

Introduction to Analytics



In God we trust, all others must bring data!

-W Edwards Deming

Corporate Decision Making: The HIPPO Algorithm

Predictive Analytics : QM901.1x
Prof U Dinesh Kumar, IIMB

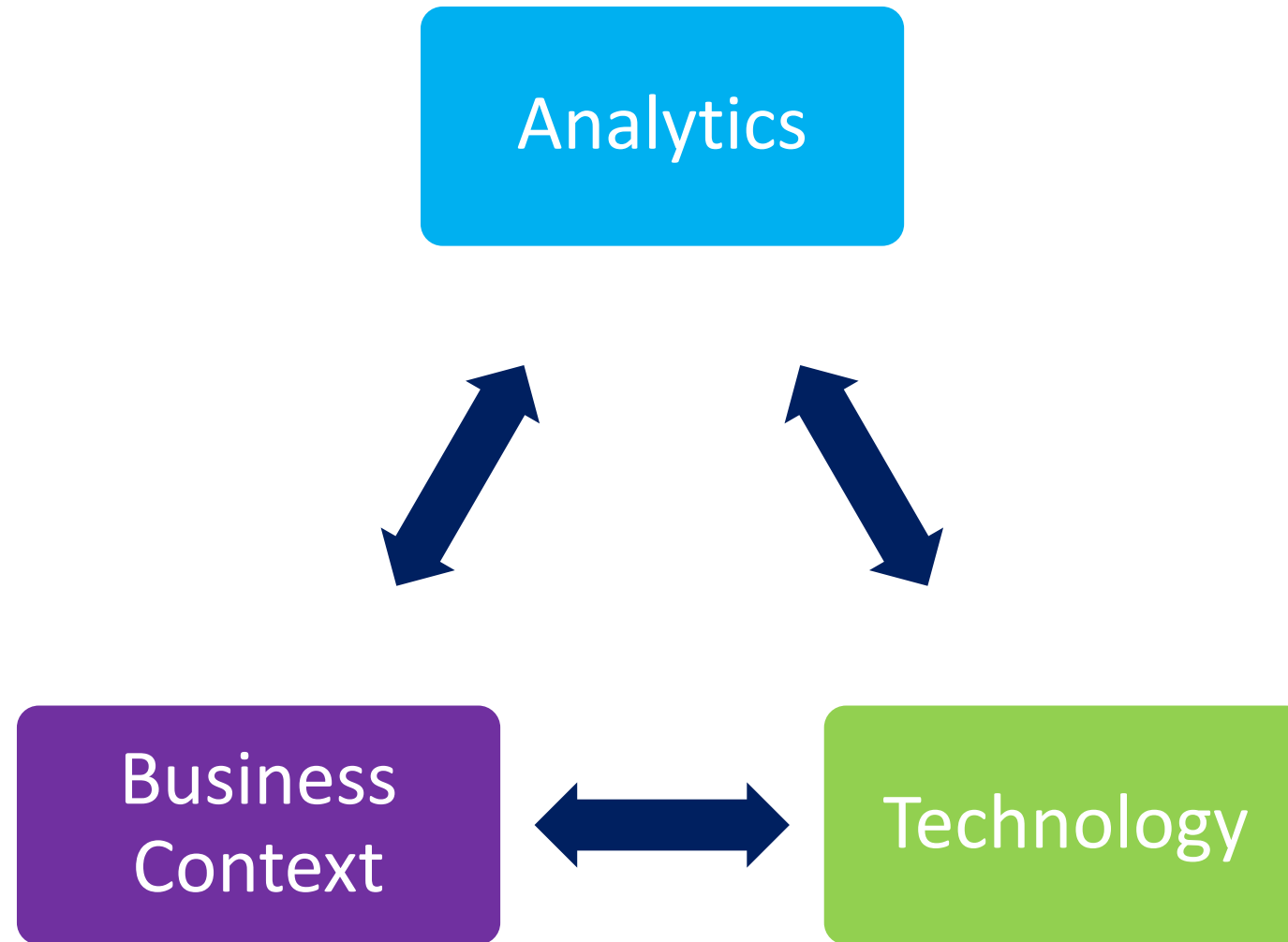


Highest Paid Person's Opinion

Business Analytics - Definition

Business analytics (BA) refers to the tools, techniques and processes for continuous exploration and investigation of past data to gain insights and help in decision making.

Business Analytics is an integration between science, technology and business context that assist data driven decision making.



Data Explosion

- About seven billion shares change hand in US equity markets everyday.
- About 350 million photos are uploaded every day in the Facebook.
- Amount of credit card debt in US: \$890.91 billion.
- Total amount of credit card fraud worldwide: \$5.5 billion.
- Number of bankruptcies filed in US in 2014 is 910, 090.
- Percentage of US credit card holders who have been victims of credit card fraud: 10%
- Every week, about 260 million customers visit Walmart stores.

Reference Links:

<https://goo.gl/s5hFFP>

<http://goo.gl/LD4AB8>

<http://goo.gl/zPRZXb>

<http://goo.gl/iRzxKt>

<http://goo.gl/JpRcLW>

Why do we Need Analytics?



Why Analytics?

- Competitive advantage.
- Removes inefficiency in the system/organization.
- Provides ability to make better decisions.



Problems faced by Flipkart

- Forecast demand for each SKU.
- Predict customer cancellations and returns.
- Predict customer contacts at the customer service.
- Predict what a customer is likely to purchase in future?
- How to optimize the delivery system?

BigBasket.com

Search for more than 10,000 products...

Search

Your Basket 0 items

CHECK OUT

SHOP OFFERS NEW ARRIVALS SHOP BY LIST

HOME > SMART BASKET

Smart Basket (125)

Collection of products that you spend on most or buy often.

SELECTED PRODUCTS (0)

FOR SELECTED PRODUCTS: ADD TO BASKET COPY TO LIST

☐ Select all

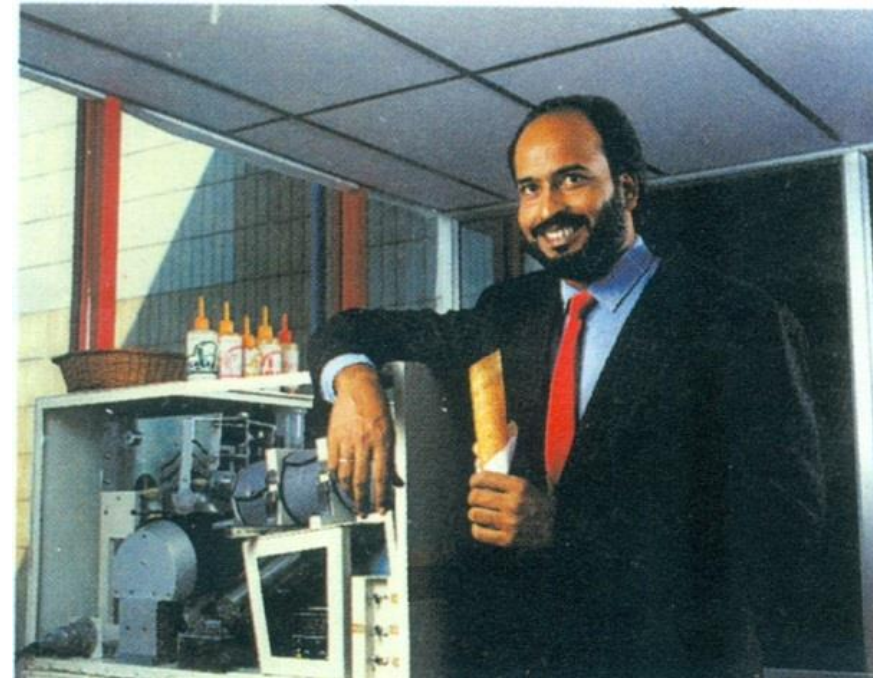
▼ Fruits & Vegetables (28) ☐ Select all

Item	Price	Action
<input type="checkbox"/> FRESHO Onion - Medium 1 kg ₹ 17.00 Qty ADD	₹ 17.00	ADD
<input type="checkbox"/> FRESHO Potato 1 kg ₹ 25.00 Qty ADD	₹ 25.00	ADD
<input type="checkbox"/> FRESHO Pomegranate - Kesar 1 kg ₹ 181.00 Qty ADD	₹ 181.00	ADD
<input type="checkbox"/> FRESHO Cauliflower (Medium) - Grade A 1 nos (approx. 500 gms) ₹ 19.00 Qty ADD	₹ 19.00	ADD
<input type="checkbox"/> FRESHO Banana - Robusta Semi Ripe (Grade A Super) (7... 1 kg ₹ 32.00 Qty ADD	₹ 32.00	ADD

Analytics and Decision Making



STORY 1 – DOSA KING



STORY 2 – Johnson & Johnson (1992)

James E Burke



STORY 3 – British Airways BA038 **(2008)**

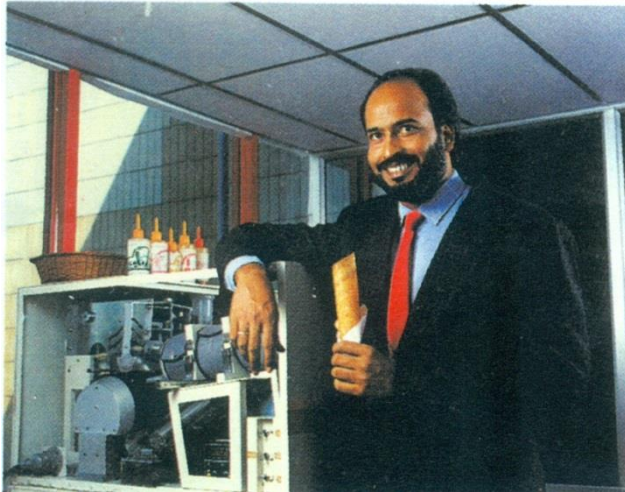
Peter Burkill



DECISION MAKING

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Narayanan



Sufficient time

Not much Data

James E Burke



Little Time

Incomplete Data

Peter Burkill



No Time

Runs into terabytes

Game changers and Innovators



The Game Changers...

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- **Google** : Used Markov chains to rank pages (25 billion dollar eigen vector).
- **Proctor and Gamble** : Analytics as competitive strategy.
- **Target** : Predicts customer pregnancy (37 Billion Dollar Industry).
- **Capital One** : Identifies the most profitable customer.
- **Hewlett Packard** : Developed “flight risk score” for employees.
- **Obama’s 2012 presidential campaign** : Persuasion Modelling.

The Innovators...

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- **OK Cupid:** Predicted which online dating messages is most likely to get a response!
- **Polyphonic HMI:** Uses “hit song science” to predict commercial success of a song.
- **Netflix:** Predicts movie ratings by customers (RMSE is 1%).
- **Amazon.com:** 35% of sales come from product recommendations.
- **Divorce360.com:** Predicting success of a marriage!

There is a striking correlation between an organization's analytics sophistication and its competitive performance.

10 Insights: A first look at the new intelligent enterprise survey on winning with data,
MIT Sloan Management Review, Vol 52, No 1, 2010

Data Scientists will be the sexiest job of 21st century!

Harvard Business Review 2012

Reference Links

<https://goo.gl/TytKtK>

<http://goo.gl/omLmzq>

<http://goo.gl/w4NRkO>

<http://goo.gl/zPf9Xc>

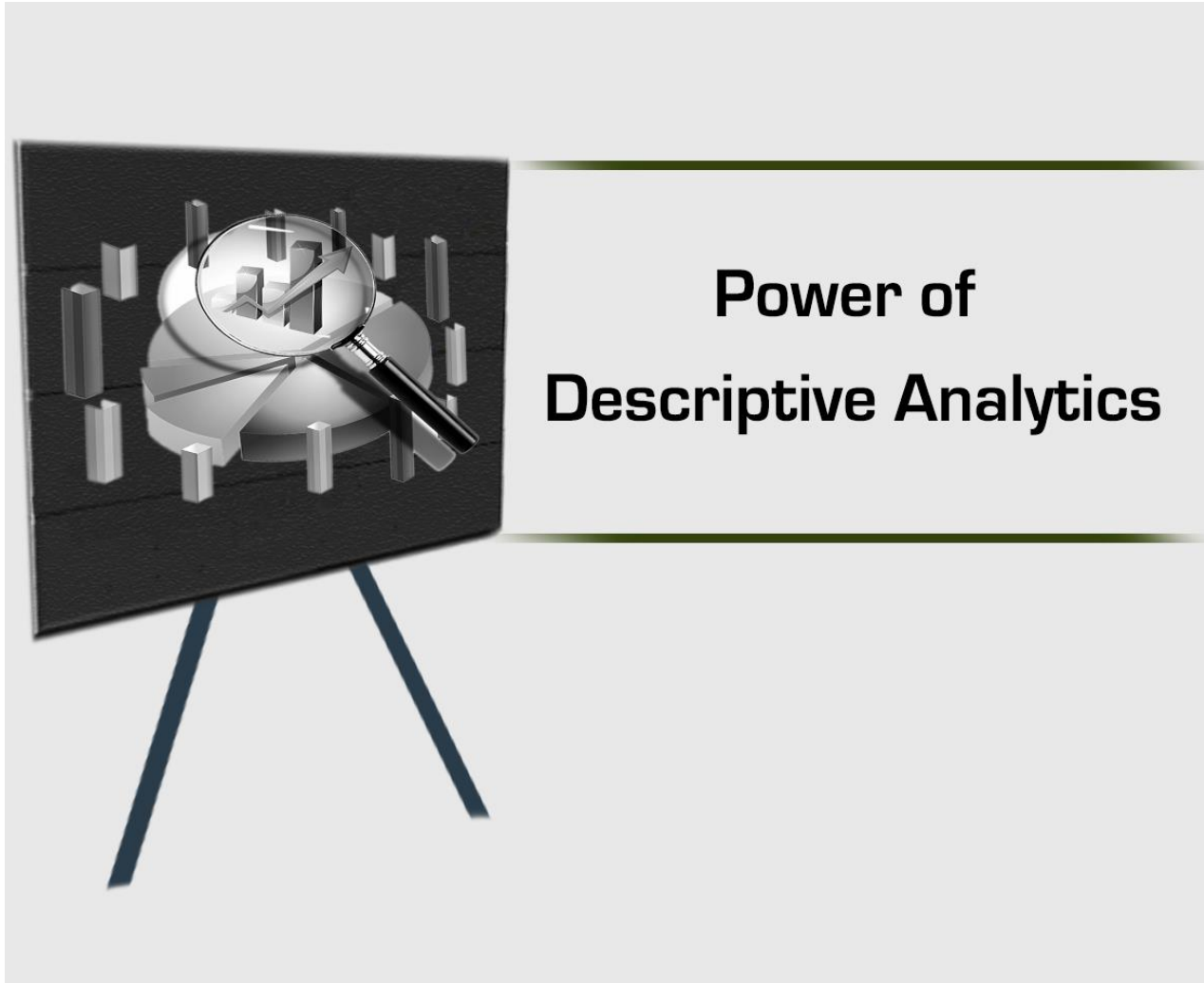
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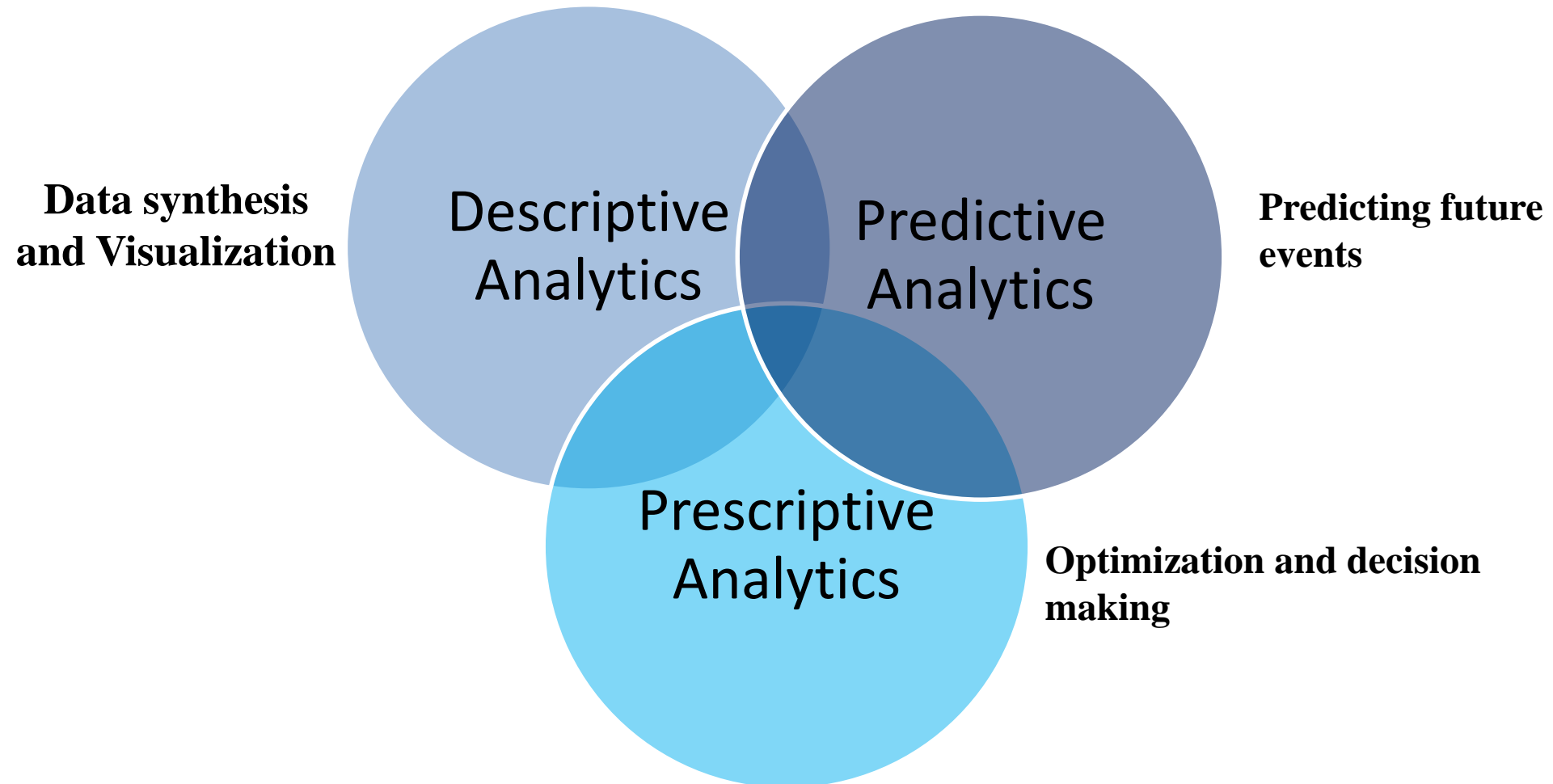
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Analytics



Components of Business Analytics



Descriptive analytics

- Communicates the hidden facts and trends in the data
- Simple analysis of data can lead to business practices that result in financial rewards
- Helps SMEs uncover inefficiencies and eliminate them

Predictive analytics

- Predicts the probability of occurrence of a future event
- Helps organizations to plan their future course of action
- Most frequently used type of analytics across several industries

Prescriptive analytics

- Assists users in finding the optimal solution to a problem
- In most cases, provides an optimal solution/decision to the problem
- Inventory management is one of the problems that are most frequently addressed

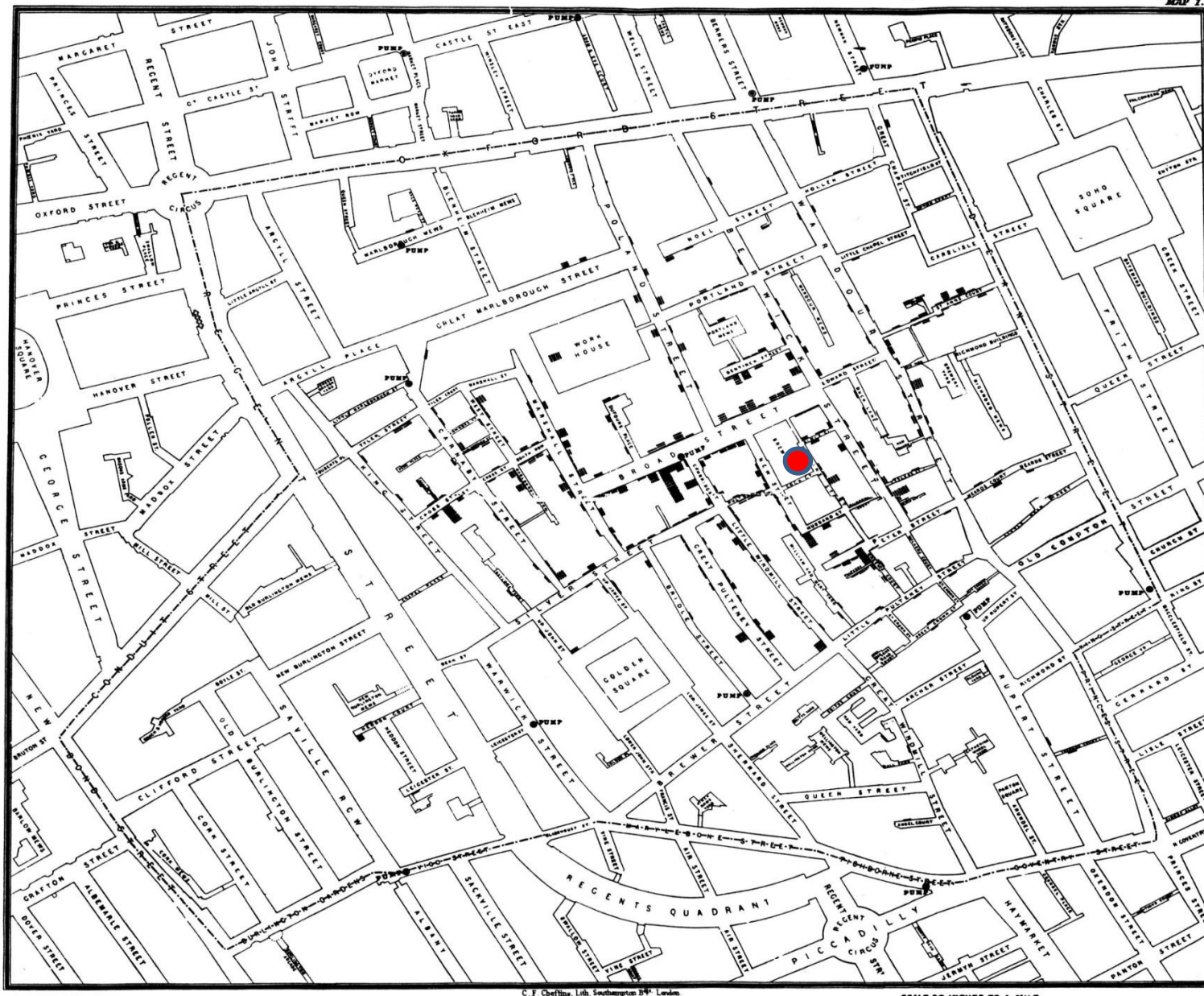
Power of Descriptive Analytics

London Cholera Outbreak - 1854

Severe outbreak of cholera that occurred near Broad Street (now Broad wick street) in Soho district of London in 1854.

More than 500 people died within 10 days of the outbreak, the mortality rate in some parts of the city was as high as 12.8%.



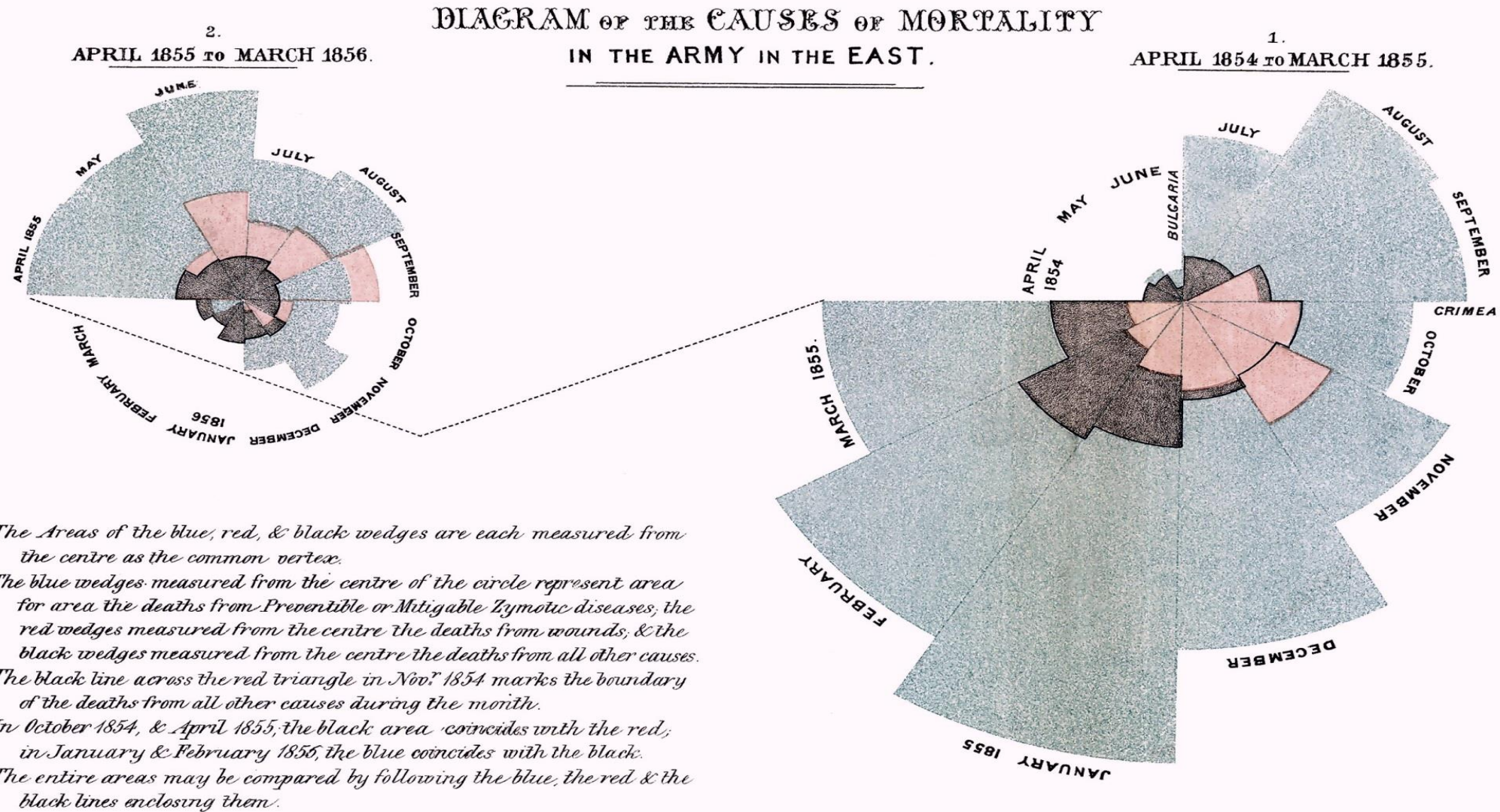


**To understand God's thoughts, we must study statistics,
for these are the measures of his purpose.**

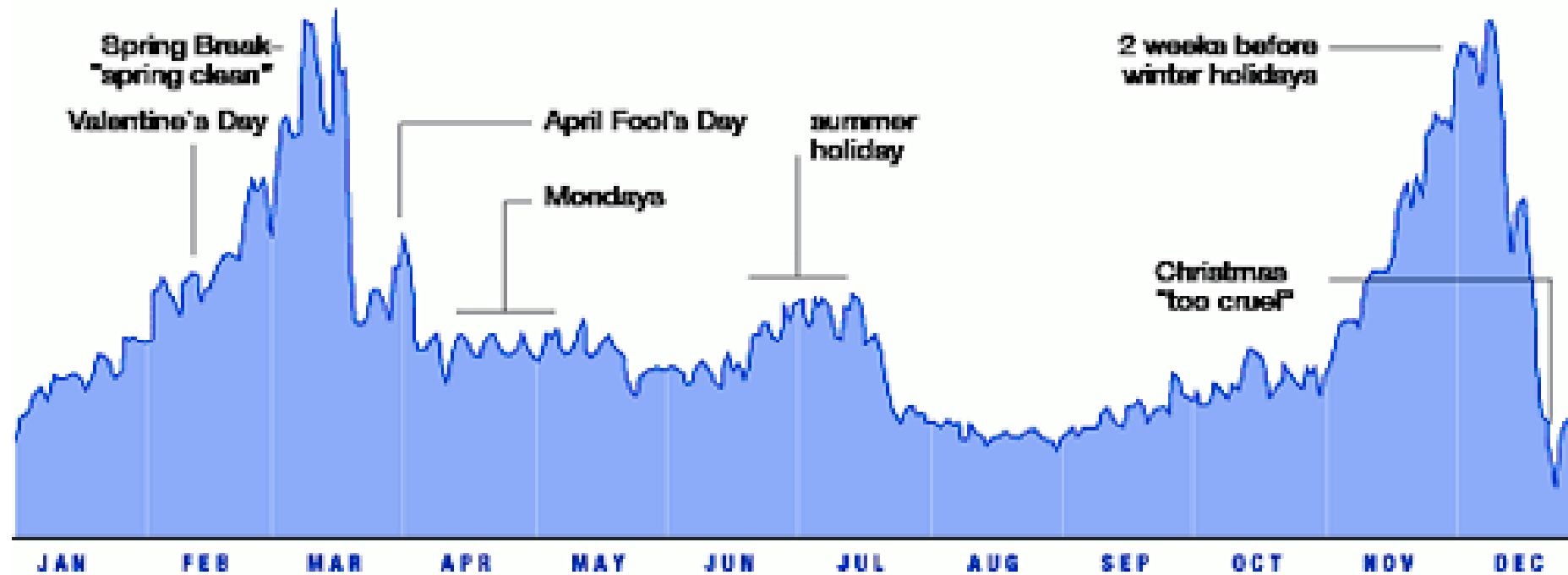
- Florence Nightingale

Florence Nightingale's Pie Chart

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Facebook Relationship Breakups





Predictive Analytics deals with predicting probability of an event.

Predictive Analytics Problems

- Which product the customer is likely to buy in his next purchase ? (recommender system).
- Which customer is likely to default in his/her loan payment ? (credit risk).
- Who is likely to cancel the product that was ordered through e-commerce portal ?

FRAMEWORK- DATA-DRIVEN DECISION MAKING

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Problem or Opportunity Identification

- Domain knowledge is very important at this stage of the analytics project.
- This will be a major challenge for many companies who do not know the capabilities of analytics.

Collection of relevant data

- Once the problem is defined clearly, the project team should identify and collect the relevant data.
- This may be an interactive process since "relevant data" may not be known in advance in many analytics projects.
- The existence of ERP systems will be very useful at this stage.

Data Pre-processing

- Data preparation and data processing forms a significant proportion of any analytics project.
- This would include data imputation and the creation of additional variables such as interaction variables and dummy variables in the case of predictive analytics projects.

Model Building

- Analytics model building is an iterative process that aims to find the best model.
- Several analytical tools and solution procedures will be used to find the best analytical model in this stage.

Communication of the data analysis

- The communication of the analytics output to the top management and clients plays a crucial role.
- Innovative data visualization techniques may be used in this stage.