

## Chapter 27

# Data Visualization: Creating Mind's Eye

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### ABSTRACT

*Data visualization has the potential to aid humanity not only in exploring and analyzing large volume datasets but also in identifying and predicting trends and anomalies/outliers in a “simple and consumable” approach. These are vital to good and timely decisions for business advantage. Data Visualization is an active research field, focusing on the different techniques and tools for qualitative exploration in conjunction with quantitative analysis of data. However, an increase in volume, multivariate, frequency, and interrelationships of data will make the data visualization process notoriously difficult. This necessitates “innovative and iterative” display techniques. Either overlooking any dimensions/relationships of data structure or choosing an unfitting visualization method will quickly lead to a humanitarian uninterpretable “junk chart,” which leads to incorrect inferences or conclusions. The purpose of this chapter is to introduce the different phases of data visualization and various techniques which help to connect and empower data to mine insights. It exemplifies on how “data visualization” helps to unravel the important, meaningful, and useful insights including trends and outliers from real world datasets, which might otherwise be unnoticed. The use case in this chapter uses both simulated and real-world datasets to illustrate the effectiveness of data visualization.*

### INTRODUCTION

Having we already entered the new world of the ‘Internet of things’ where Facebook being used for long-term customer relationships and Twitter being used for building momentum for new products, it becomes inevitable for every global organization / governments to prep themselves to tame and manage these mountainous, multivariate data for business/social advantage. Today, every global organization is grappling to find ways for “business transformation”, not only to reduce costs and improve the service-ability to their customers but also for their very existence.

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## Data Visualization

Data in the real-world may represent one or more attributes of entities like customers, markets, weather, product feedback, sales or even geospatial information without which 360 degree view of customer or business cannot be examined.

Analyzing and visualizing the connectedness of different attributes and relationships of the “data” is the first & paramount step for business transformation. (Chambers, Cleveland, Tukey, & Kleiner, 1983)

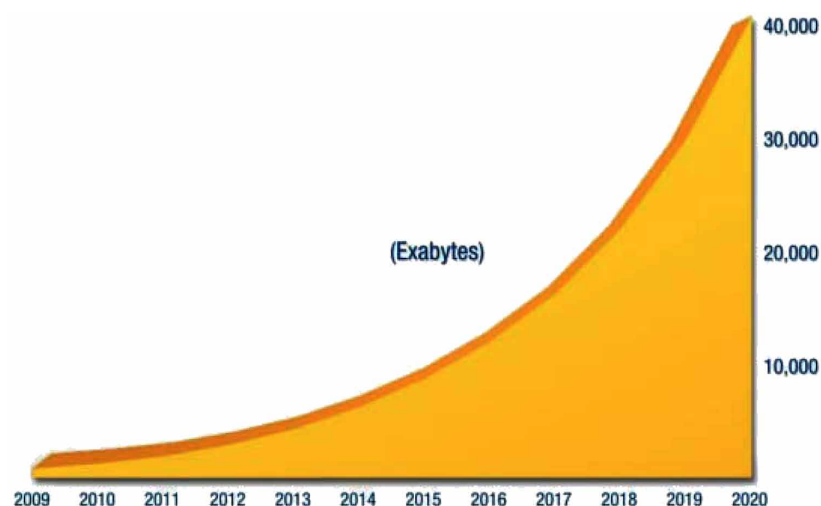
But the reality is that, a cornucopia of electronic data has emerged over decades which are dispersed across the business applications/repositories, leaving every sector and industry with very limited choice for discovery, analysis and visualization of data.

2012 Digital Universe study by International Data Corporation (Gantz & Reinsel, 2012) reveals surprising facts about the growth of the multivariate data in the universe.

1. From 2005 to 2020 - the digital universe will grow by a factor of 300 (from 130 exabytes to 40,000 exabytes, or 40 trillion gigabytes). 90% percent of the world data today is created in last 2 years.
2. The amount of information in the Digital Universe is doubling every 2 years, currently growing at a rate of more than 7,600 petabytes per day. (see Figure 1)
3. By 2020, there will be 7.6 billion people and 200 billion interconnected “things” in internet. These are scanners, ATMs, SMART devices/buildings, security cameras which are empowered to communicate with each other through internet. (Internet of Things).
4. Having every industry is enabling their enterprise with sensors and devices for the business effectiveness, machine generated data will account for 40% of the Digital Universe by 2020, up from just 11% in 2005
5. But, *ONLY less than 1% of the world's data is being analyzed and put for use*. In this, there were secured data which are limited to corporates.

The exponential growth of semi-structured, unstructured and poly-structured data from sensors, logs, web, geospatial, temporal events and customer sentiments texts in social applications like twitter, Facebook, blogs, product reviews etc. aggravate this situation further.

Figure 1. IDC's-Digital Universe in 2020 (Gantz & Reinsel, 2012)



Source: IDC's Digital Universe Study, sponsored by EMC, December 2012

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