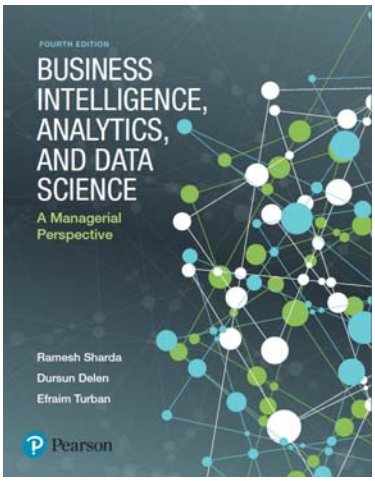
# Business Intelligence, Analytics, and Data Science: A Managerial Perspective

Fourth Edition




## Chapter 1

An Overview of Business Intelligence, Analytics, and Data Science

Pearson

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## Learning Objectives

**1.1** Understand the need for computerized support of managerial decision making

**1.2** Recognize the evolution of such computerized support to the current state—analytics/data science

**1.3** Describe the business intelligence (BI) methodology and concepts

**1.4** Understand the various types of analytics, and see selected applications

**1.5** Understand the analytics ecosystem to identify various key players and career opportunities

Pearson



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# OPENING VIGNETTE Sports Analytics—
## An Exciting Frontier for Learning and Understanding
## Applications of Analytics (1 of 5)

- Sports analytics is becoming a specialty within analytics
- Sports is a big business
  - Generating $145B in revenues annually
  - Additional $100B in legal and $300B in illegal gambling
- Analytic in sports popularized by the *Moneyball* book by Michael Lewis in 2003
  - About Oakland A's
  - And the follow-on movie in 2011
- Nowadays, analytics is used in many facets of sports


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# OPENING VIGNETTE Sports Analytics—
## An Exciting Frontier for Learning and Understanding
## Applications of Analytics (2 of 5)

### Example 1: The Business Office

- FIGURE 1.1 Season Ticket Renewals—Survey Scores

| Tier | Highly Likely | Likely | Maybe | Probably Not | Certainly Not |
|---|---|---|---|---|---|
| 1 | 92 | 88 | 75 | 69 | 45 |
| 2 | 88 | 81 | 70 | 65 | 38 |
| 3 | 80 | 76 | 68 | 55 | 36 |
| 4 | 77 | 72 | 65 | 45 | 25 |
| 5 | 75 | 70 | 60 | 35 | 25 |


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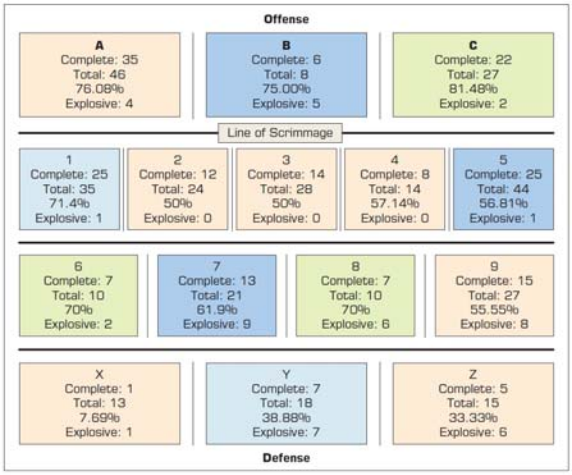
# OPENING VIGNETTE Sports Analytics—
## An Exciting Frontier for Learning and Understanding
## Applications of Analytics (3 of 5)

### Example 2: The Coach

- FIGURE 1.4 Heat Map Zone Analysis for Passing Plays





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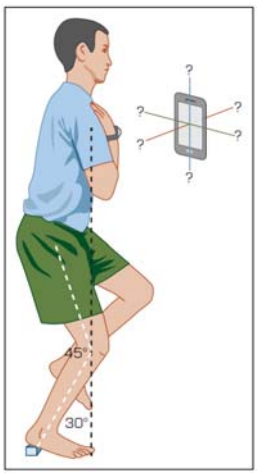
# OPENING VIGNETTE Sports Analytics—
## An Exciting Frontier for Learning and Understanding
## Applications of Analytics (4 of 5)

### Example 3: The Trainer

- FIGURE 1.7 Single Leg Squat Hold Test – Core Body Strength Test

  (Source: WILKERSON and GUPTA).





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# OPENING VIGNETTE Sports Analytics—
## An Exciting Frontier for Learning and Understanding Applications of Analytics (5 of 5)

**Discussion Questions**

1. What are three factors that might be part of a PM for season ticket renewals?
2. What are two techniques that football teams can use to do opponent analysis?
3. How can wearables improve player health and safety? What kinds of new analytics can trainers use?
4. What other analytics applications can you envision in sports?


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# Changing Business Environments and Evolving Needs for Decision Support and Analytics

- Increased hardware, software, and network capabilities
- Group communication and collaboration
- Improved data management
- Managing giant data warehouses and Big Data
- Analytical support
- Overcoming cognitive limits in processing and storing information
- Knowledge management
- Anywhere, anytime support


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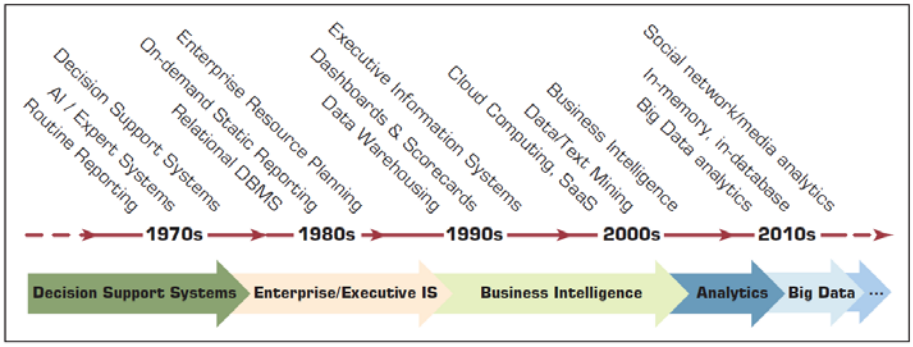
## Evolution of Computerized Decision Support to Analytics/Data Science

- FIGURE 1.8 Evolution of Decision Support, Business Intelligence, and Analytics





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## A Framework for Business Intelligence

- DSS → EIS → BI
- Definition of Business Intelligence
  - [Broad Definition] An umbrella term that combines architectures, tools, databases, analytical tools, applications, and methodologies
  - [Narrow Definition] Descriptive analytics tools and techniques (i.e., reporting tools)
- A Brief History of BI – 1970s → 1980s → 1990s …
- The Origins and Drivers of BI (See Figure 1.9)
- The Architecture of BI (See Figure 1.10)


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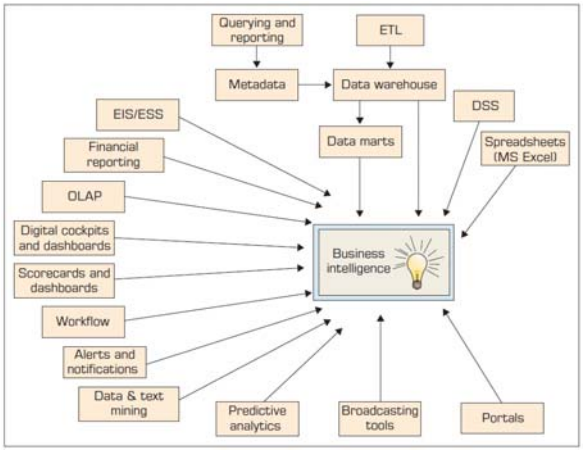
# A Framework for Business Intelligence

- **FIGURE 1.9** Evolution of Business Intelligence (BI) →





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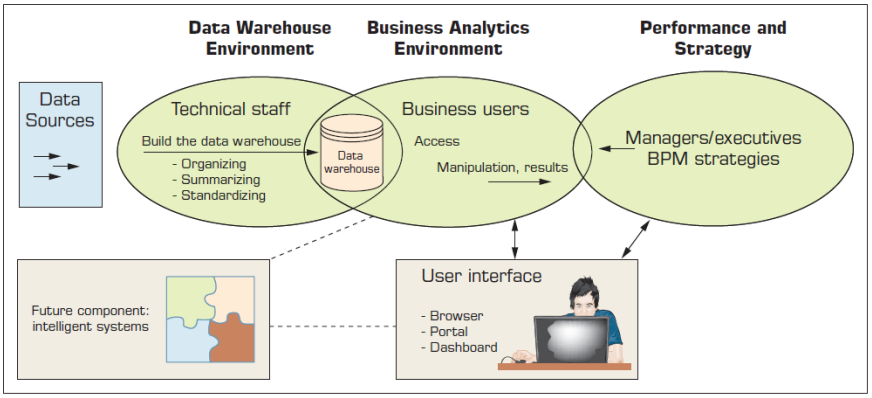
# A Framework for Business Intelligence

- The Architecture of BI
- **FIGURE 1.10** A High-Level Architecture of BI





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# Application Case 1.1

## Sabre Helps Its Clients through Dashboards and Analytics

**Questions for Discussion**

1. What is traditional reporting? How is it used in the organization?
2. How can analytics be used to transform the traditional reporting?
3. How can interactive reporting assist organizations in decision making?


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# A Multimedia Exercise in Business Intelligence

- TUN (TeradataUniversityNetwork.com)
  - BSI Videos (Business Scenario Investigations)
    - Analogues to CSI (Crime Scene Investigation)
- Go To
  - www.youtube.com/watch?v=NXEL5F4_aKA
- See the
  - www.slideshare.net/teradata/bsi-how-we-did-it-the-case-of-the-misconnecting-passengers.slides
- Discuss the case presented in the video and in the slides


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## Transaction Processing versus Analytic Processing

- Online Transaction Processing (OLTP)
  - Operational databases
  - ERP, SCM, CRM, …
  - Goal: data capture
- Online Analytical Processing (OLAP)
  - Data warehouses
  - Goal: decision support
- What is the relationship between OLTP and OLAP?


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## Appropriate Planning and Alignment with the Business Strategy

- Planning and Execution → Business, Organization, Functionality, and Infrastructure
- Functions served by BI Competency Center
  - How BI is linked to strategy and execution of strategy
  - Encourage interaction between the potential business user communities and the IS organization
  - Serve as a repository and disseminator of best BI practices between and among the different lines of business.
  - Standards of excellence in BI practices can be advocated and encouraged throughout the company


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## Real-Time, On-Demand BI Is Attainable

- Emergence of real-time BI applications
- Justifying the need
  - Is there a need for real-time [is it worth the additional expense]?
- Leveraging the enablers
  - RFID
  - Web services
  - Intelligent agents


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## Critical BI System Considerations

- Developing or Acquiring BI Systems
  - Make versus buy
  - BI shells
- Justification and Cost–Benefit Analysis
  - A challenging endeavor, why?
- Security
- Protection of Privacy
- Integration to Other Systems and Applications


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## Analytics Overview

- Analytics…a relatively new term/buzz-word
- Analytics…the process of developing actionable decisions or recommendations for actions based on insights generated from historical data
- According to the Institute for Operations Research and Management Science (INFORMS)
  - Analytics represents the combination of computer technology, management science techniques, and statistics to solve real problems.


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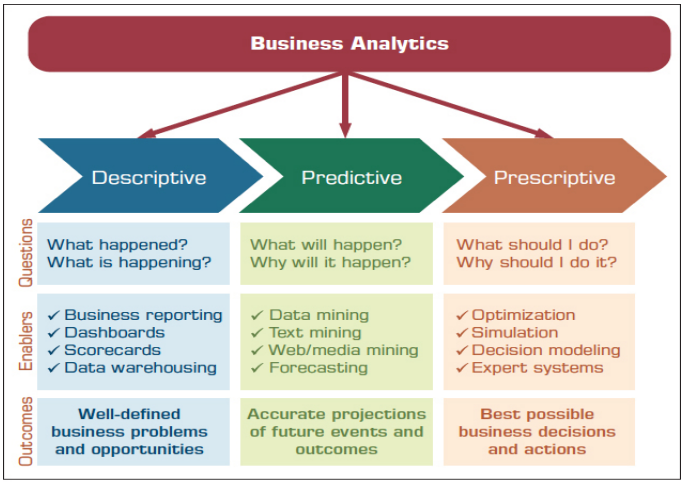
## Business Analytics

- FIGURE 1.11 Three Types of Analytics

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## Descriptive Analytics

- Descriptive or reporting analytics
- Answering the question of what happened
- Retrospective analysis of historic data
- Enablers
  - OLAP / DW
  - Data visualization
    - Dashboards and Scorecards
  - Descriptive statistics


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## Application Case 1.2

### Silvaris Increases Business with Visual Analysis and Real-Time Reporting Capabilities

**Questions for Discussion**

1. What was the challenge faced by Silvaris?
2. How did Silvaris solve its problem using data visualization with Tableau?


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# Application Case 1.3
## Siemens Reduces Cost with the Use of Data Visualization

**Questions for Discussion**

1. What challenges were faced by Siemens' visual analytics group?
2. How did the data visualization tool Dundas BI help Siemens in reducing cost?


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# Predictive Analytics

- Aims to determine what is likely to happen in the future (foreseeing the future events)
- Looking at the past data to predict the future
- Enablers
  - Data mining
  - Text mining / Web mining
  - Forecasting (i.e., time series)


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# Application Case 1.4
## Analyzing Athletic Injuries

**Questions for Discussion**

1. What types of analytics are applied in the injury analysis?
2. How do visualizations aid in understanding the data and delivering insights into the data?
3. What is a classification problem?
4. What can be derived by performing sequence analysis?


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# Prescriptive Analytics

- Aims to determine the best possible decision
- Uses both descriptive and predictive to create the alternatives, and then determines the best one
- Enablers
  - Optimization
  - Simulation
  - Multi-Criteria Decision Modeling
  - Heuristic Programming
- Analytics Applied to Many Domains
- Analytics or Data Science?


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# Application Case 1.5

## A Specialty Steel Bar Company Uses Analytics to Determine Available-to-Promise Dates

**Questions for Discussion**

1. Why would reallocation of inventory from one customer to another be a major issue for discussion?
2. How could a DSS help make these decisions?


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# Analytics Examples in Selected Domains

- Analytics Application in HealthCare—Humana Examples
  - Example 1: Preventing Falls in a Senior Population—An Analytic Approach
  - Example 2 : Humana's Bold Goal—Application of Analytics to Define the Right Metrics
  - Example 3: Predictive Models to Identify the Highest Risk Membership in a Health Insurer


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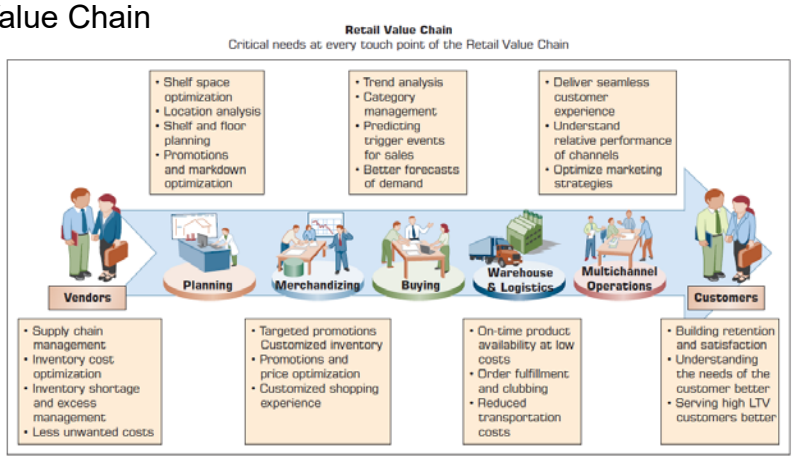
# Analytics Examples in Selected Domains

- Analytics in Retail Value Chain
- FIGURE 1.12 Example of Analytics Applications in a Retail Value Chain





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# Analytics Examples in Retail Value Chain

**TABLE 1.1 Examples of Analytics Applications in the Retail Value Chain**

| Analytic Application | Business Question | Business Value |
|---|---|---|
| Inventory Optimization | 1. Which products have high demand?<br>2. Which products are slow moving or becoming obsolete? | 1. Forecast the consumption of fast-moving products and order them with sufficient inventory to avoid stock out scenario.<br>2. Perform fast inventory turnover of slow-moving products by combining them with one in high demand. |
| Price Elasticity | 1. How much net margin do I have on the product?<br>2. How much discount can I give on this product? | 1. Markdown prices for each product can be optimized to reduce the margin dollar loss.<br>2. Optimized price for the bundle of products is identified to save the margin dollar. |
| Market Basket Analysis | 1. What products should I combine to create a bundle offer?<br>2. Should I combine product based on slow-moving and fast-moving characteristic?<br>3. Should I create bundle from the same category or different category line? | 1. The affinity analysis identifies the hidden correlations between the products, which can help in following values:<br>a) Strategize the product bundle offering based on focus on Inventory or Margin.<br>b) Increase cross sell or up-sell by creating bundle from different categories or the same categories, respectively. |

- For the complete table, refer to your textbook


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## A Brief Introduction to Big Data Analytics

- What Is Big Data? (Is it just "big"?)
  - Big Data is data that cannot be stored or processed easily using traditional tools/means
  - Big Data typically refers to data that comes in many different forms: large, structured, unstructured, continuous
    - 3Vs – Volume, Variety, Velocity
  - Data (Big Data or otherwise) is worthless if it does not provide business value (and for it to provide business value, it has to be analyzed)
- More on Big Data Analytics is in Chapter 7


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## Application Case 1.6

### CenterPoint Energy Uses Real-Time Big Data Analytics to Improve Customer Service

**Questions for Discussion**

1. How can electric companies predict possible outage at a location?
2. What is customer sentiment analysis?
3. How does customer sentiment analysis help provide a personalized service to their customers?


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## An Overview of the Analytics Ecosystem

- What are the key players in analytics industry?
- What do they do?
- Is there a place for you to be a part of it?
- There is a need to classify different industry participants in the broader view of analytics to
  - Identify providers (as an analytics consumer)
  - Identify roles to play (as a potential provider)
  - Identify job opportunities
  - Identify investment/entrepreneurial opportunities
  - Understand the landscape and the future of computerized decision sport systems


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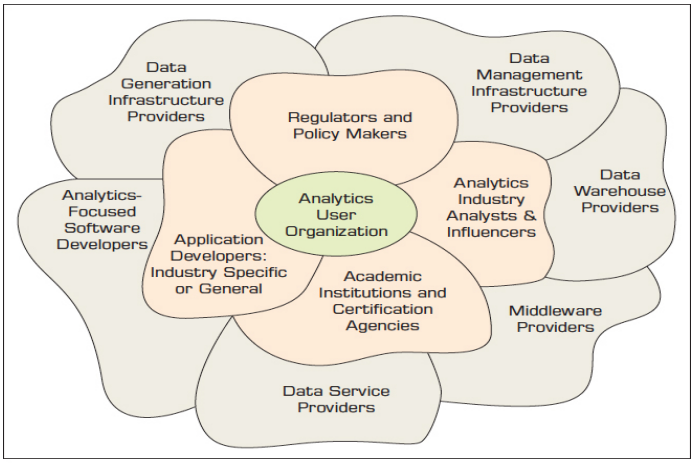
## An Overview of the Analytics Ecosystem

- FIGURE 1.13 Analytics Ecosystem

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## An Overview of the Analytics Ecosystem

- Data Generation Infrastructure Providers
- Data Management Infrastructure Providers
- Data Warehouse Providers
- Middleware Providers
- Data Service Providers
- Analytics Focused Software Developers
  - Descriptive, Predictive, Prescriptive
- Application Developers: Industry Specific or General
- Analytics Industry Analysts and Influencers


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## An Overview of the Analytics Ecosystem

- Academic Institutions and Certification Agencies
  - Certificates
  - Masters programs
  - Undergraduate programs
  - Offered by
    - MIS, Engineering
    - Marketing, Statistics
    - Computer Science
    - …
- Regulators and Policy Makers
- Analytics User Organizations



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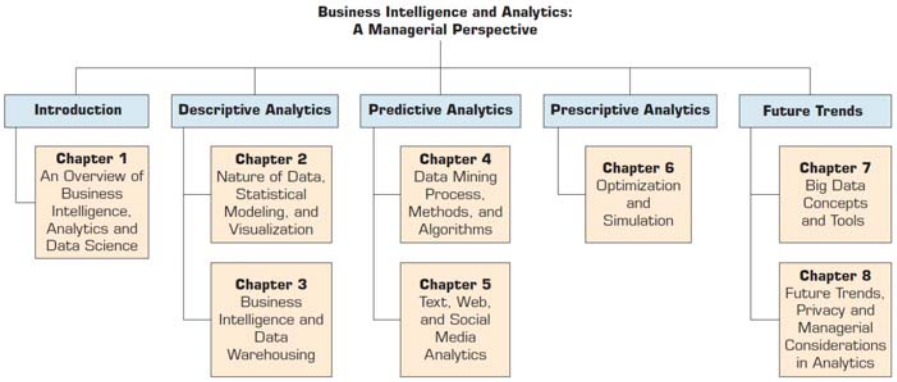
# Plan of the Book




- FIGURE 1.15 Plan of the Book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# Resources

- Teradata University Network (TUN)



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# End of Chapter 1

- Questions / Comments


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