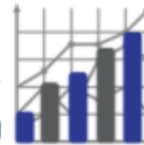




# BUSINESS ANALYTICS & INDUSTRIAL ENGINEERING



## Achieving Excellence in System Integration & Data Science World

### NASA Quality Leadership Forum

Diala T. Gammoh, PhD. , ASQ CSSBB

Manager, Revenue Management and Data Science

Universal Orlando

March 14, 2019

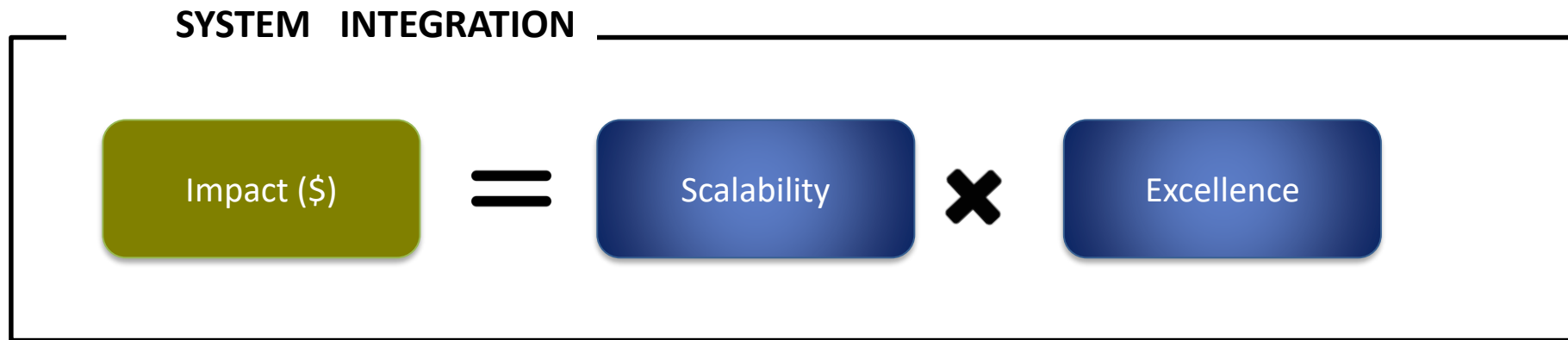
# Agenda

- **Introduction**
- **System Integration**
- **Data Acquisition**
- **Data Preparation**
- **Data Modeling**
- **Visualization**

# Overview

## Definitions

- System Integration: the ability to integrate multiple components together in one system to achieve certain functionality
- Excellence: the ability to integrate all these components with a smooth transition of data on a large scale
- Big Challenge: real time integration versus accuracy



### Scalability

The capability of a system to handle the growing amount of business growth

### Excellence

The ability to implement value added activities through the use of methods that allow early detection of possible failures

# How Data Analytics Touch Your Vacation



## Before you Arrive

Advance booking  
Planning and Forecasting

## As you Arrive

Parking Services  
Entrance Operations



## Play in our Resorts

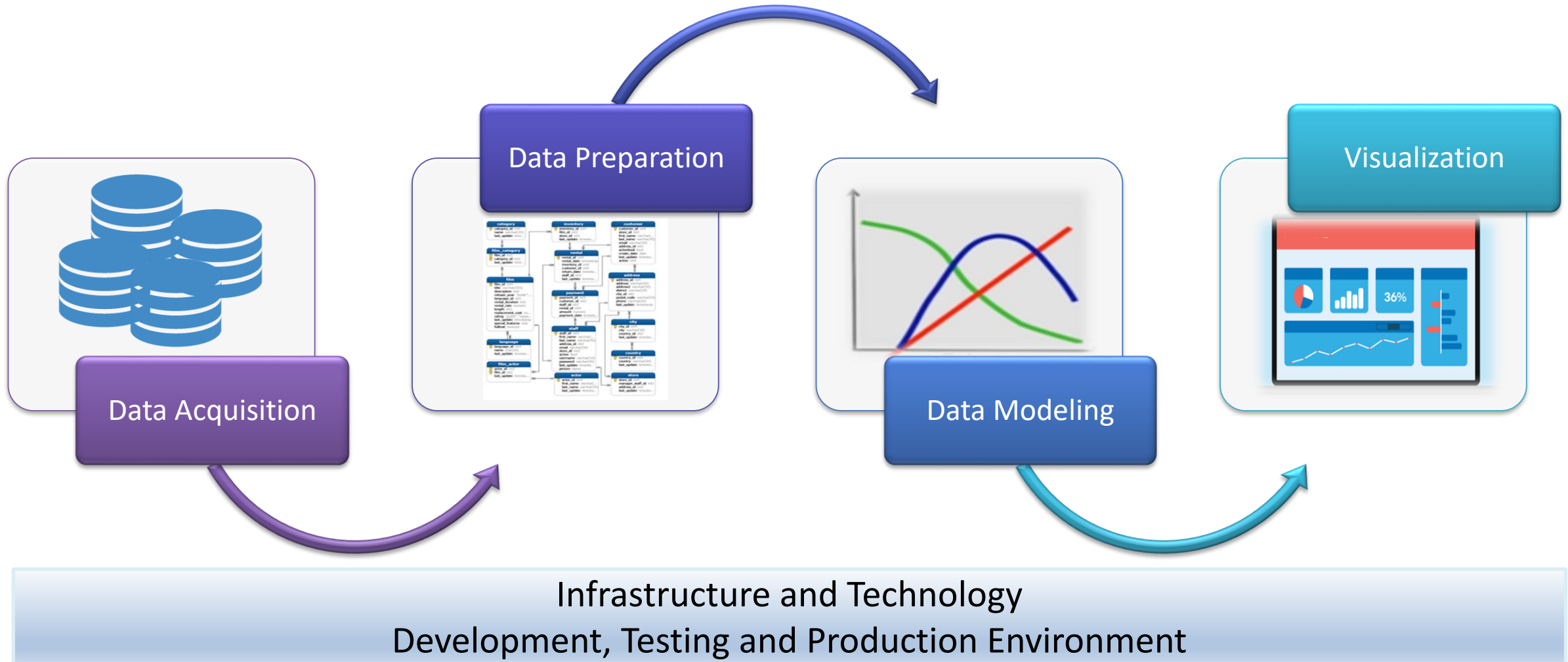
Attractions  
Food & Beverage  
Merchandise  
Park Services  
Entertainment

## Behind the Scenes

Pricing  
Wardrobe  
Technical Services  
Information Technology  
Skin Shop

# The 3 C's Architecture

Collect   ●   Converge   ●   Consume

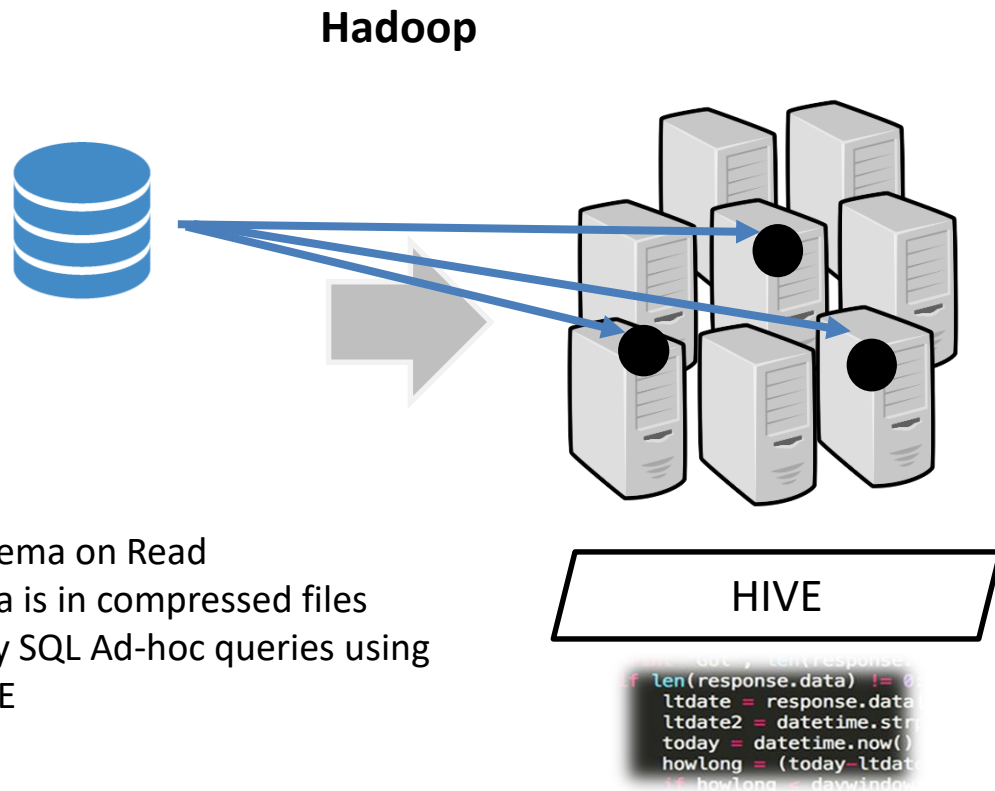


Infrastructure and Technology  
Development, Testing and Production Environment

# Data Acquisition

## Challenges

- Multiple data sources with unstructured data format
- Table design and relationships, short vs. long design
- Scheduling and execution time
- Set up quality control checks (alerts)
- Exception handling procedure
- Technology



- Schema on Read
- Data is in compressed files
- Easy SQL Ad-hoc queries using HIVE

## SQL



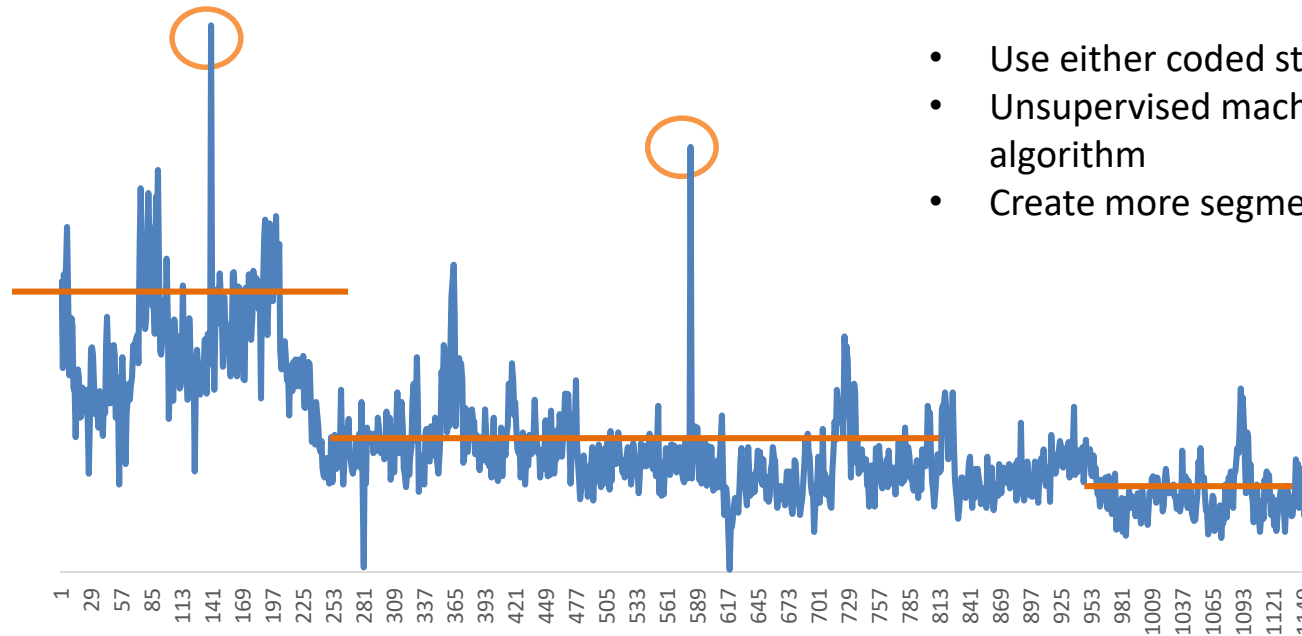
- Schema on Write
  - Information on hand before moving the data
- Data stored in logical form

# Data Preparation and Cleansing

## Challenges

- An enormous increase in the availability of streaming, time-series data
- Process data in real time, not in batches
- Detect anomalies; outliers and significant shifts over time

**Early anomaly detection is valuable, yet it can be difficult to execute reliably in practice**



- Use either coded statistical measures
- Unsupervised machine learning anomaly detection algorithm
- Create more segmentation upfront

# Modeling and Predictive Analytics

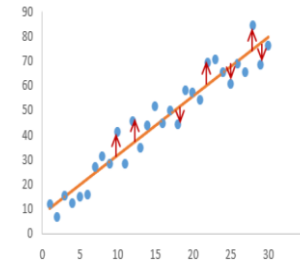
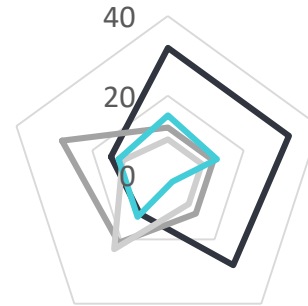
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## Applications

- Personalization; customize offerings for our guests based on their past purchases and interests
  - More bundling and offerings
  - Upsell and Cross sell
- Revenue Management and Pricing
  - Optimal and dynamic pricing at the park

## Approaches:

- Supervised Machine Learning Algorithms
  - Regression
  - Classification and Regression Trees
- Unsupervised Machine Learning Algorithms
  - Clustering; K-Means
  - Nearest neighbors



## Conventional Statistical Predictive Modeling

- One time or in batches
- Statistical assumptions are more controlled
- Reliable

## Machine Learning

- Real time
- More efficient on large scale
- More effort on anomaly and outliers detection
- More segmentation upfront
- Reliable



# Visualization – Business Intelligence

## Challenges

- Understanding Customer Requirements
- Interface Design
- Visual Design
- Correct KPIs

## Criteria to Consider

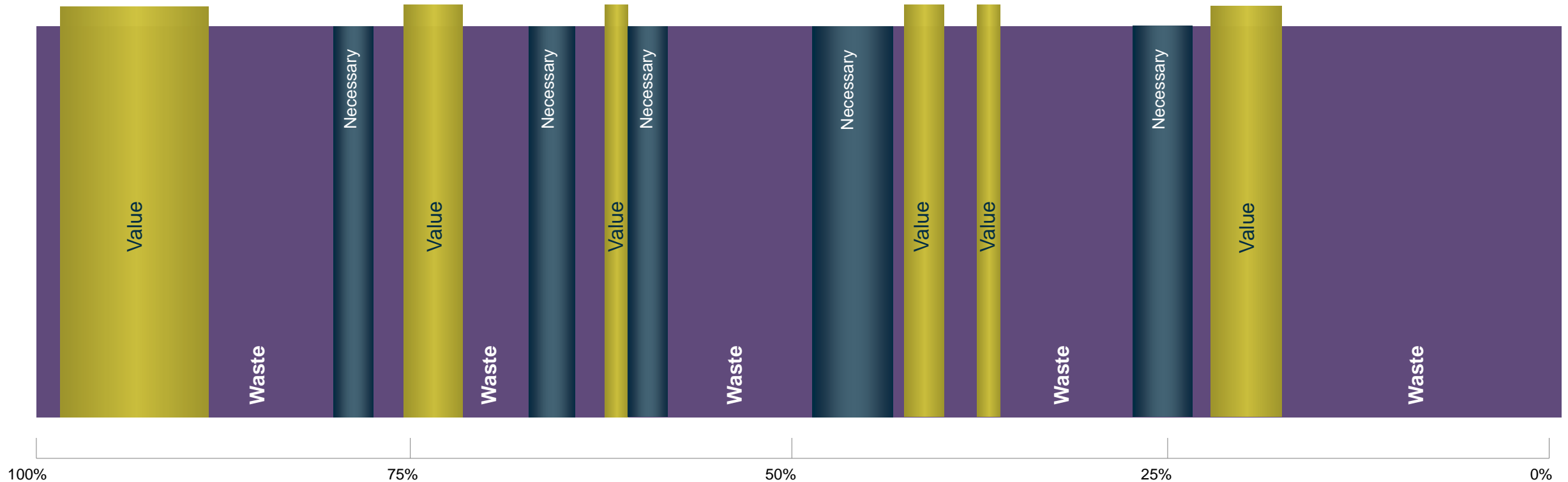
- Easy to set up
- Interactive; can write to a data warehouse
- Ability to share
- Security
- Price and maintenance cost



Microsoft power BI



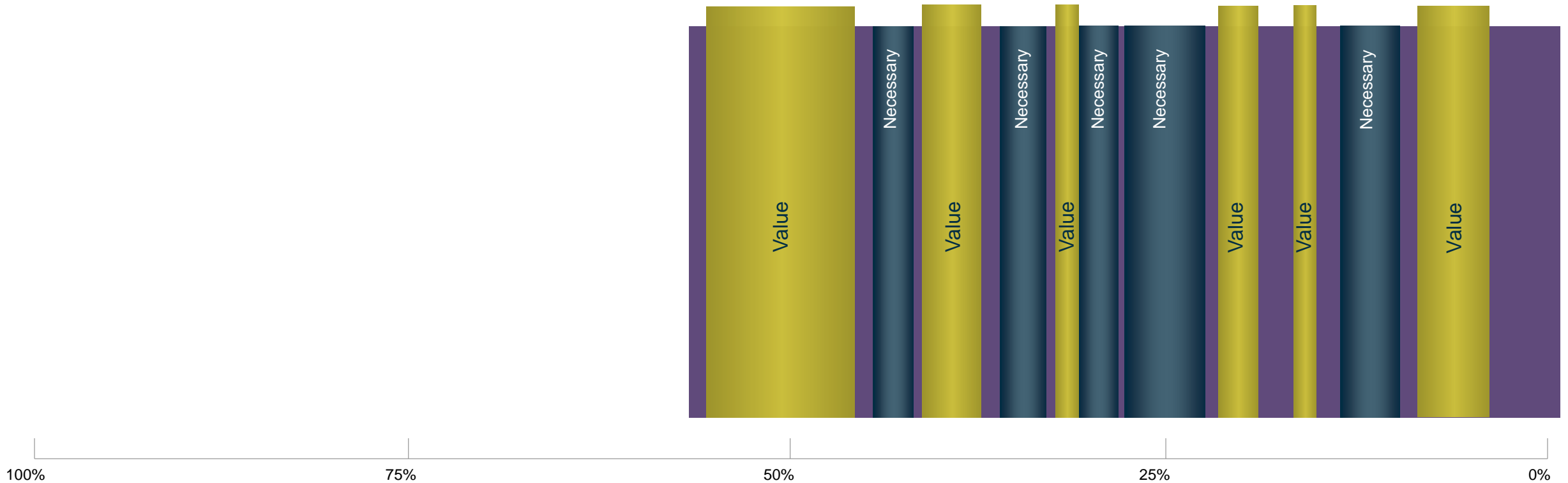
# How to create a Lean System?



## How much "waste" in the current system?

- Adjusts
- Assigns
- Collects
- Copies/Backups
- Eliminates
- Update
- Data UpLoads
- Verify
- Wait For
- Reviews
- Approves
- Maintains
- Measures
- Requests
- Manual Updates

# How to create a Lean System?



- **Shorter cycle time** for every process
- A process that is much more focused on **value-adding** activities
- Meet **client's time line** for price recommendations