

An Influence of Data Visualization on the Decision-Making Process in the Business World

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ABSTRACT

Data visualization has advanced from static representations to dynamic, interactive tools that have a big influence on how businesses communicate and make decisions. The impact of dynamic data visualization on corporate communication and decision-making is examined in this research. Customers are able to make better choices by gaining a more thorough knowledge of their financial data via interactive features, large databases, and access to a variety of information sources. Additionally, press releases with well-designed data visualizations expose brands to a wider audience and make a greater impact on readers. However, issues like data oversimplification, algorithmic human limits, and an excessive dependence on graphics present possible issues. Data visualization is still necessary and essential for turning unprocessed data into insights that can be put into action, despite these obstacles. Compelling communication and decision-making are worked with by various data visualization draws near, for example, line outlines, bar graphs, candle diagrams, region graphs, skyline graphs, cascade diagrams, timetable outlines, and multiline graphs. These graphs are customized to specific data and bits of knowledge. In the present data-driven professional workplace, data visualization gives associations an upper hand by further developing communication, decision quality, and hierarchical execution.

Keywords: Dynamic data visualization, Interactive tools, Business communication, Decision-making, Extensive databases.

1. INTRODUCTION

The graphical portrayal of conceptual data for two targets is known as data visualization, and these are sensemaking (otherwise called data examination) and communication. Our data contains significant stories, and data visualization is a helpful instrument for finding, fathoming, and imparting these stories to other people. The process of turning unstructured data into various visual representations is known as data visualization. By showing the data with regards to a visual picture, the idea of data visualization features the meaning of the data. Data visualization innovation offers a modern technique for orchestrating the data expected to pursue wise business choices. It empowers chiefs to appreciate the situation in its entirety without a moment's delay, including patterns, measurements, areas of interest, and trouble spots. This empowers people with differing levels of decision-making capacity to mutually decide the most likely ways to progress and the best ways of propelling thoughts.

The most often used and comprehended method for presenting data visualization by audiences is the simple chart. One of the following three formats is often used to display it: a line chart, bar chart, or pie chart. The main objective of the basic chart is to provide important information in a clear and easily understood style so that interested parties may quickly

assimilate the information. The organization may make better decisions and adjust the flow of their operations based on the data visualization and analysis. Utilizing data visualisation may help you convince or influence more people, mobilize stakeholders for action, and reach a larger audience. It is an easy-to-understand and effective way to evaluate vast volumes of data so that others may get fresh insights and that engagement and cooperation are made possible.



Figure-1: Basic charts

1.1. Data Visualization

Data and data are addressed graphically in data visualization. Data visualization tools give a simple to-utilize method for seeing and fathoming patterns, exceptions, and examples in

data by means of the utilization of visual parts like as outlines, charts, and guides. It likewise offers an extraordinary method for staff individuals or organization proprietors to convey realities to non-specialized crowds obviously.

Data visualization tools and advances are basic in the Huge Data climate to break down tremendous volumes of data and go with data-driven decisions.

Advantages And Disadvantages of Data Visualization

There may appear to be no drawbacks to something as straightforward as displaying data in a visual style. However, when data is shown in an incorrect manner, it may sometimes lead to misinterpretation or misrepresentation. It's wise to weigh the benefits and drawbacks before deciding to develop a data visualization.

Advantages

Varieties and examples grab our eye. Red can be recognized from blue and squares from circles easily. All that in our general public is visual, from television and motion pictures to promotions and craftsmanship. One more sort of visual workmanship that catches our consideration and holds it is data visualization. A diagram permits us to distinguish examples and exceptions without any problem. We absorb data quick assuming that it is noticeable. It's story with an objective. A visualization might be significantly more helpful than an enormous bookkeeping sheet of data on the off chance that you've at any point looked at one and neglected to track down an example.

Additional benefits of data visualization include:

- Information exchange made simple.
- Investigate possibilities aggressively.
- Show connections and patterns.

Disadvantages

Indeed, even while there are a lot of advantages, certain disadvantages may not be as obvious. For instance, it's easy to get some unacceptable decision while taking a gander at a visualization with an enormous number of unmistakable datapoints. At times the visualization is one-sided or hazy essentially in light of the fact that it was inadequately built.

Additional drawbacks include:

- Inaccurate or biased information.
- Causation isn't always implied by correlation.
- Essential points may be mistranslated.

The quantity of stages and the objectives of each phase in decision-making processes differ. Typically, the procedure includes these seven phases, or ones that are comparable:

1.2. Steps of The Decision-Making Process

Whether devising a plan of action or reacting to a crisis, decision-makers sometimes have to make a choice among many possibilities. There are several options to consider and a lot of judgments that need to be made constantly. Because of this, putting in place a strong decision-making process is essential to properly managing corporate operations.

Articulate the decision to be made. The group responsible for making decisions has to state exactly what decision it is trying to reach. Every member of the team should be well aware of the situation around the choice and the goals they have set for themselves. The issue or circumstance at hand should be very clear. The simpler it will be to go on with the remaining decision-making steps and the better the result, the more accurately the team can describe the choice and why it should be taken.

Gather relevant information. After reaching a conclusion, the group should collect all relevant data. It might look for previous information on the problem or locate details about analogous initiatives inside the company that have either succeeded or failed. It need to compile relevant data from outside the company, such studies or market research. The team may also find it helpful to speak with outside partners who are facing comparable issues or to consider hiring a consultant.

Identify possible solutions. Equipped with the requisite data, the group may begin pinpointing possible solutions to deal with the circumstance. For example, the team may need to decide how to increase storage capacity in the next year. Leasing equipment, extending into the cloud, buying new storage systems, reusing old systems, and other approaches are some possible answers. Though only the most practical options should be included in the final list, this is a fantastic time for brainstorming and creative thinking.

Evaluate the possible solutions. Each potential solution should be thoroughly assessed by the team, with its advantages and disadvantages noted. It should also search for instances of how comparable technologies have performed both within and outside the company. In certain situations, the team may decide to rule out particular options due to evident issues or pressing difficulties. An assessment of how a certain solution can affect important stakeholders and implementation needs should also be part of the team's review.

Choose the best solution. The team should choose the option that best meets its requirements after weighing the available options. Occasionally, the decision will be clear-cut and one option will have risen to the top of the list. In other situations, the decision won't be as simple, and the group will have to consider the advantages and disadvantages of a number of viable options. Having said that, the group may discover that integrating a few of the options into a single comprehensive solution is the best course of action.

Implement the selected solution. After a choice is reached, action must be taken. The group should create a thorough implementation strategy with clearly defined roles. Every choice has an impact; therefore, preparation should take potential obstacles into consideration and include a procedure for dealing with unforeseen difficulties. Clearly defined responsibilities and expectations are crucial, as is open communication.

Review the implemented solution. After the solution is put into practice, the group should assess both its execution and the choice of solution. The group must guarantee that the problem at hand is addressed in the solution. If not, the group may have to go through the decision-making process again, at least in part. The group should assess whether there was an other option that may have worked better. In order to make decisions in the future that are more efficient and successful, it is also a good idea to go over the whole decision-making process and assess what worked and where improvements may be made.

1.3. Criteria For Getting Most Benefits Out Of Data Visualization

- The presentation's visualizations have to be the most appropriate and pertinent to the information being presented, which is often the original data.
- To ensure that all interested parties can easily understand the charts, figures, and symbols, the data must be integrated with background information.
- The relevant facts must be presented in the visualizations in a way that suggests wise courses of action.

Experts might follow up on the experiences they get with high certainty that the subsequent stage will prompt considerably better progress as long as data visualization is performed with every one of the three of the previously mentioned qualities set up.

2. LITERATURE REVIEW

Kopp, A. M., and D. L. Orlovskiy (2020). In order to enhance data analytics and decision making as business intelligence capabilities, this evaluation looks at the dashboard design

issue. A quick overview of the fundamentals of data marts and warehouses that are utilized as sources of information for business intelligence tasks is provided, with the star schema data structure being regarded as the most popular. The selection of appropriate graphs and charts for data visualization is taken into consideration. It is crucial for dashboard design since unsuitable graphics have the potential to mislead consumers and divert their attention. The three types of visualization graphs that are most often used are bar, line, and pie charts. The two stages of the suggested method are dataset preparation and dataset analysis. The dataset analysis step makes suggestions for which visualizations should go on a created dashboard, while the dataset preparation phase primarily focuses on transforming star schema into flat structures. We employ threshold values of dataset sizes to make such suggestions. The suggested dashboard design method is predicated on a dashboard design process, which is described in detail. A sample dataset is examined, five data subsets are created, and suggestions are made for visualization charts that these datasets may use to be shown on a dashboard.

Shao, C., GSeetharam, T., Juneja, S., and Yang, Y. (2022). To help firms in making more data-driven decisions, business knowledge (BI) consolidates foundation, best practices, data mining, data visualization, business exploration, and data tools. Among the hardest parts of business knowledge incorporate data breaks, the unpredictability of dissecting numerous data sources, and bad quality data, which is considered vital. The IoT-based Effective Data Visualization System (IoT-EDVF) has been introduced in this concentrate for the purpose of improving the gamble of holes, overseeing data quality, and dissecting various data hotspots for business knowledge in corporate money. The presentation of corporate examination the board means to expand the gamble of the data investigation framework, and business knowledge can be gotten to notwithstanding the intricacy of many sources. The use of financial risk analysis aids in the usage of primary success measures that are crucial to the specific demands and goals of the data quality management program. The factual consequences of the reenactment study exhibit upgraded income examination with an improvement of 29.42% over current models and better execution with a decreased postpone reaction of 5 ms, showing the reliability of the recommended system.

In 2021, Rawat, Sabitha, A. S., Kumar, D., Rawat, S., and Rawat, A. Any nation's ability to expand economically sustainably is greatly influenced by the insurance sector. An insurance company's need to have a comprehensive claim analysis system in place has grown along with the number of insurance purchasers. Insurance firms use claim analysis to

discern between legitimate and fraudulent claims. In addition, Claim Analysis may be utilized to further apply the findings throughout the underwriting and acceptance/denial stages of policy enrollment, as well as to get a deeper understanding of the customer strata. The primary goal of this research project is to use feature selection and exploratory data analysis (EDA) to find significant and important elements for claim submission and approval in a learning environment. Additionally, performance measures are used to assess machine learning algorithms after they have been applied to the datasets.

In 2022, Martins, N. C., Araújo, T., Dias, P., Alves, J., Marques, B., & Santos, B. S. Numerous techniques from several scientific domains, including information science and artificial intelligence (AI), have been used to enhance decision-making processes and decision support systems (DSS). Better DSS may be supported by situated visualization (SV), which enables the display of visual data representations in context. Displaying data representations close to the data referent is its primary feature. Using augmented reality (AR) as a tool for SV becomes feasible in a number of scenarios as it becomes more developed, accessible, and economical. Moreover, as users have access to pertinent, suitable, and contextual information that helps them make better decisions, it could positively influence more effective and efficient decision-making. It's critical to recognize the value of combining different domains when new possibilities and problems present themselves. This survey, which depends on an audit of the writing, presents the critical thoughts and addresses and examines the benefits, challenges, and chances of utilizing SV through AR to picture data in setting and work with better decision-making processes. It additionally addresses and talks about current areas of utilization. At long last, various proposals in view of arranged expanded the truth are made for the turn of events and utilization of DSS.

Geraldi, J., Killen, C. P., and Kock, A. (2020). Data is being shown more and more via visualizations to aid in project portfolio decision-making. These choices attempt to improve the total return on project investments while assisting in the implementation of organizational strategy. While some research indicates that data visualizations aid in data comprehension, other studies imply that they may skew judgments. We construct and test a reasonable model that features the job of the decision producer in understanding and using visual data to more readily comprehend if and how visualizations impact decisions on project portfolios. We show a positive connection, intervened by decision-making achievement, between decision producers' use of visualizations and venture portfolio execution utilizing a double source test of 138 undertakings. We make sense of

how the connection between the use of visuals and decision-making achievement is influenced by the decision producer's penchant to use heuristics as well as their knowledge of visualizations by drawing on speculations of mental fit and mental burden.

In 2020, Özemre, M., and Kabadurmus, O. The objective of this study is to give a spic and span worldview to large data examination (BDA)- based key decision making. This examination utilizes an enormous amount of open exchange data to expect send out amounts utilizing two separate AI calculations: Irregular Woods (RF) and Fake Brain Organizations (ANN). To do vital market examination, the anticipated qualities are incorporated into the Boston Counseling Gathering (BCG) Grid. Through an imaginary contextual investigation of a Chinese firm that sends out coolers and fridges, the recommended procedure is confirmed. The discoveries exhibit that the recommended method produces exact exchange projections and works with proficient key statistical surveying. As far as expectation exactness, the RF outflanks the ANN also.

I. H. Sarker (2021). In the current period of the Fourth Modern Upset (Industry 4.0 or 4IR), the advanced world has a wealth of data, including web of things (IoT) data, business data, wellbeing data, versatile data, metropolitan data, security data, and some more. Making shrewd decisions in an assortment of utilization fields may be worked with by determining information or down to earth bits of knowledge from this data. Progressed examination procedures in data science, for example, AI demonstrating, may give more prominent comprehension or significant experiences about data, which robotizes and brilliantly processes PC errands. We give a careful comprehension of "Data Science" in this article, covering an extensive variety of modern examination procedures that might be utilized to work on an application's knowledge and capacities through sharp decision-making in different settings. By taking into account data-driven brilliant figuring and decision making, we likewise inspect and depict 10 potential certifiable application fields, like business, medical services, network protection, metropolitan and country data science, etc. At last, we cause to notice the troubles and potential roads for future examination that fall inside the domain of our examination. The general objective of this study is to give scholastics, decision-producers, and application designers with an asset on data science and progressed examination, particularly with regards to data-driven answers for genuine issues.

Margounakis, D., Protosaltis, A., Sarigiannidis, P., and Lytos, A. (2020, August). Gigantic remote sensor networks have arisen to screen an extensive variety of foundation in

various spaces, including medical care, energy, transportation, savvy urban communities, building robotization, horticulture, and industry, and they are constantly delivering smooths out of data as the Web of Things (IoT) grows rapidly. Large Data advances are significant parts of Web of Things activities since they are visual examination tools that give canny data right away to help significant decision-making. An extensive outline of IoT visualization tools, approaches, and techniques is given in this paper. By analyzing the visual investigation pipeline, we place data visualization into the work process. We give an investigation of the few diagram types that are accessible for data visualization and give rules for involving every one while representing the novel prerequisites of the particular use case. We look all the more carefully at a couple of the most favorable visualization tools. We look at visualization problems in each IoT area since they are separate from one another in terms of big data methodologies. We also examine visualization techniques focused on anomaly identification. Lastly, we provide a summary of the main difficulties with IoT visualizations.

3. DYNAMIC DATA VISUALIZATION AND IMPROVEMENT IN BUSINESS COMMUNICATION

Data visualization becomes dynamic when graphs and charts include cross-referenced information, interactive choices, and more in-depth features, like figure-



Figure 1: Dynamic Data Visualization

➤ Interactivity

The subtleties of a particular client's communications with an organization are nearly written in stone when they are remembered for a client proclamation. The buyer presently has a dynamic cluster of potential outcomes when an assertion is updated with interactive, online components and made accessible on a safe, encoded, secret phrase safeguarded server. Customers may watch charts on a daily or weekly basis and filter information to meet their requirements by using online visualization prompts. The following are additional categories of data that users may see using online filters:

Transaction data: Customers may get information about a specific transaction by clicking on the link associated with it. This information can often be searched by the time and date of the transaction.

Spending totals: If a consumer wants to compare how much they spent on eating in vs eating out over a two- or four-week period, the information may be eliminated by limiting expenditure data to the relevant period.

Interactive visualization not only simplifies financial tracking but also provides solutions to long-standing, perplexing questions about charges or bank statements. Customer preferences for charts vs graphs or vice versa may be taken into account when setting up visuals.

➤ Extensive Databases

A client may want access to transaction data spanning longer than the last 12 months under certain circumstances. Year-by-year document files including transactional archives dating back to the account's inception may be obtained with an expanded database. If an IRS audit is being conducted on a client, this may be extremely helpful. Account holders who just want to review spending patterns over the last five or 10 years may also find a large database useful.

➤ Multiple Content Sources

Not every account holder combines all of their assets into one. For cross-referencing reasons, many customers would want to be able to examine all of their accounts or systems in one location. Customers may analyse information in a variety of ways using numerous source possibilities, such as the following:

Look at different consumption classes: A client might get to one record by means of another and inspect the data next to each other to contrast his yearly essential living uses with the sum he spends on his two times yearly journeys abroad.

Compare prices and refunds: Alternatively, the account holder may compare her income tax returns with the credit debt she has accumulated over the past four quarters.

A consumer may easily solve problems by accessing all forms of data in one location with multiple-source alternatives. Interactive features, large databases, and a variety of sources come together to provide clients a flexible toolkit for a more positive overall experience.

3.1. Benefits Of Data Visualization

• Heightened Brand Exposure

Well-designed data visualizations in a press release will make it stand out from the sea of content that PR executives

and journalists are inundated with on a regular basis. When releasing a press release, this is particularly advantageous since the images make it more likely that it will be selected over the PR materials of rival organizations.

- **Stronger Impressions on Consumers**

The essential math in a particular piece of data may be quickly understood by audiences thanks to visualization graphics. As long as the graphics are presented properly, a customer may be able to see insights that they would have missed otherwise, and they can use that knowledge to go on with making better judgments. Here, "well-designed" and "clearly laid out" are key terms since, on the other hand, pictures devoid of such attributes run the risk of having the opposite impact, confusing, deceiving, or even alienating viewers.

To put it simply, a visual must include three essential elements to be well-received by viewers:

- **Eye-catching design:** The picture must be visually striking on a website or in a Windows browser, regardless of whether it is a graph, chart, or anything else.
- **Informative contents:** Information must be readable and beneficial to visitors, no matter how briefly it is presented.
- **Factual accuracy:** The data must be accurate and not speculative or selectively chosen.

However, the picture does not have to be very elaborate in order to serve its intended function. The designs with the least amount of complexity often succeed in conveying the intended message to the audience. A design could be noteworthy for its inventiveness, but if it omits key details, it won't have the "data" that data visualization needs.

3.2. The Problems with Visualization

Regrettably, the idea of data visualization is plagued by the following present and future issues:

the data's excessive simplicity. The capacity of visualization to take large amounts of data and reduce them to simpler, more intelligible language is one of its main appeals. It's easy to overreach with this, though, as attempting to distill conclusions from millions of data points down to a small number of pictorial representations may result in erroneous conclusions or a complete disregard for important modifiers that have the power to drastically alter your initial assumptions. Consider basic real-world tests, like alcohol intoxication tests, as an example that is not limited to the realm of data. These tests attempt to simplify complicated

systems into simple "yes" or "no" responses; yet, as Monder Law Group notes, they may be wildly wrong.

The algorithms' human limitations. This is both the largest possible issue and the trickiest to solve. Every algorithm that converts data into visual representations is dependent on human input, and human input is subject to basic errors. An algorithm created by a human, for instance, might emphasize certain data points that are "most" important to take into account while discarding other data points completely. This doesn't account for all businesses or circumstances, particularly if there are data outliers or special circumstances that call for a different strategy. The issue is made worse by the fact that the majority of data visualization systems are implemented nationally, which leads to the development of one-size-fits-all algorithms that don't take into account the unique requirements of each user.

too dependence on images. Although this affects users more than developers, it nonetheless lessens the potential effect of visualization in general. Users risk becoming too dependent on this kind of input if they begin to rely too much on visuals for quick interpretation of data. For instance, people may never go further into the data sets that produced such visualizations, taking their findings as gospel. Although the broad conclusions you get from this could be broadly relevant, they won't provide you with a complete picture of your target audiences or advertising strategies.

The vision that is inevitable. Data visualization is too common to ever go away, and there are now hundreds of tools available to aid in our understanding of large data sets via visual diagrams, charts, and drawings. We are rapidly approaching a future where visualization will rule many domains, and there isn't much turning back now. While this may not seem like a big deal to some, think about the consequences: businesses vying to create visualization goods, and customers only looking for items that provide visualization. The aforementioned consequences have the potential to exacerbate users' over-reliance on graphics and increase the risk of human mistake in algorithm development, as corporations strive to launch their products quickly.

4. TYPES OF DATA VISUALIZATIONS

In order to turn raw data into insights that can be put into practice, data visualization is crucial. It facilitates the effective interpretation of complicated information by analysts, decision-makers, and the general public. Different approaches address certain facts and insights, enabling efficient data visualization. In this investigation, we examine popular forms of data visualization, highlighting its benefits and uses.

Types of Data Visualization:

1. **Line:** Trends over time or between categories are shown using line charts, which display data points on a continuous line.
2. **Bars:** Bar charts use rectangular bars to display data, which facilitates value comparisons across categories.
3. **Candlestick charts:** Candlestick charts show price changes over a certain time period by displaying financial data.
4. **Area:** Area charts emphasize cumulative data patterns by filling the area under the line, much as line charts do.

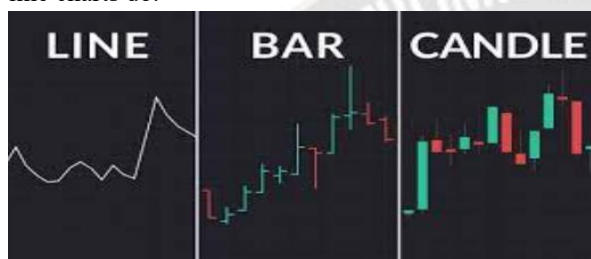


Figure 2: Line, Bar, Candlestick and Area Visualizations

5. **Horizon:** Horizon charts are useful for viewing enormous datasets because they compress data into a compact manner.

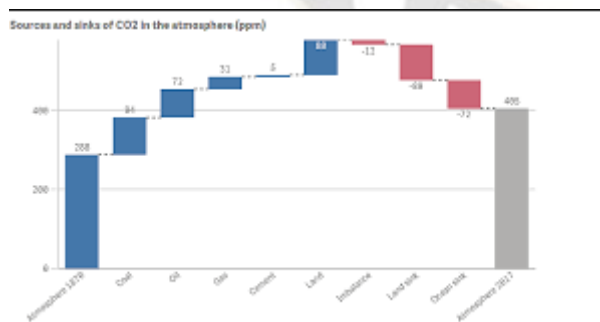
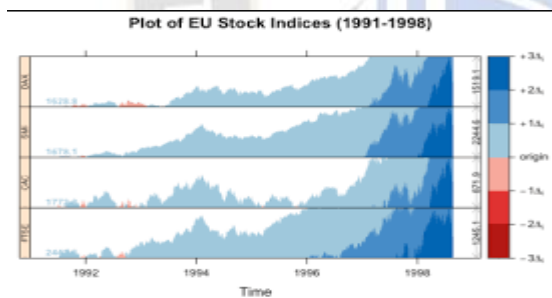


Figure 3: Horizon and Waterfall Visualizations

6. **Waterfall:** The cumulative effect of introducing positive and negative numbers one after the other is seen in a waterfall chart.

7. **Chronology:** Chronology charts highlight the temporal sequence of events or data points by displaying them in chronological order.
8. **Multilines:** Multiline charts facilitate comparisons by displaying many data series on a single graph.

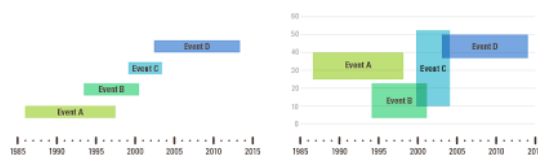


Figure 4: Chronology and Multi-Line Visualizations

4.1. Impact Of Data Visualization

Data visualization has a significant influence on communication, decision quality, and organizational success.

By giving decision-makers an understandable and straightforward depiction of the facts, data visualization improves the quality of decisions. It streamlines complicated data, making it simpler to see trends, patterns, and anomalies. Decision-makers are more equipped to make educated judgments as a consequence of this increased knowledge, which produces more precise and successful decisions [5]. It acts as a universal language that cuts across borders and reaches a wide range of listeners with insightful messages. Stakeholders with differing degrees of data literacy can easily access and understand the visual storytelling created from complex data. Enhancing communication not just with customers and partners but also inside businesses helps to create a common understanding and agreement on important choices.

An essential component of improving organizational performance is visualization. It helps companies to pinpoint areas in need of development, streamline workflows, and seize expansion prospects. Key performance indicator (KPI) visualizations provide real-time information that enable businesses to swiftly adjust to shifting market circumstances. Thus, businesses that use data visualization often gain a competitive advantage, increased efficiency, and cost savings.

5. CONCLUSION

Data visualization plays a critical role in today's data-driven corporate environment by providing improved comprehension, efficient communication, and insightful analysis of complicated data. It enables enterprises to flourish in changing contexts since it is a universal language. Effective visualizations for quick judgments are made possible by best practices, which include accessibility, consistency, relevance, clarity, and interaction. Case studies from real-world situations demonstrate the practical effects, and inclusion,

ethics, and accessibility foster trust. Data visualization promotes efficiency and creativity, making it a permanent need. Future studies will improve ethical frameworks, customization, and interaction. Data visualization is essential for getting a competitive advantage and clearly navigating complexity in today's data-centric environment. Data visualization technology offers a sophisticated method of arranging the information required to make wise business decisions. Executives may see trends, data, hotspots, and problem places all at once with its assistance. This empowers people with shifting degrees of decision-making capacity to cooperatively decide the most likely ways to progress and the best ways of propelling thoughts. To provide specialists with a careful comprehension of data visualization and empower them to push ahead, we take care of various ideas in this paper, including a prologue to data visualization, its sorts, data visualization and decision-making, high-level data visualization, business planning and decision making, and benefits and difficulties of data visualization.

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