

Data Navigation and Data Driven Strategies







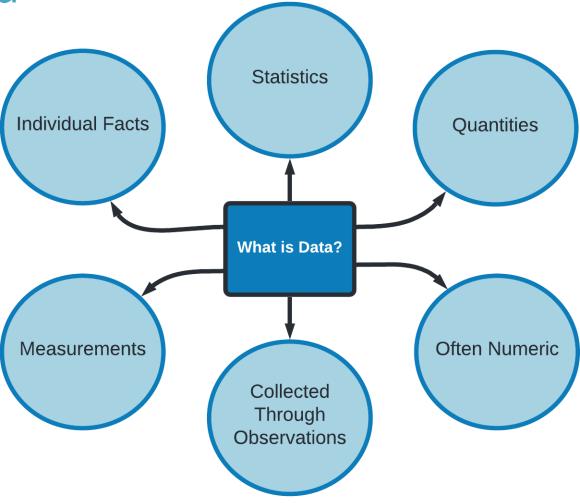
What is data?

Defining data types and data structures





Defining Data







Defining Data Types

Quantitative

- Numerical
- The type of data whose value is measured in the form of counts or numbers where each data-set has a unique numerical value associated with it.
- Express a certain quantity, amount, or range
- Can apply mathematical operations

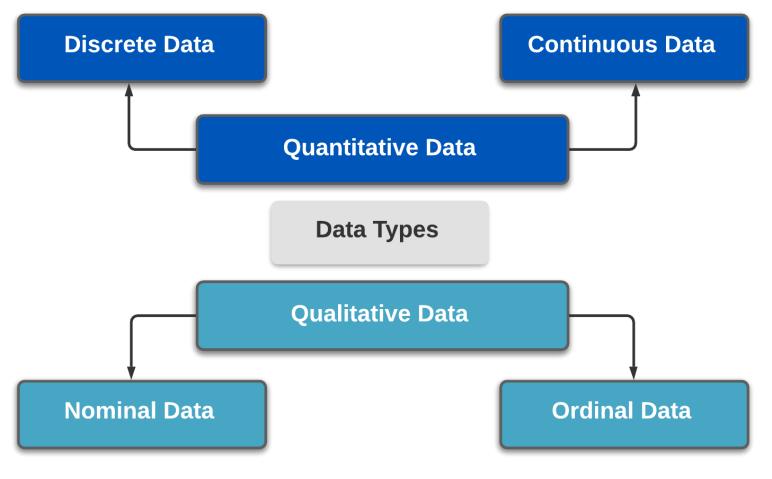
Qualitative

- Categorical
- Descriptive data based on observations
- Categorical data is what numeric data is about
- Can take on numerical values, but those numbers don't have mathematical meaning





Defining Data Types



Quantitative

- **Discrete** (counted)
 - Number of Ferms
- Continuous (measured)
 - HPLC readings

Qualitative

- Nominal mutually exclusive labeled categories
 - Phase
- Ordinal ordered series
 - Batch#





Defining Data Structure

Structured Data

- Conforms to a tabular format with relationship between the different rows and columns
- Comprised of clearly defined data types with patterns that make them easily searchable
- Common Example: Excel files

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Unstructured Data

- "everything else"
- Comprised of data that is not as easily searchable
- Includes audio, video, text streams, pictures









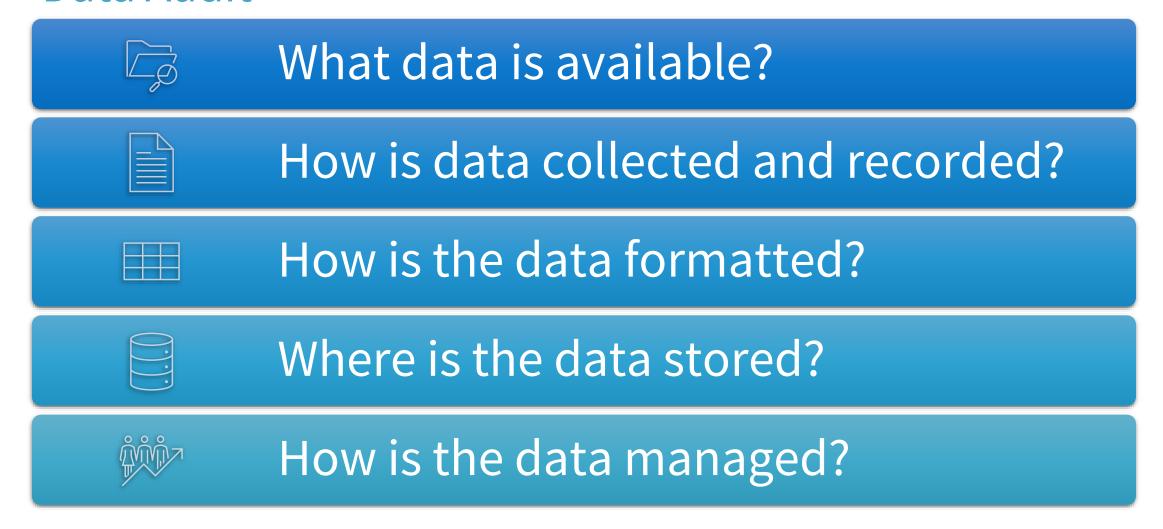
Create a Data Architecture:

Categorize and Classify to make data more useable





Data Audit







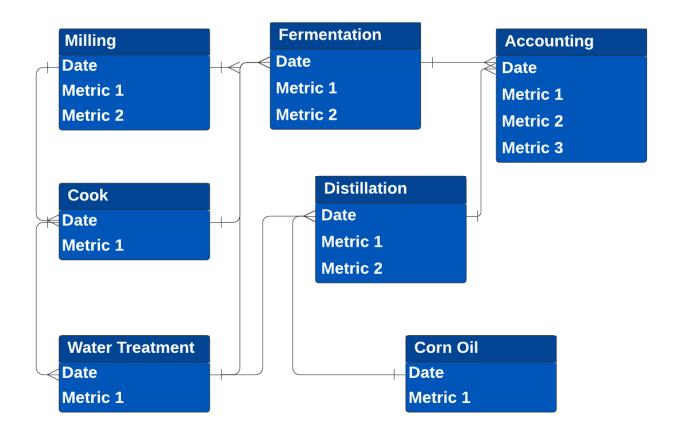
Laying the Foundation: Data Set Index

| Department | File Name | File Type | File Location | Champion | Department |
|------------|-----------------|-----------|-------------------------------|-------------|------------|
| LAB | FERM_DATA | JMP | S DRIVE -> LAB -> DATA | Lab Manager | LAB |
| | | | | Production | |
| PRODUCTION | PRODUCTION_DATA | EXCEL | S DRIVE -> PRODUCTION -> DATA | Manager | PRODUCTION |
| | | | Bob's Desktop -> | | |
| ACCOUNTING | CHEM_COST_DATA | EXCEL | CHEMICALS -> COST_2021 | Bob | ACCOUNTING |





Laying the Foundation: Data Set Connections







Data Management QA/QC

Good Data = Good Decisions



QA/QC

Ensure the generation of precise, accurate and reproducible data

Strategies for preventing errors from entering a dataset

Actions to ensure quality of data before collection

Performed to data throughout its lifecycle







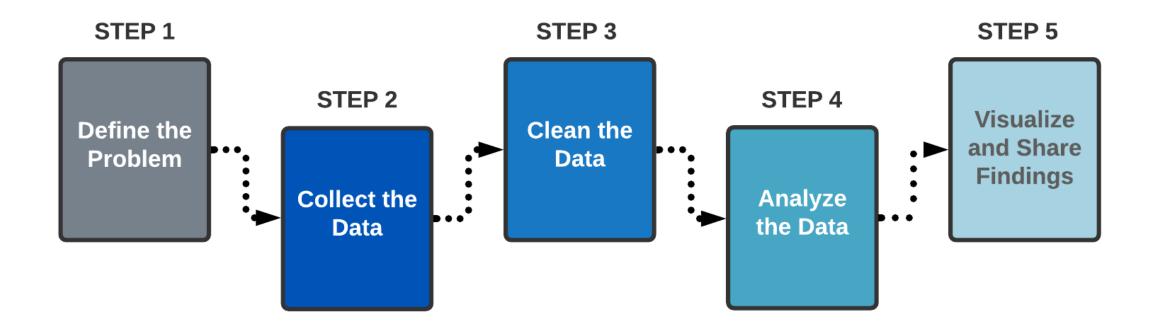
The Data Analysis Process:

5 Steps to Enhanced Decision Making





The Five Steps of the Data Analysis Process







Step 1: Defining the Problem

Root Cause

5 Whys

- an iterative interrogative technique used to explore the cause-and-effect relationships underlying a particular problem.
- Fishbone (Ishikawa) Diagrams
 - Visualization tool for categorizing the potential root cause
 - Combines brainstorming with a mind map template

Measurement Priorities

What to Measure

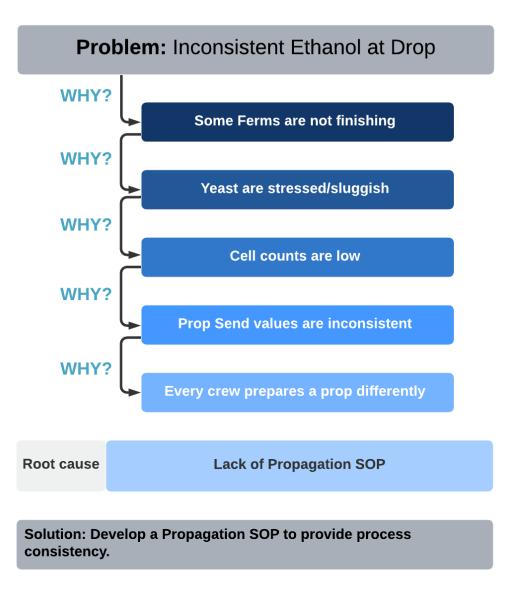
- Consider what kind of data you need to answer your key question
- How to Measure it
 - The measuring process backs up or discredits your analysis later on
 - Identify your: time frame, units of measure, and other factors to be included





Defining the Problem

• 5 Whys Example

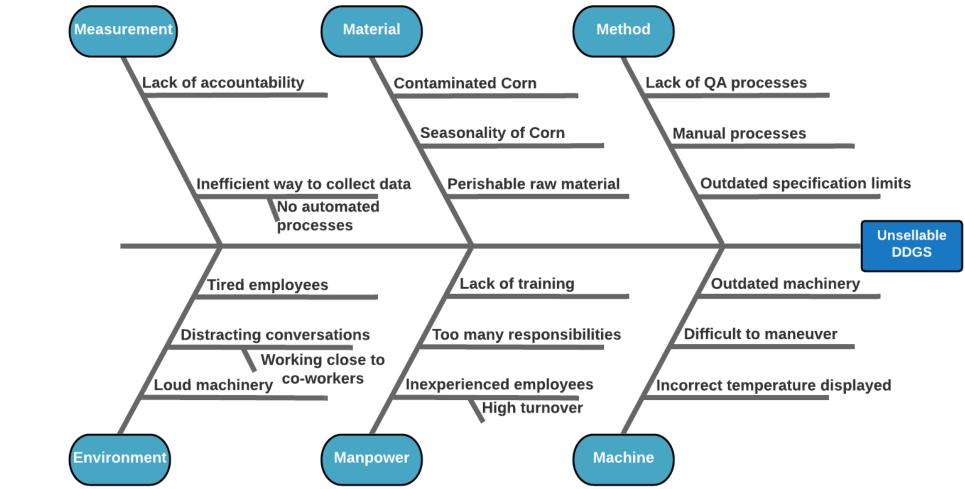






Defining the Problem

Fishbone Example





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Step 2: Collect the Data

1

- First-Party Source
 - You collected directly
 - Usually structured and organized

2

- Second-Party Source
 - Someone else's first party data
 - Usually structured and reliable

3

- Third-Party Data
 - Collected and combined from numerous sources
 - Consists of a vast amount of unstructured data





Step 3: Clean the Data

Remove outliers and duplicates

Remove irrelevant observations

Establish structure to your data

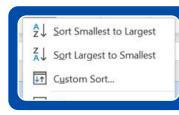
Append data



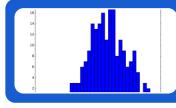


Clean the Data

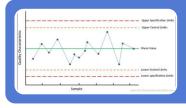
Identify outliers



Sort High to Low



Histogram



Control Chart



Advanced Analytics



Step 4: Analyze the Data

The Four Main Types of Data Analysis

Descriptive

- Tells us WHAT has happened
- Helpful for operations and management
- Easy to visualize

Diagnostic

- Assists in Root Cause Analysis
- Explains WHY things are happening
- Helps trouble shoot issues

Predictive

- Tells what is likely to happen
- Based on historical data
- Helps build algorithms for automation

Prescriptive

- Helps determine future actions
- Based on current data analytics and future plans
- Can help develop advanced algorithms to test potential outcomes





Step 5: Visualize and Share Findings

Interpretation of Results

Does the data answer your original question? How?

Does the data help you defend against any objections? How?

Are there any limitation on your conclusions, any angles you haven't considered?





Visualize and Share Findings

Visualization – Charts and Graphs



Distribution



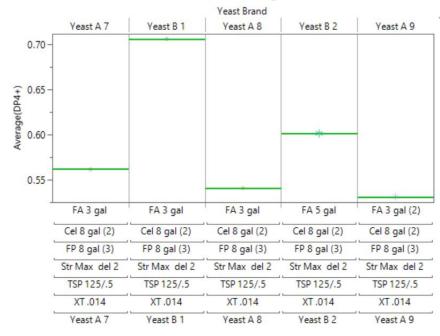
Relationship

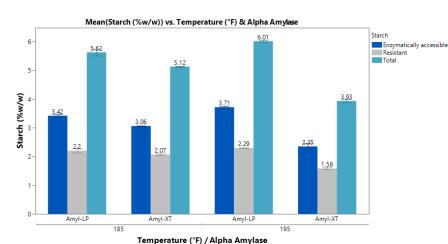


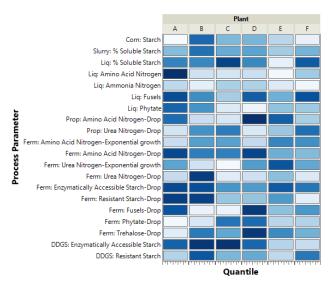
Composition

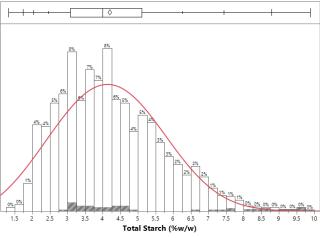


Comparison





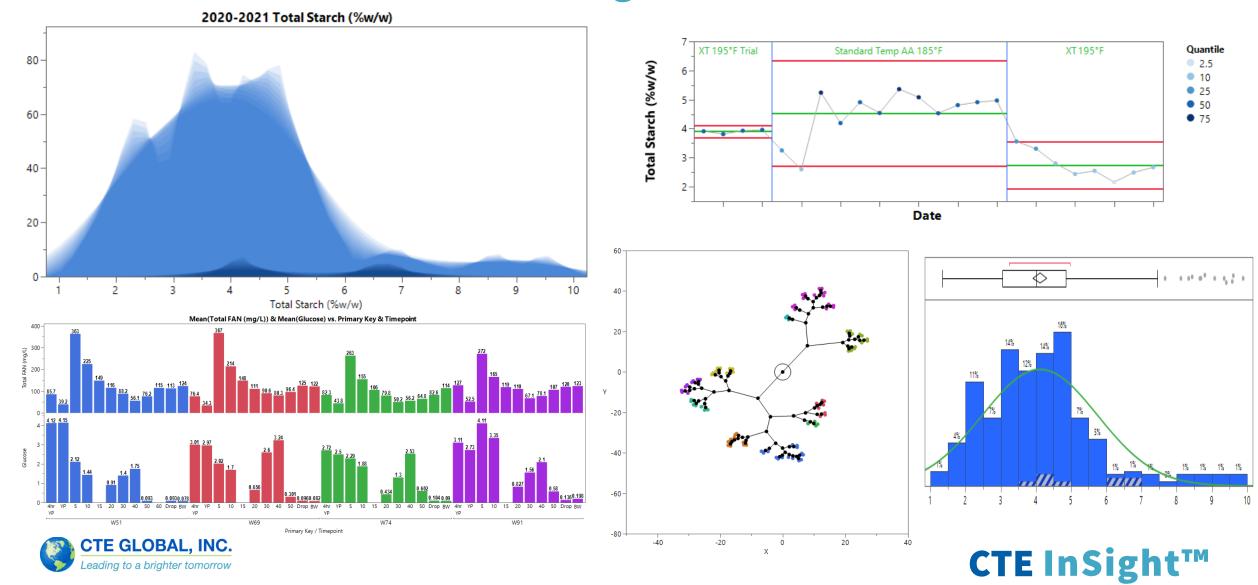








Visualize and Share Findings



Visualize and Share Findings

Visualization- Presentation Formats



Reports



Dashboards



Interactive Visualizations







Data Driven Transformation:

Key Traits





Key Traits

Data-Driven Approach



Build a history of making decisions based on data insights - rather than gut feeling or intuition



Use The Data Analysis Process as the framework to tackle problems and make decisions



Cultivate a culture in which data is valued by ALL as a primary vehicle for decision making



Develop policies for Data Architecture and Data Management to improve your organizational agility







CTE InSight:

Implementing a Data Driven Approach





Providing value with CTE InSight™



Deep understanding of your process and industry to provide best value possible



Improved understanding supports capability to optimize process and profitability



Develop process strategies to meet evolving goals

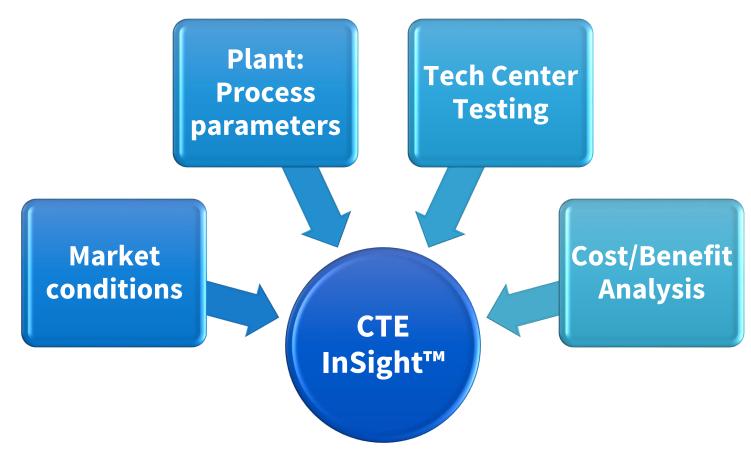


Troubleshoot within the context of rich background of process information





Interconnecting data to improve performance





CTE InSight™

Maximizing the value of our Tech Center Data:







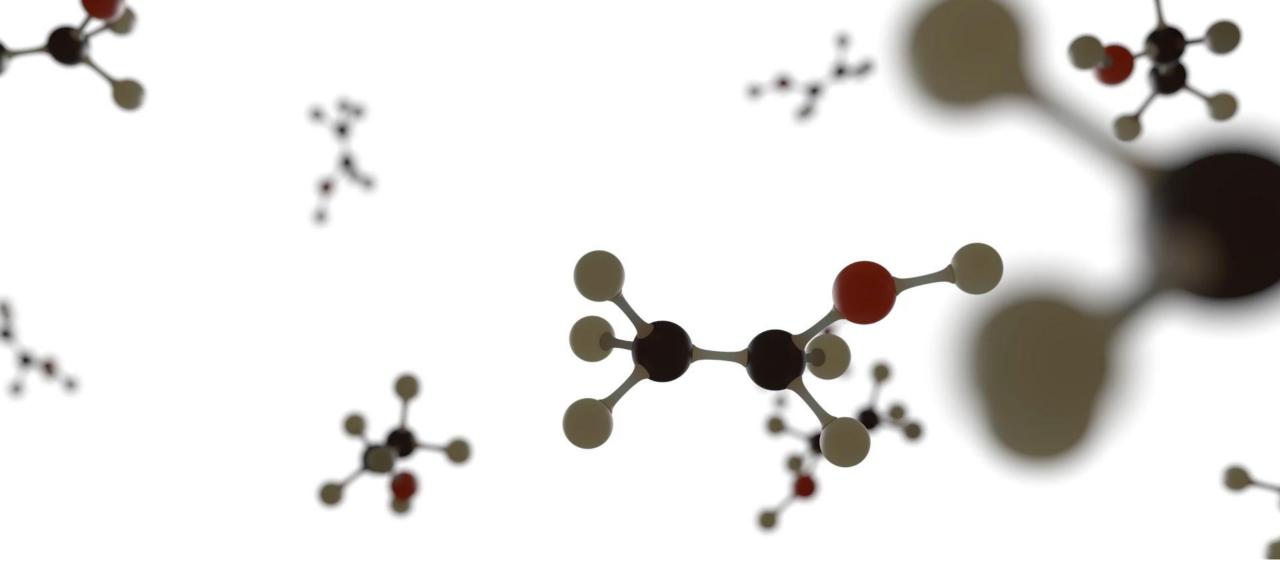
Linking process performance metrics and lab analytics to improve value of data

Industry-wide or regional comparison of key performance metrics

Data-targeted improvement









We can help—contact us today.

cte-global.com (847) 564-5770