PHÂN TÍCH DỮ LIỆU BẰNG PYTHON

Lecture 1: Business Analytics

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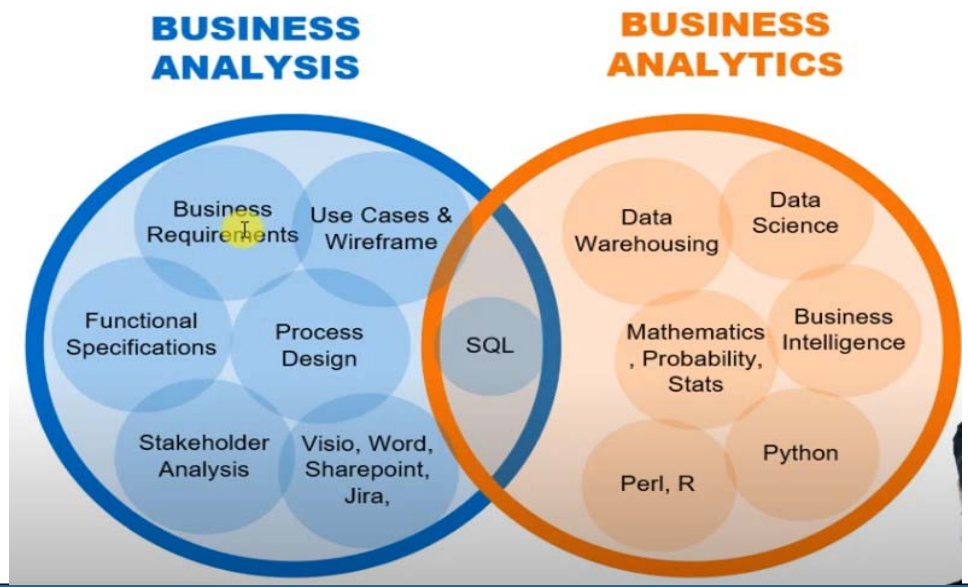


1.1 Introduction of Business Analytics

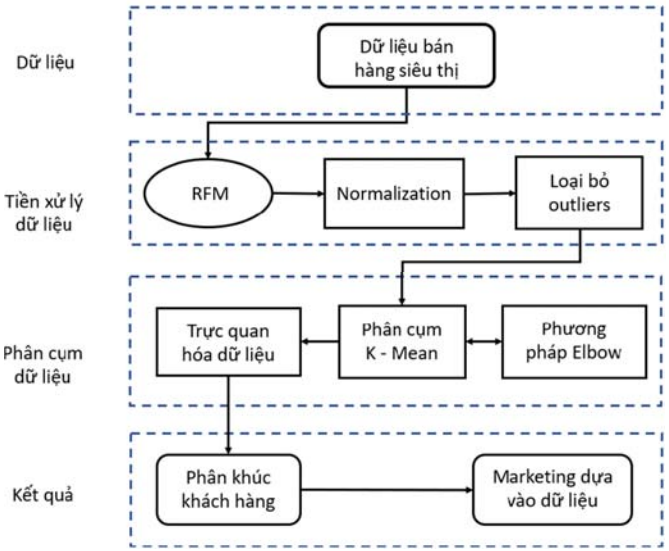
Business analytics:

- Analytics is the science of analysis – the processes by which we analyze data, draw conclusion, and **make decisions.**
- Business analytics is a data-driven decision-making approach to guide an organization in **business planning and effective decision making.**
- The **essence of analytics** lies in the application-making sense from the data **using prescribed methods of statistical analysis, mathematical and statistical models (Bayesian networks), and logic** to draw meaningful conclusion from the data.

1. Xử lý và phân tích những dữ liệu có sẵn → 2. Đưa ra những kết luận dựa trên kết quả phân tích dữ liệu → 3. Quyết định hành động cho doanh nghiệp

1.1 Introduction of Business Analytics

Phân khúc khách hàng dựa vào mô hình RFM



Source: Le Dien Tuan và cộng sự, hội thảo cấp quốc gia, CITA 2022

Decision making

Traditional approach: Decisions are made by observing and intuitive understanding of the situation at hand. However, human can be vulnerable to cognitive biases that lead them to make bad decisions

Data-driven approach: data-driven decision making is the practice where data is collected, analyzed, and decisions are made based on the insights which are derived from the collected information.

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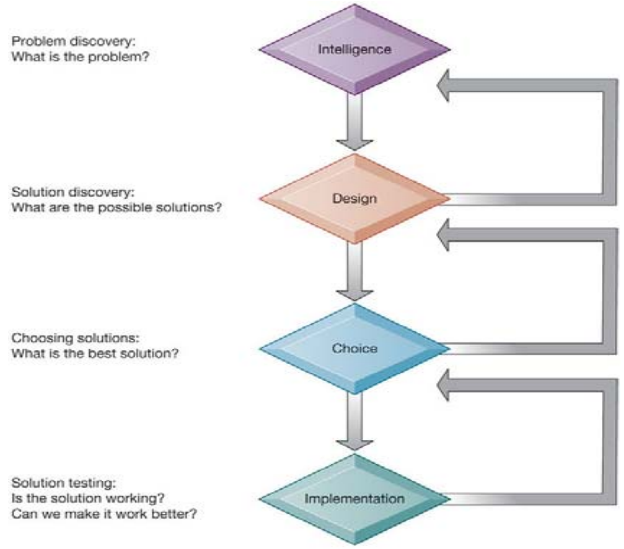
❖The decision-making process in business



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- The decision-making process in business
  - Intelligence
    - Discovering, identifying, and understanding the problems occurring in the organization
  - Design
    - Identifying and exploring solutions to the problem
  - Choice
    - Choosing among solution alternatives
  - Implementation
    - Making chosen alternative work and continuing to monitor how well solution is working

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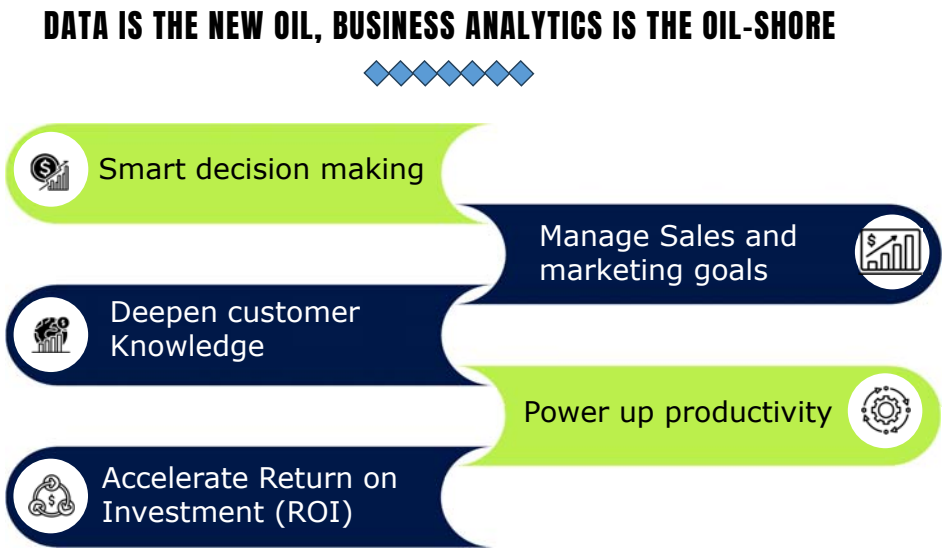

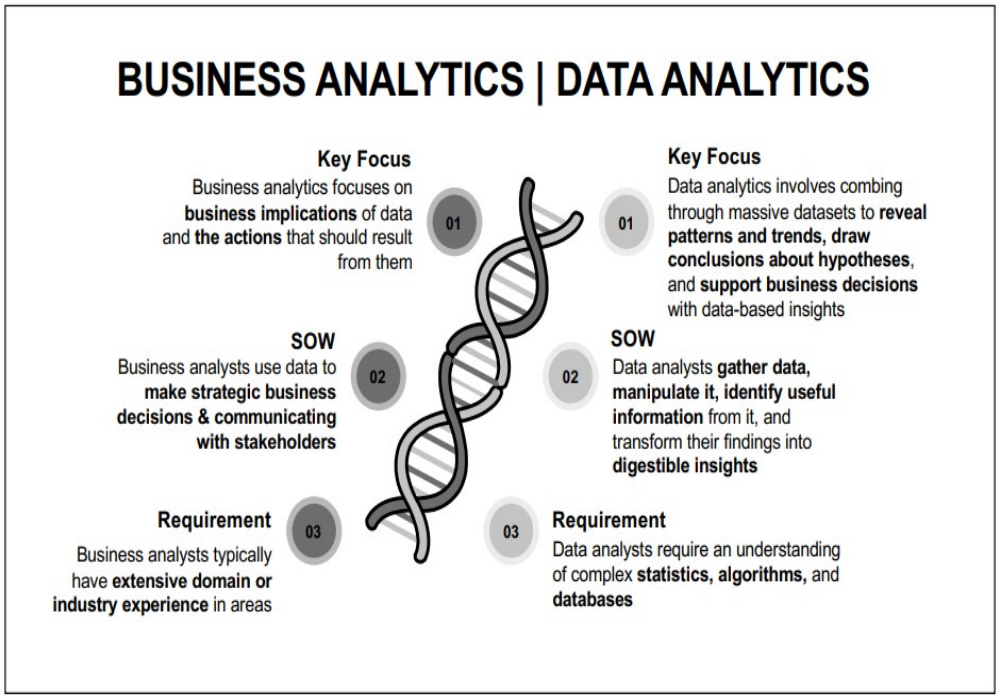

Statement of work (SOW)

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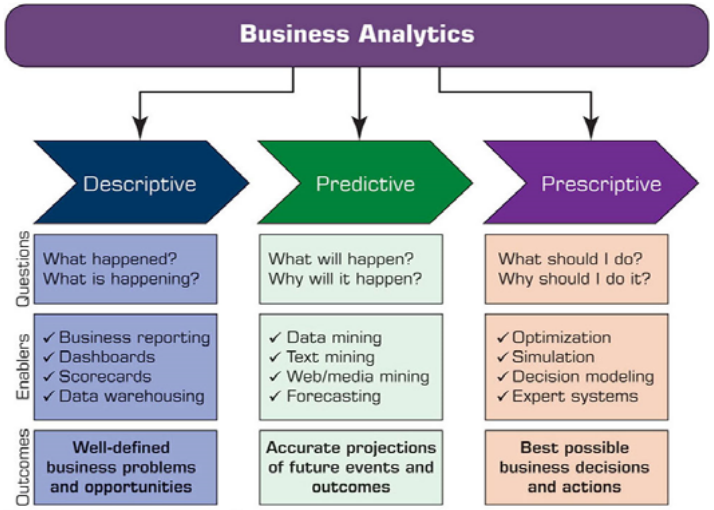
Analytics Overview



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Balance Scoreca

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- **Descriptive analytics**: Encompasses the set of techniques that describes ***what has happened in the past***; examples include:
  - Data queries: A request for information with certain characteristics from a database.
  - Reports.
  - Descriptive statistics.
  - Data visualization (including data dashboards).
  - Data-mining techniques.
  - …

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A Taxonomy for Data Mining

Data Mining Tasks and Methods	Data Mining Algorithms	Learning Type
Prediction		
Classification	Decision Trees, Neural Networks, Support Vector Machines, kNN, Naive Bayes, GA	Supervised
Regression	Linear/Nonlinear Regression, ANN, Regression Trees, SVM, kNN, GA	Supervised
Time series	Autoregressive Methods, Averaging Methods, Exponential Smoothing, ARIMA	Supervised
Association		
Market-Basket	Apriori, OneR, ZeroR, Eclat, GA	Unsupervised
Link Analysis	Expectation Maximization, Apriori Algorithm, Graph-Based Matching	Unsupervised
Sequence Analysis	Apriori Algorithm, FP-Growth, Graph-Based Matching	Unsupervised
Segmentation		
Clustering	K-means, Expectation Maximization (EM)	Unsupervised
Outlier Analysis	K-means, Expectation Maximization (EM)	Unsupervised

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Descriptive Analytics (cont.):

- **Data dashboards**: Collections of tables, charts, maps, and summary statistics **that are updated as new data become available.**
- Uses of dashboards:
  - To help **management monitor** specific aspects of the company's performance related to their decision-making responsibilities.
  - For **corporate-level managers**, daily data dashboards might summarize sales by region, current inventory levels, and other company-wide metrics.
  - **Front-line managers** may view dashboards that contain metrics related to staffing levels, local inventory levels, and short-term sales forecasts.

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Descriptive Analytics (cont.):

- **Data mining:** The use of analytical techniques for better understanding ***patterns and relationships*** that exist in large data sets.
- Examples of data-mining techniques include:
  - Cluster analysis.
  - Sentiment analysis.

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Predictive Analytics:

- **Predictive analytics:** Consists of techniques that ***use models*** constructed from past data to predict the future or ascertain the impact of one variable on another.
- **Survey data** and **past purchase behavior** may be used to help predict the market share of a new product.

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Predictive Analytics (cont.):

- Techniques used in Predictive Analytics include:
  - Linear regression.
  - Time series analysis.
  - Data mining is used to find ***patterns or relationships*** among elements of the data in a large database; often used in predictive analytics.
  - **Simulation** involves the use of probability and statistics to construct a ***computer model*** to study the impact of **uncertainty** on a decision.

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Prescriptive Analytics:

- **Prescriptive Analytics**: Indicates ***a best course of action*** to take:
  - A forecast or prediction, when combined with a rule, becomes a prescriptive model.
  - Prescriptive models that rely on a rule or set of rules are often referred to as **rule-based models.**
  - **Optimization models:** Models that give the best decision subject to constraints of the situation.
  - **Simulation optimization:** Combines the use of probability and statistics to **model uncertainty** with optimization techniques to find good decisions **in highly complex and highly uncertain settings.**

1.1 Introduction of Business Analytics – Sapo

1.1 Introduction of Business Analytics – Sapo

❖ **Sapo Data team**

- Quản lý và vận hành hệ thống kho dữ liệu doanh nghiệp
- Phân tích dữ liệu (phân tích kết quả kinh doanh,…)
- Xây dựng báo cáo BI
- Xây dựng data model
- AI-ML

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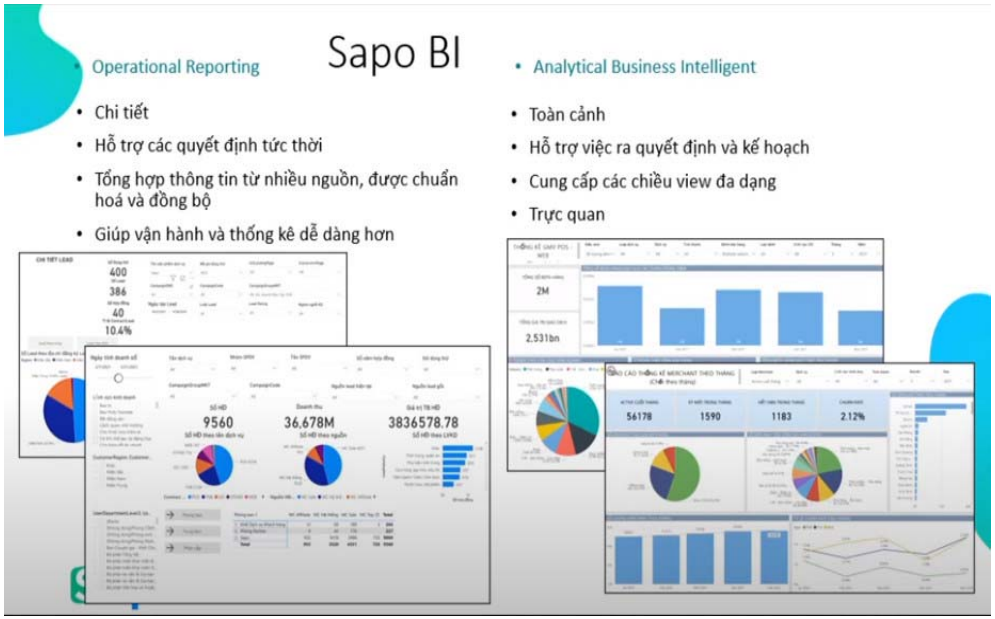

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❖ ***Phân tích tình huống để xác định loại phân tích***

Tình huống 1: Nhà bán lẻ thường nghiên cứu mối quan hệ giữa doanh số bán hàng với giá, phiếu giảm giá và quảng cáo để dự đoán doanh số bán. Theo Anh (Chị) vấn đề cần giải này thuộc loại phân tích gì? Vì sao?

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❖ ***Tình huống 1:***

Tuần	Giá ($)	Phiếu giảm giá (0,1)	Quảng cáo ($)	Doanh số cửa hàng 1 (Đơn vị)	Doanh số cửa hàng 2 (Đơn vị)	Doanh số cửa hàng 3 (Đơn vị)
1	6,99	0	0	501	510	481
2	6,99	0	150	772	748	775
3	6,99	1	0	554	528	506
4	6,99	1	150	838	785	834
5	6,49	0	0	521	519	500
6	6,49	0	150	723	790	723
7	6,49	1	0	510	556	520
8	6,49	1	150	818	773	800
9	7,59	0	0	479	491	486
10	7,59	0	150	825	822	757
11	7,59	1	0	533	513	540
12	7,59	1	150	839	791	832
13	5,49	0	0	484	480	508
14	5,49	0	150	686	683	708
15	5,49	1	0	543	531	530
16	5,49	1	150	767	743	779

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❖ ***Tình huống 1:***

ANOVA

	df	SS	MS	F	Significance F
Regression	3	2561694.739	853898.2	198.1463	1.74544E-10
Residual	12	51713.19831	4309.433		
Total	15	2613407.938			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	**1105.55**	144.3964608	7.65637	5.88E-06	790.939934	1420.165657	790.939934	1420.165657
Giá ($)	**56.18**	21.32091838	2.634791	0.021782	9.721869839	102.6304508	9.721869839	102.6304508
Phiếu giảm giá (0,1)	**123.88**	32.82313663	3.774015	0.002652	52.3595288	195.3904712	52.3595288	195.3904712
Quảng cáo ($)	**5.24**	0.218820911	23.94271	1.69E-11	4.762396859	5.715936475	4.762396859	5.715936475

- **Mô hình:** Tổng doanh số = 1105,55+56,18 x Giá + 123,88 x Phiếu giảm giá + 5,24 x Quảng cáo
- Nếu giá là $6,99 kết hợp với việc không phát phiếu giảm giá và không thực hiện quảng cáo (thử nghiệm tương ứng với tuần 1) thì mô hình ước tính doanh số bán hàng là:

Tổng doanh số = 1105,55+56,18 x 6,99 + 123,88 x 0 + 5,24 x 0 = 1498,25 đơn vị

1.1 Introduction of Business Analytics

❖ ***Tình huống 2:***

Giả sử nhà sản xuất tự sản xuất sản phẩm thì chi phí cho một đơn vị sản phẩm là $125, cộng với chi phí cố định là $50.000. Nếu nhà sản xuất thuê ngoài thì chi phí thuê ngoài cho một đơn vị sản phẩm là $175. Theo Anh (Chị) vấn đề cần giải này thuộc loại phân tích gì? Vì sao?

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❖ ***Tình huống 2:***

- Chi phí sản xuất: $125/đơn vị sản phẩm, cộng với chi phí cố định $50.000
- Chi phí thuê ngoài: $175/ đơn vị sản phẩm
- Hàm tổng chi phi (TC) cho tự sản xuất: $125 x Q + $50.000
- Hàm tổng chi phi (TC) cho thuê ngoài : $175 x Q
- Điểm hòa vốn: TC cho tự sản xuất = TC cho thuê ngoài

  $125 x Q + $50.000 = $175 x Q => Q = 1.000

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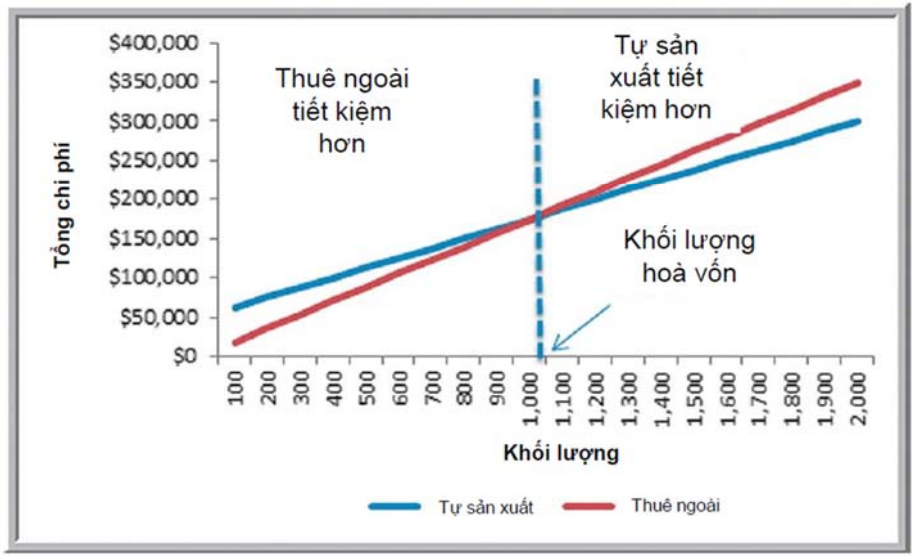
❖ *Tình huống 2:*



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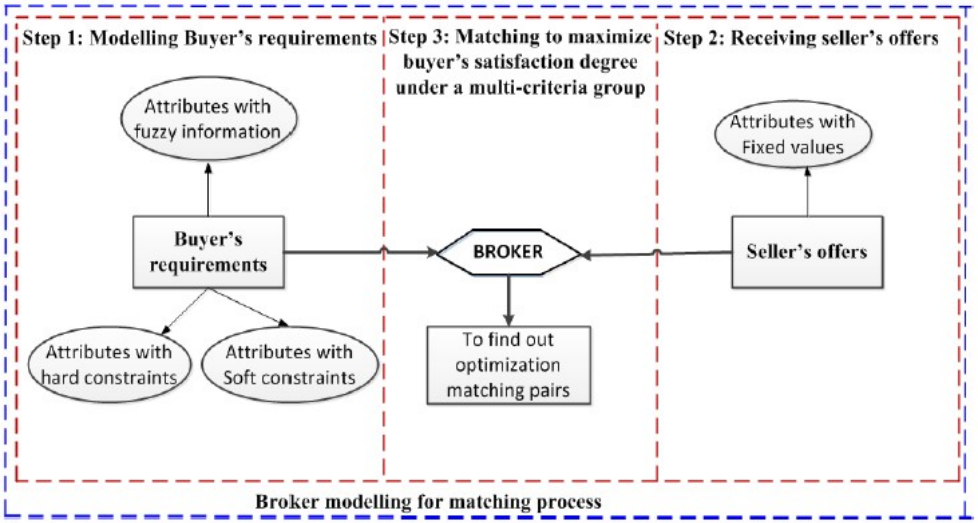
❖ *Tình huống 3:*



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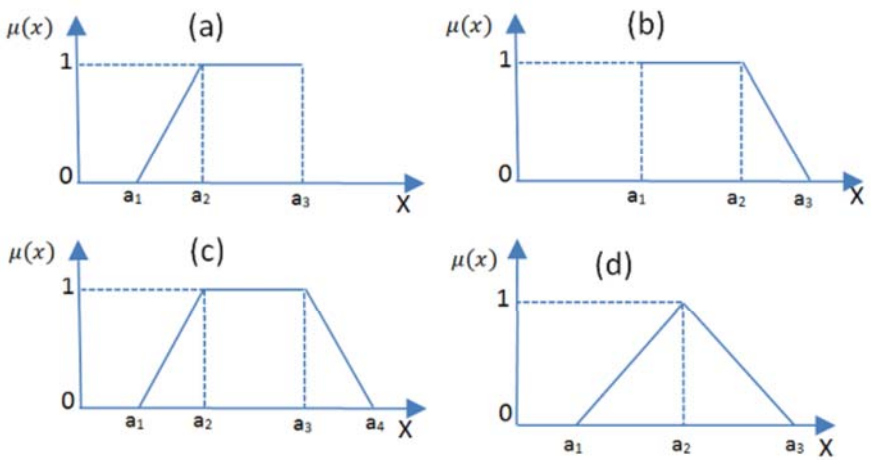
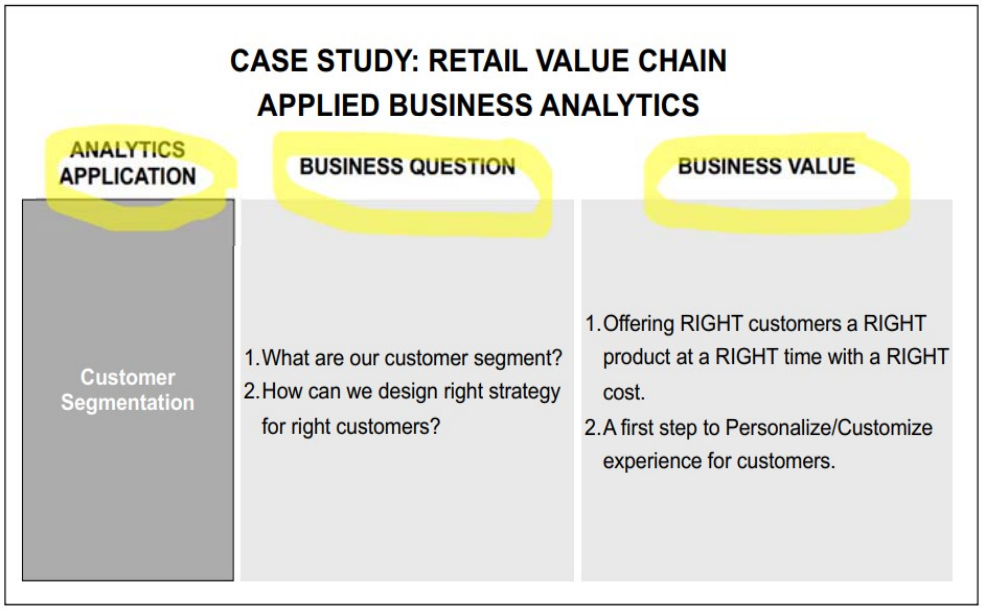
❖ *Tình huống 3:*

There are some popular fuzzy numbers to express buyers' behaviors through fuzzy membership in business environments



1.2 Case study of Business Analytics



1.2 Case study of Business Analytics

CASE STUDY: RETAIL VALUE CHAIN APPLIED BUSINESS ANALYTICS

ANALYTICS APPLICATION	BUSINESS QUESTION	BUSINESS VALUE
Store Layout	1. How should I do store layout for better topline? 2. How can I increase in-store customer experience?	1. Understand the association of products to decide store layout which fit with customer needs. 2. Workforce deployment can be planned for better customer interactivity resulting in customer satisfaction increase.

1.3 Business analytics success - organization

BUSINESS ANALYTICS SUCCESS

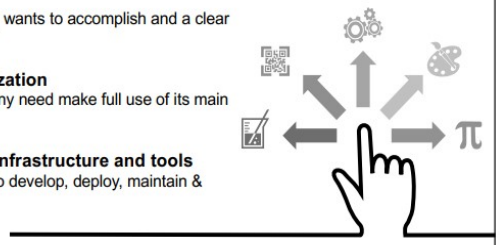
Build a Data-driven mindset & culture
The whole company (from business managers to operations professionals & staffs) need to have a consensus view on the role of data & analytics.

Expand the analytical power of leadership
Business managers must update their analytical skills and become leaders in this field.

Have a clear strategy & roadmap
Company need a strategy of what it is the company wants to accomplish and a clear roadmap to achieve it.

Data need to be transparent across organization
To make information trustful and actionable, company need make full use of its main assets. *'Two half truths do not make a truth'.*

Invest for right people & right technology infrastructure and tools
Company need a professional team with right tool to develop, deploy, maintain & enhance BA systems.



1.4 Business analytics success - Individual

ANALYTICS JOURNEY

Identify Business Questions
- Define Business problems or opportunities
- Formulate research questions
- Plan data analytics approach

Data source
- Plan data collection
- Determine data set
- Collect & validate data

Analyze data
- Prepare & Explore data
- Perform data analysis

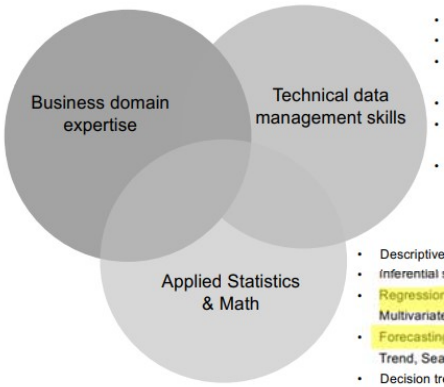
Interpret & visualize
- Derive Insights from data
- Communicate findings

Use results to influence decision making
- Recommend action
- Develop Implementation plan
- Manage change

1.4 Business analytics success - Individual

SKILL & KNOWLEDGE BUSINESS ANALYTICS

- Business domain: Industry & Department
- Analytics skill
- Critical thinking
- Problem solving skill
- Storytelling/ Presentation skill



- EDA (Exploratory data analysis) process
- Data wrapping/ mining
- Database management & processing tool (Excel, SQL…)
- Big data tools (Spark, Apache Hadoop…)
- Visualization tool (Powerpoint, BI tool (Power BI, Tableau…)
- Advanced data analysis tool (Python/ R…)

- Descriptive statistics
- Inferential statistics (hypothesis testing…)
- Regression (Logistics, Linear regression, Multivariate Regression…)
- Forecasting (Time series forecasting, E.T.S (Error, Trend, Seasonality), AR.I.MA models
- Decision tree, K-means, KNN, Naive Bayes classifier….

1.4 Business analytics success - Individual

MEET NATASHA

- Love data & analysis
- High self-learning spirit
- Can-do attitude
- Patience and Perseverance

Hỏi & Đáp

Cám ơn các bạn đã lắng nghe!