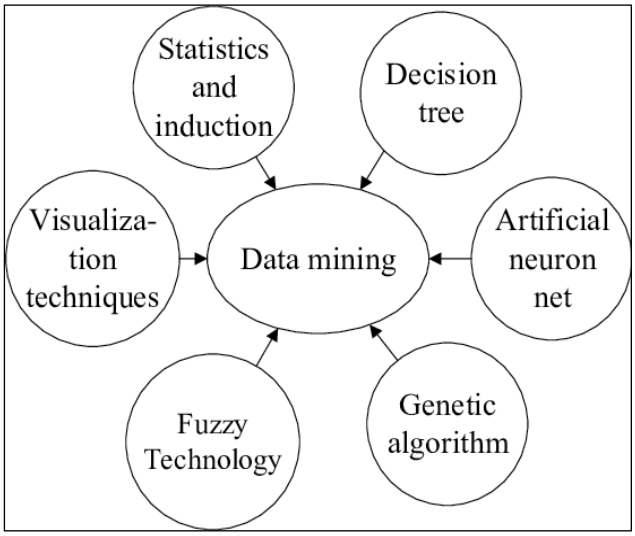

Figure 1

Warehousing

Warehousing is an intermediate step in a collateralized debt obligation (CDO) transaction that involves purchasing loans or bonds that will serve as collateral in a contemplated CDO transaction. The warehousing period typically lasts three months, it comes to an end upon closing of the transaction when they are ultimately securitized and sold as part of the CDO.

- Warehousing is the accumulation and custodianship of bonds or loans that will become securitized through a CDO transaction
- A collateralized debt obligation (CDO) is a complex structured-finance product that is backed by a pool of loans and other interest-bearing assets
- This intermediate step before the transaction is finalized typically lasts three months, during which time the underwriting bank is subject to the risks involved in holding those assets
- A CDO is a structured financial product that pools together cash flow-generating assets and repackages this asset pool into discrete tranches that can be sold to investors. The pooled assets, comprising mortgages, bond, loans, are debt obligations that serve as collateral hence the name collateralized debt obligation. The tranches of a CDO vary substantially with their risk profile. Senior tranches are relatively safer because they have priority on the collateral in the event of a default. The senior tranches are rated higher by credit rating agencies but yield less, while the junior tranches receive lower credit ratings and offer higher yields
- An investment bank carries out the warehousing of the assets in preparation of launching a CDO into the market. The assets are stored in a warehouse account until the target amount is reached, at which point the assets are transferred to the corporation or trust established for the CDO. The process of warehousing exposes the bank to capital risk because the assets sit on its books. The bank may or may not hedge this risk

Benchmarking

A benchmark is a standard against which something is compared. Investors use benchmarks to measure the performance of securities, mutual funds, exchange-traded funds, portfolios, or other investment instruments.

Generally, broad market and market-segment stock and bond indexes are used for this purpose even cryptocurrencies have benchmarks, hallmarking the importance of having something to compare an asset's performance to.

If there is an investment instrument, there is a benchmark to compare it to learn more about benchmarks and how you can use them to check your portfolio's performance.

- A benchmark is a standard with which to measure performance
- In investing, benchmarks are generally indexes of investment instruments against which portfolio performance is evaluated
- Depending on the particular investment strategy or mandate, the benchmark will differ
- There are benchmarks for every type of investment and strategy
- Market benchmarks are indexes created to include multiple securities, assets, or other instruments to represent the performance of a stock, fund, or any other investment of the same type and composition
- Benchmark indexes have been created across all types of asset classes. For example, the S&P 500 and Dow Jones Industrial Average are two of the most popular large-capitalization stock benchmarks in the equities market

Descriptive Analytics

Descriptive analytics refers to the interpretation of historical data to better understand changes that occur in a business. Descriptive analytics describes the use of a range of historic data to draw comparisons with other reporting periods for the same company (i.e. quarterly or annually) or with others within the same industry. Most commonly reported financial metrics are a product of descriptive

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analytics, such as year-over-year (YOY) pricing changes, month-over-month sales growth, the number of users, or the total revenue per subscriber. These measures all describe what has occurred in a business during a set period.

- Descriptive analytics is the process of parsing historical data to better understand the changes that occur in a business
- Using a range of historic data and benchmarking, decision-makers obtain a holistic view of performance and trends on which to base business strategy
- Descriptive analytics can help to identify the areas of strength and weakness in an organization
- Examples of metrics used in descriptive analytics include year-over-year pricing changes, month-over-month sales growth, the number of users, or the total revenue per subscriber
- Descriptive analytics is used in conjunction with newer analytics, such as predictive and prescriptive analytics.

Steps in Descriptive Analytics

- There are a few steps that companies can take in order to successfully implement descriptive analytics into their business strategy. The following list highlights these steps along with a description of each
- Identifying which metrics to analyze. Before beginning, it's important to decide which metrics companies want to produce and the time frame for each, such as quarterly revenue or annual operating profit
- Identifying and locating the data. This step requires locating all of the data required to produce the result. This means going through all internal and external sources, including databases
- Compiling the data. Once all the data is identified and located, the next step is to prepare and compile it together. Part of the process here is to ensure that it's accurate and to format everything into a single format
- Data analysis. Analyzing datasets and figures means using different tools

Once all these steps are completed, it's important to present all the data to the appropriate stakeholders. Using appropriate visual aids, such as charts, graphics, videos, other tools can be a great way to provide analysts, investors, management, others with the insight they need about the direction of the company.

Data Collection

Big data refers to the large, diverse sets of information that grow at ever-increasing rates. It encompasses the volume of information, the velocity or speed at which it is created and collected, the variety or scope of the data points being covered (known as the "three v's" of big data). Big data often comes from data mining and arrives in multiple formats.

- Big data is a great quantity of diverse information that arrives in increasing volumes and with ever-higher velocity
- Big data can be structured (often numeric, easily formatted and stored) or unstructured (more free-form, less quantifiable)
- Nearly every department in a company can utilize findings from big data analysis, but handling its clutter and noise can pose problems
- Big data can be collected from publicly shared comments on social networks and websites, voluntarily gathered from personal electronics and apps, through questionnaires, product purchases, electronic check-ins
- Big data is most often stored in computer databases and is analyzed using software specifically designed to handle large, complex data sets

History of Business Intelligence

In 1865, Richard Millar Devens presented the phrase "Business Intelligence" (BI) in the "Cyclopedia of Commercial and Business Anecdotes." He used it to describe how Sir Henry Furnese, a banker, profited from information by gathering and acting on it before his competition. More recently, in 1958, an article was written by an IBM computer scientist named Hans Peter Luhn, describing the potential of gathering business intelligence (BI) through the use of technology.

Business intelligence, as it is understood today, uses technology to gather and analyze data, translate it into useful information, act on it "before the competition." Essentially, the modern version of BI focuses on technology as a way to make decisions quickly and efficiently, based on the right information at the right time.

The history of BI can be traced back to the 1960s when the first decision support systems (DSS) were developed. These early systems were used primarily for financial analysis and reporting.

In 1968, only individuals with extremely specialized skills could translate data into usable information. At this time, data from multiple sources was normally stored in silos, research was typically presented in a fragmented, disjointed report that was open to interpretation. Edgar Codd recognized this as a problem, published a paper in 1970, altering how people thought about databases. His proposal of developing a "relational database model" gained tremendous popularity and was adopted worldwide.

Decision support systems (DSS) was the first database management system to be developed. Many historians suggest the modern version of business intelligence evolved from the DSS database. The number of BI vendors grew in the 1980s, as business people discovered the value of business intelligence. An assortment of tools was developed during

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this time, to access and organize data in simpler ways. OLAP, executive information systems, data warehouses were some of the tools developed to work with DSS.

In the 1980s, the emergence of data warehousing technology enabled organizations to store and access large amounts of data. The 1990s saw the rise of online analytical processing (OLAP) and data mining technologies, which allowed organizations to perform complex analysis on their data.

Components of Business Intelligence

The components of BI include

Data Sources

Data sources refer to the various data inputs, such as databases, spreadsheets, social media, that are used to generate insights. This component of BI involves various forms of stored data. It's about taking the raw data and using software applications to create meaningful data sources that each division can use to positively impact business. BI analysts using this strategy may create data tools that allow data to be put into a large cache of spreadsheets, pie charts, tables or graphs that can be used for a variety of business purposes. For example, data can be used to create presentations that help to structure attainable team goals. Looking at the strategic aspect of data sources can also help organizations make fact-driven decisions that take into account a more holistic view of the needs of the company.

Data Integration

Data integration involves combining data from various sources into a single data repository.

Data Warehousing

Data warehousing refers to the storage of data in a central repository that is optimized for data analysis. Data warehousing lets business leaders sift through subsets of data and examine interrelated components that can help drive business. Looking at sales data over several years can help improve product development or tailor seasonal offerings. Data warehousing can also be used to look at the statistics of business processes including how they relate to one another. For instance, business owners can compare shipping times in different facilities to look at which processes and teams work most efficiently. Data warehousing also involves storing huge amounts of data in ways that are beneficial to different divisions within the company.

Data Analysis

Data analysis involves using statistical and machine learning techniques to extract insights from data.

Data Visualization

Data visualization involves presenting the results of data analysis in a visual format that is easy to understand.

Reporting

Reporting involves generating reports that summarize the insights gained from data analysis.

OLAP (Online Analytical Processing)

This component of BI allows executives to sort and select aggregates of data for strategic monitoring. With the help of specific software products, a certification in business intelligence helps business owners can use data to make adjustments to overall business processes.

Advanced Analytics or Corporate Performance Management (CPM)

This set of tools allows business leaders to look at the statistics of certain products or services. For instance, a fast food chain may analyze the sale of certain items and make local, regional and national modifications on menu board offerings as a result. The data could also be used to predict in which markets a new product may have the best success.

Benefits of Business Intelligence

Business Intelligence in the modern world is the implementation of computer software which assists in the

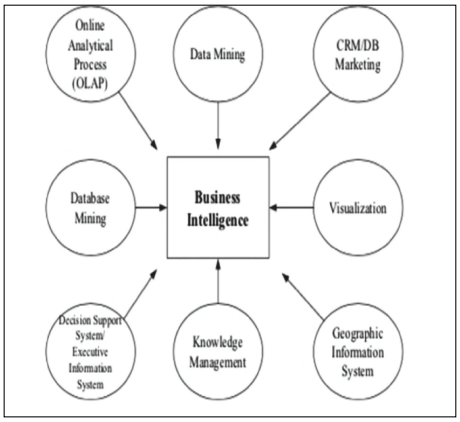

Figure 1

collection, analysis and storage of related business data. This can then be presented in report format, allowing for easy and effective data-based business decisions.

9 key benefits of Business Intelligence

Business Intelligence benefit – Improve sales

A Business Intelligence system is able to identify trends in sales, possible product improvements, customer preferences and business opportunities by creating detailed reports. This invaluable data can be used to drive sales and assist with negotiations between businesses and suppliers

Business Intelligence benefit – Accurate reporting

An organisation's data – financial, operations and sales – can be used by a Business Intelligence system to generate

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accurate reports as either visual representations (charts, tables or graphs) or written information.

Business Intelligence benefit – Better decision-making

Using the aforementioned accurate reporting systems, businesses are better-positioned to make impactful decisions. By assessing productivity and revenue by department, Business Intelligence is able to set up alerts about overall performance so that a business plan can be clearly outlined. By leveraging up-to-the-minute data, companies can deliver valuable information to stakeholders, beating out competitors and maintaining a lead position.

Business Intelligence benefit – Identify opportunities and trends

The data analysis also allows companies to compare its strengths and weaknesses with competitor organisations, thereby analysing market conditions and identifying trends. This means lucrative opportunities can be acted upon while potential business challenges are addressed.

Business Intelligence benefit – Operational efficiency

The streamlining of various data sources through Business Intelligence will help with overall operations, saving management time in tracking down information. Employees will also have access to relevant and reliable data, allowing them to engage with the impact of their decisions and, thereby, outline both short- and long-term business goals.

Business Intelligence benefit – Reduce waste

The unified nature of a Business Intelligence system allows it to analyse inter-departmental transactions, noting any areas of inefficiency, loss or waste.

Business Intelligence benefit – Better inventory

For organisations that supply goods, Business Intelligence is able to track inventory and ensure the right orders are being placed at the right time. This means that customers receive products when requested and there is no excess stock going to waste.

Business Intelligence – Customer satisfaction

The implementation of Business Intelligence software allows companies to obtain customer feedback in real time, thereby identifying patterns, noting challenges and delivering better service to customers overall.

Business Intelligence benefit – Increased revenue

Through enhanced operational efficiency, waste reduction, trend identification and a boost in customer satisfaction, Business Intelligence will serve to increase revenue.

BI provides a number of benefits to organizations, including improved decision-making, increased efficiency, reduced costs. By providing actionable insights, BI helps organizations to make better decisions, based on data rather than intuition. BI also helps organizations to improve their efficiency by identifying areas where processes can be streamlined or automated. This, in turn, reduces costs by eliminating unnecessary or redundant processes.

Challenges in Business Intelligence Implementation

Business Intelligence (BI) is designed to provide organizations with data-driven insights to inform decision making, however, implementing and utilizing BI systems can pose challenges such as data integration, data quality, user adoption, data security, scalability, technical complexity. Integrating data from multiple sources and ensuring its consistency and accuracy is critical, however, this is a complex process. Ensuring stakeholders have the necessary skills and training to effectively use BI tools and protecting sensitive data from unauthorized access are also important considerations. Organizations must also ensure that their BI systems can scale to accommodate growth and that they have the necessary resources and expertise to manage these systems. Addressing these challenges is essential for organizations to fully realize the potential of BI and drive better decision making and business outcomes.

Ensuring Data Quality

Data Quality and completeness are important success factors for all BI efforts. It is critical for organizations to perform basic auditing to ensure the validity of the data. This is especially vital for data that will be used for measures and indicators.

Since data is utilized differently for Business Intelligence than it is in other user cases, auditing often reveals data quality issues that would mostly go undiscovered without these efforts. When an issue is recognized and the root cause determined, the project is launched to close the data quality gap.

Absence of Execution and Training

Many times, businesses have all-around enunciated necessities, a decent apparatus setup, a sound BI systems, but still require specialized abilities. There is a need to have personnel that is well trained to handle the BI systems but many organizations lack this.

The reason for absence of execution frequently are different and fluctuated, similar to it cures. This requires extra training in data administration applications. Organizations need to focus on understanding their assets, why BI service is required, the benefits of a BI solution. The most important training that they would require is getting comfortable with the visual interface after picking the right BI stage.

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Unifying BI across All User Groups

One of the main challenges is having a unified BI tool that includes central governance, security, management across all users inside or outside your organization. There is not a single BI platform that can offer every capability that users require But an upgraded BI tools¸ helps businesses to overcome the challenge of reaching out to only a few users.

Targeting Big Needs with a Centralized Team

Another BI challenge faced by organizations is the lack of a centralized team. The lack of such a team means that the needs are not well looked into and some areas are neglected which may lead to the failure of BI.

The work of the centralized team is to drive organizational alignment on the big deals by initiating and managing BI deliverables and working to enable successful integration into the organization's operations. The team will gather requirements for each participating department and develop a prioritized roadmap for implementation.

Self-Service BI

The ability to deliver self-service reporting and analysis across an organization is a big Business Intelligence challenge. One of the biggest problem with traditional BI tools is that they are complicated to use to an extent that only a few key individuals within the company know how to use them. Problems can quickly form around these key individuals which can slow down the entire reporting process.

To address this issue, organizations need to work to deliver full self-service BI data stewards and other end users. This way, users can access data models within the organization data mart and create their own reports. They can also download the data models into their personal sandbox areas after which they can add or remove data, create their own relationships, restructure models, calculated columns, measures and KPIs.

Extending Value with BI "Soft-Serve"

Unlike the self-service BI, soft-serve Bi doesn't allow end users to access and manipulate data from the data warehouse, only reports.

But, the soft-serve Bi model has considerable value since an organization can standardize data, indicators, measures, visualizations, reports while empowering end users to adjust reports as needed to take care of their unique requirements.

Unlocking Data buried in Systems

Regardless of whether you have the data already in place and know where to get it does not automatically mean that it is easily accessible.

Accessing the information you need, when you need it can be quite a process when the data is buried in complex systems and software. In order to gain any real value from your data, you must transform and manipulate it into the right shape. You can clean up your data using a data warehouse and an effective ETL process and get it into the right shape and apply any business calculations or rules.

Cost – TCO

Business Intelligence is costly—assets and expenses plans have always been tight especially for small businesses. However, this has changed with the introduction of SSBI stages. The cost of transmitting BI is a worry only among the SMEs. SMEs are weakened by the obstructive costs of obtaining the correct programming.

Currently, a few stages make SSBI open to small businesses without causing anyone to spend a substantial amount of cash. Similarly, constrained assets means looking for qualified professionals. In this case, small businesses should look for BI dealers offering adaptable arrangements with minimal TCO.

Huge Infrastructure Investment

In the past, expensive BI solutions required huge hardware resources. In addition to increasing the installation price, these data marts and processors also increased the time required for setting up.

However, with modern solutions, you can implement BI either with the existing hardware or by running on virtualized infrastructure in the cloud. The fact is that most SSBI channels can ably use the hardware resources of an office computer for all data processes. There is no need to buy a SQL server or an additional hardware to start using BI to empower your decision-making

Emerging Trends in Business Intelligence

Some of the Business Intelligence trends are

Artificial Intelligence

Artificial intelligence (AI) is the science aiming to make machines execute what is usually done by complex human intelligence. While we work on programs to avoid inconvenience, AI and machine learning are revolutionizing the way we interact with our analytics and data management while increments in security measures must be taken into account. The fact is that it is and will affect our lives, whether we like it or not. t is expected that in the coming year AI will evolve into a more responsible and scalable technology as organizations will require a lot more from AI-based systems. According to Gartner's Data and Analytics research for 2021, with COVID-19 completely changing the business landscape, historical data will no longer be the main driver of AI-based technologies. In change, these

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solutions will need to work with smaller datasets and more adaptive machine learning while also being compliant with new privacy regulations. This concept is known as ethical AI and it aims to ensure that organizations use AI systems in a way that will not break the law. To this day, many organizations have faced legal issues for illegally collecting data from users. The Facebook and Cambridge Analytica scandal is a perfect example of that. By 2026, businesses that apply this kind of framework to their AI models are expected to be 50% more successful in terms of adoption, business goals, user acceptance.

Data Security

The implementation of privacy regulations such as the GDPR (General Data Protection Regulation) in the EU, the CCPA (California Consumer Privacy Act) in the USA, the LGPD (General Personal Data Protection Law) in Brazil have set building blocks for data security and management of customers personal information. Moreover, the recent overturn by the European Court of Justice of the legal framework called Data Privacy Shield hasn›t made software companies› life much easier. The Shield was a legal framework that enabled them to transfer data from the EU to the USA but, with recent legal developments causing the invalidation of the process, companies that have their headquarters in the US don›t have the right to transfer any of the EU data subjects. a similar situation happened already in 2015 when the EU and the USA had no legally valid agreements on this matter for a while. Many US-based (software) providers argue that they use European servers, there is no data transfer to the US at all. However, from a legal perspective, even this solution is questionable, as, in theory, the US judiciary could force US-based businesses to reveal even data from EU-based servers. In essence, the information that is located in the EU needs to stay in the EU. In practice, that means that EU-based businesses that use in the current situation US-based software vendors that store any kind of data for them are taking hazards as they operate in a legal grey area. For companies such as datapine, this doesn't represent a big issue since the registration, business, servers are located in the EU. Taking all this into account, businesses have been forced to invest in security to stay compliant with the new regulations, also to protect themselves from cybercrime. In fact, it is expected that global spending on cybersecurity products will reach $1.75 trillion in the next 5 years. The concern in cybersecurity also presents a challenge for SaaS BI tools as they need to make sure they are offering a secure product that clients will trust with their sensitive data. Just like any other cloud solution, online business intelligence software is also subjected to security risks. Some of them include processing data quickly to provide real-time insights that might be subjected to regulatory compliance, vulnerabilities when moving data from user's systems to the BI tool's cloud, or when the tool provides access to data from multiple devices that may be unsafe and exposed to attacks. To prevent any of this from happening BI software needs to have a clear focus on security.

Data Discovery/ Visualization

Data discovery is the process of collecting data from various internal and external sources and using advanced analytics and visualizations to consolidate all the information. This allows businesses to keep every relevant stakeholder engaged with the information by empowering them to analyze and manipulate the information in an intuitive way and extract actionable insights. To achieve this, businesses of all sizes turn to modern solutions such as business intelligence tools that offer data integration, interactive visualizations, a user-friendly interface, the flexibility to work with big amounts of data in an efficient and intuitive way.

Since humans process visual information better, the data discovery trend will find increment as one of the most important BI trends in 2023.

Data Governance

This concept refers to a set of processes, policies, roles that ensure appropriate valuation, creation, consumption, control of business data at a strategic, tactical, operational level. It establishes roles and responsibilities regarding who can manipulate the data, in which situation, with what tools and methods with the aim of ensuring a secure and efficient data management process.

A well-implemented governance framework not only assists organizations in staying compliant but also in minimizing risks, reducing costs, improving communication from an internal and external point of view, achieving strategic goals, among other things.

Data Literacy

Data literacy is defined as the ability to understand, read, write, communicate data in a specific context. This means understanding the techniques and methods used to analyze the data as well as the tools and technologies implemented.

data literacy continues to be the foundation of a successful data-driven culture. Business leaders are responsible for providing the needed training and tools to the entire organization so that everyone will be empowered to work with data and analytics. To achieve a successful data literacy process, a careful assessment of the skills of employees and managers needs to be made in order to identify weak spots and gaps. Gartner recommends starting by identifying fluent data users that can serve as "mediators" for non-skilled groups as well as identifying communication barriers

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where data is failing its purpose. With all this knowledge in hand, the creation of targeted training instances will become an easier task.

Natural Language Processing (NLP)

NLP enables computers and machines to understand, learn from, interpret human language in a spoken or written form, it can be divided into two subsets: natural language understanding (NLU) and natural language generation (NLG). NLU focuses on understanding the meaning behind text and speech, while NLG focuses on text generation based on specific data input. The growth of this trend has been such in the past years, that its $3 billion worldwide market revenue from 2017 is expected to be almost 14 times larger by 2025, reaching $43 billion.

Sentiment analysis: Also known as opinion mining, it is the process of analyzing text data to identify the emotional tone behind it. It is often used by businesses to analyze comments on social media, emails, blog posts, webchats, more, define if the tone of what is being said is negative, positive, or neutral. Through this, organizations can extract useful insights regarding product development and brand positioning, as well as understand pain points to improve the customer experience on different touch points.

Data Automation

Business intelligence topics wouldn't be complete without data (analysis) automation. In the last decade, we saw so much data produced, stored, ready to process that companies and organizations were seriously looking for modern data automation solutions to tackle massive volumes of information that have been collected.

Figure 1

Conclusion

BI has become an essential component of modern business operations, providing organizations with valuable insights that enable them to make better decisions, increase efficiency, reduce costs. While BI implementation can be challenging, the benefits far outweigh the costs. Emerging trends in BI, such as big data analytics, artificial intelligence, cloud computing, promise to further enhance the value of BI in the years to come.

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