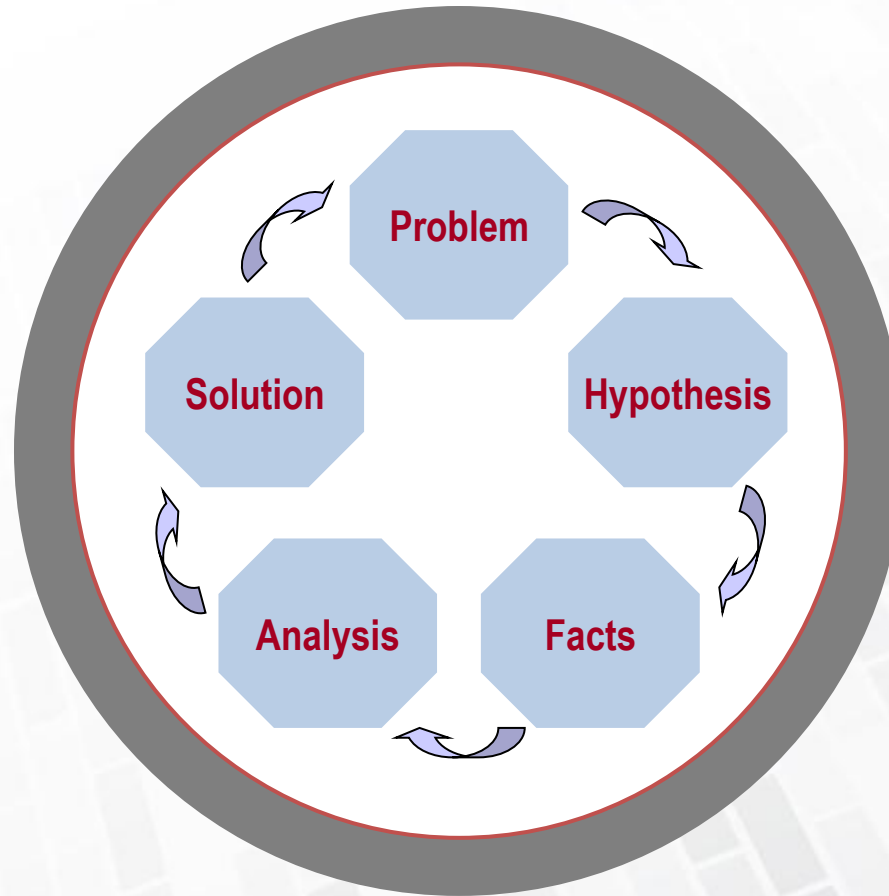


# How to Develop Analytical Thinking Skills

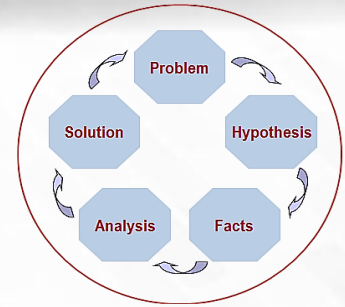


# Session - 1

## Analytical Thinking follows the scientific approach to problem solving



# Defining the Problem



## Definition:

- A problem is a situation that is judged as something that needs to be corrected – implies that a state of "wholeness" does not exist

## Importance:

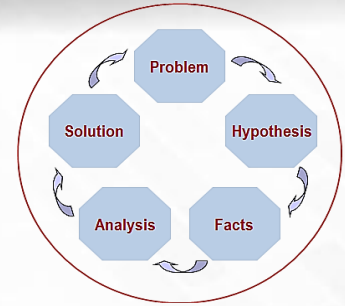
- It is our job to make sure we're solving the right problem – it may not be the one presented to us by the client. What do we really need to solve?

## Basic Concepts:

- Most of the problems are initially identified by our clients
- Defining the problem clearly improves focus – it drives the analytical process
- Getting to a clearly defined problem is often discovery driven – Start with a conceptual definition and through analysis (root cause, impact analysis, etc.) you shape and redefine the problem in terms of issues



# Formulating the Hypotheses



## Definition:

- Hypothesis is a tentative explanation for an observation that can be tested (i.e. proved or disproved) by further investigation

## Importance:

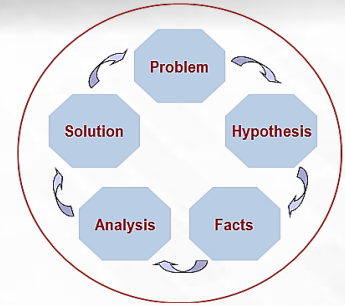
- Start at the end - Figuring out the solution to the problem, i.e. "hypothesizing", before you start will help build a roadmap for approaching the problem

## Basic Concepts:

- Hypotheses can be expressed as possible root causes of the problem
- Breaking down the problem into key drivers (root causes) can help formulate hypotheses



## Collecting the Facts



### Definition:

- Meaningful information (has merit – not false) that is qualitative (expert opinions) or quantitative (measurable performance) to your decisions

### Importance:

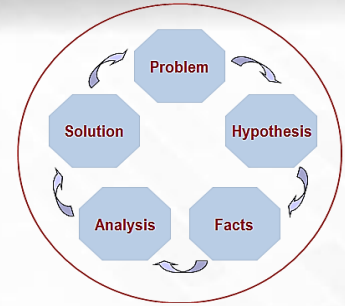
- Gathering relevant data and information is a critical step in supporting the analyses required for proving or disproving the hypotheses

### Basic Concepts:

- Know where to dig
- Know how to filter through information
- Know how to verify – Has happened in the past
- Know how to apply – Relates to what you are trying to solve



# Conducting the Analysis



## Definition:

- The deliberate process of breaking a problem down through the application of knowledge and various analytical techniques

## Importance:

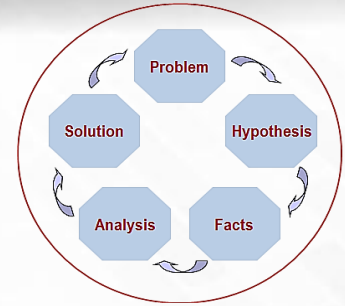
- Analysis of the facts is required to prove or disprove the hypotheses
- Analysis provides an understanding of issues and drivers behind the problem

## Basic Concepts:

- It is generally better to spend more time analyzing the data and information as opposed to collecting them. The goal is to find the “golden nuggets” that quickly confirm or deny a hypothesis
- Root cause analysis, storyboarding, and force field analysis are some of many analytical techniques that can be applied



# Developing the Solution



## Definition:

- Solutions are the final recommendations presented to our clients based on the outcomes of the hypothesis testing

## Importance:

- Solutions are what our clients pay us for...

## Basic Concepts:

- It is important to ensure the solution fits the client – solutions are useless if they cannot be implemented
- Running an actual example through the solution is an effective way of testing the effectiveness and viability of the solution





**TOOLS AND TECHNIQUES**  
**FOR**  
**"DEFINING THE PROBLEM"**





## Problem Identification

A problem becomes known when a person observes a discrepancy between the way things are and the way things ought to be. Problems can be identified through:

- **Comparative/benchmarking studies**
- **Performance reporting** - assessment of current performance against goals and objectives
- **SWOT Analysis** – assessment of strengths, weaknesses, opportunities, and threats
- **Complaints**
- **Surveys**
- **Etc.**



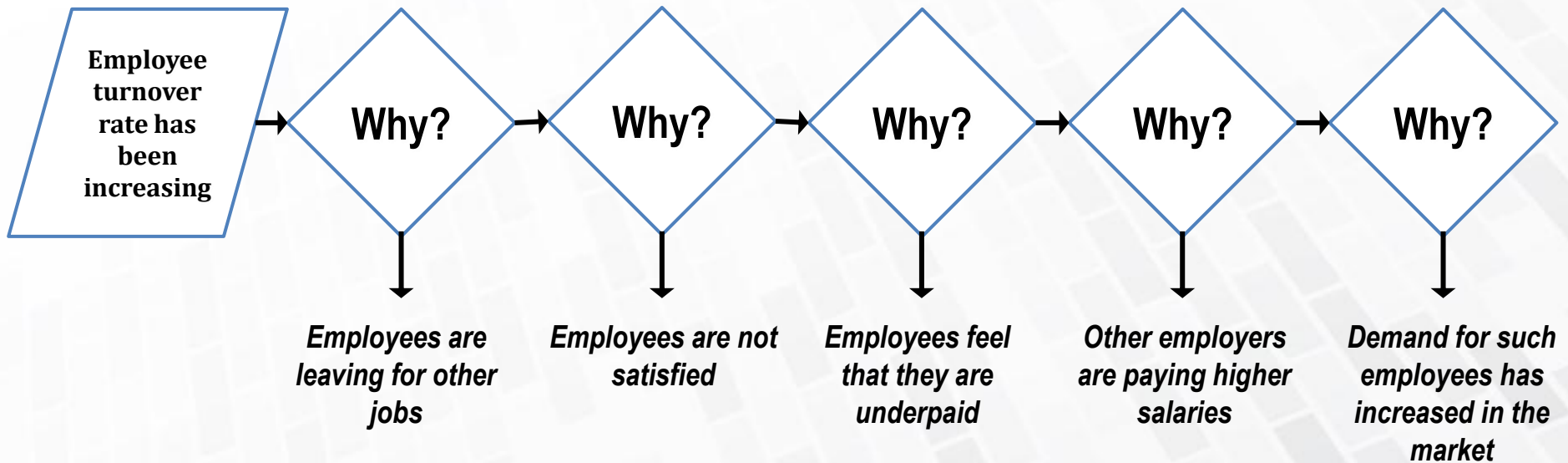
## Getting to the "Root" of the Problem

- Sometimes the thing we think is a problem is not the real problem, so to get at the real problem, probing is necessary
- **Root Cause Analysis** is an effective method of probing – it helps identify what, how, and why something happened
- **Definition of root cause:**
  - Specific underlying cause
  - Those that can reasonably be identified
  - Those that management has control to fix



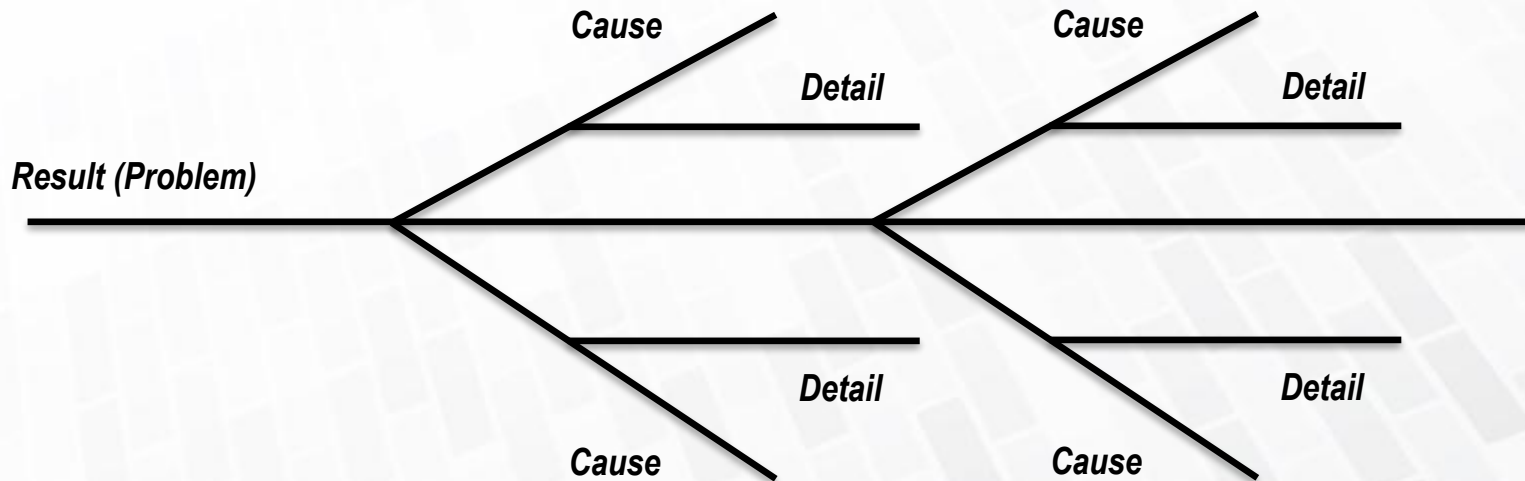
## Root Cause Analysis Technique - *Five Why's*

Refers to the practice of asking, five times, why the problem exists in order to get to the root cause of the problem.



## Root Cause Analysis Technique – *Fishbone Diagram*

Fishbone Diagram (a.k.a. Cause and Effect diagram) is an analysis tool that provides a systematic way of looking at effects and the causes that create or contribute to those effects.



The value of the **Fishbone diagram** is that it provides a method for categorizing the many potential causes of problems or issues in an orderly way and in identifying root causes



## Other Root Cause Analysis Techniques

- **Force Field Analysis** – Visually show forces that impact your problem or issue
- **Scatter Diagrams** – Graphs the relationship of two variables – quantifies the correlation, showing how one variable influences another
- **Process Mapping** – Maps the “as is” flow of activities that make up a process – look for excessive handoffs, redundancies, and other root causes of inefficiencies
- **Benchmarking** – Compares existing performance to another internal or external source, identifies issues not otherwise revealed through other techniques



## Basic Questions to Ask in Defining the Problem (regardless of the technique used)

### Who

- *Who is causing the problem?*
- *Who says this is a problem?*
- *Who are impacted by this problem?*
- *Etc.*

### What

- *What will happen if this problem is not solved?*
- *What are the symptoms?*
- *What are the impacts?*
- *Etc.*

### Where

- *Where does this problem occur?*
- *Where does this problem have an impact?*
- *Etc.*

### When

- *When does this problem occur?*
- *When did this problem first start occurring?*
- *Etc.*

### Why

- *Why is this problem occurring?*
- *Why?*
- *Why?*
- *Etc.*

### How

- *How should the process or system work?*
- *How are people currently handling the problem?*
- *Etc.*

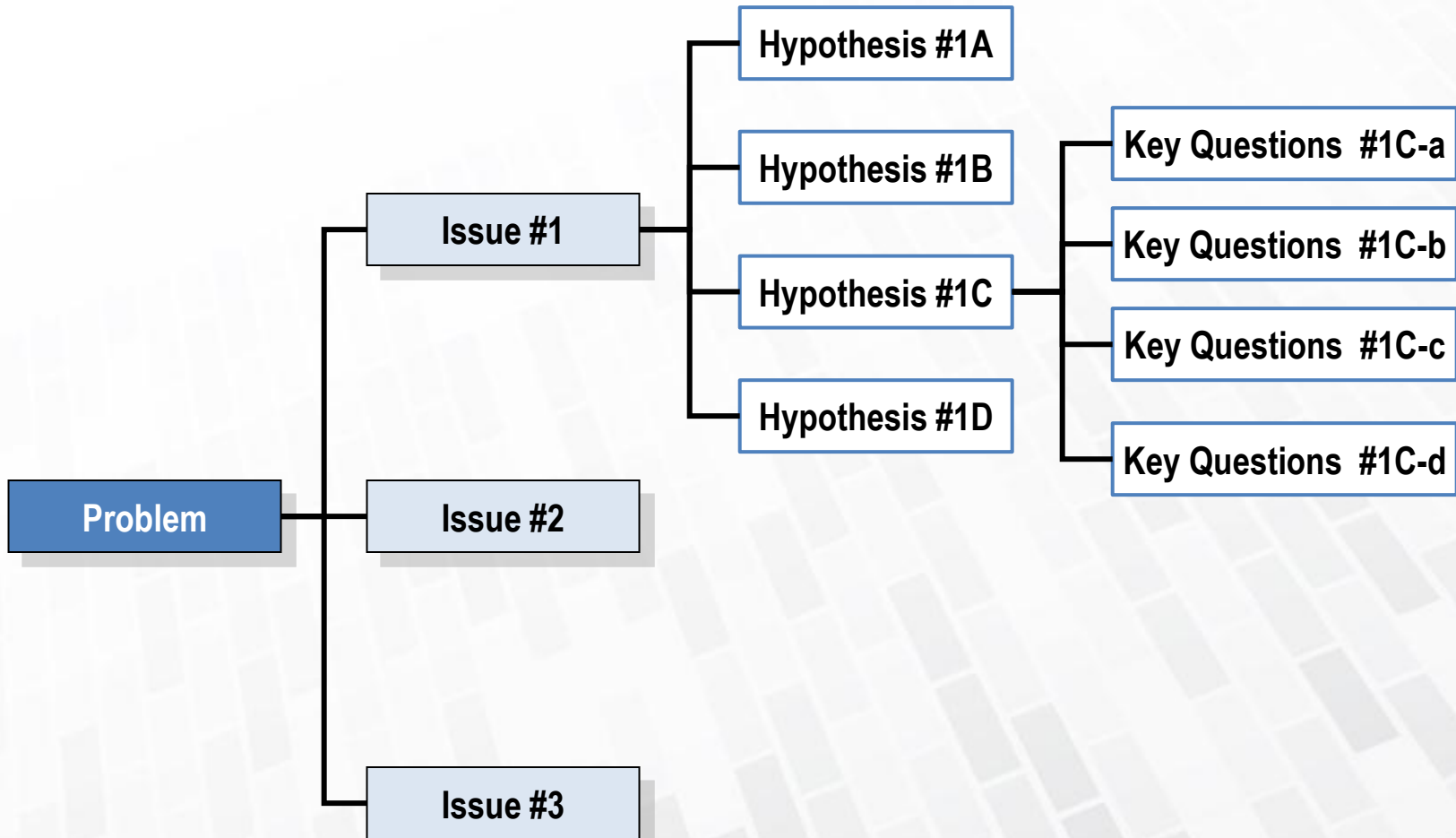


**TOOLS AND TECHNIQUES**  
**FOR**  
**"FORMULATING THE HYPOTHESES"**

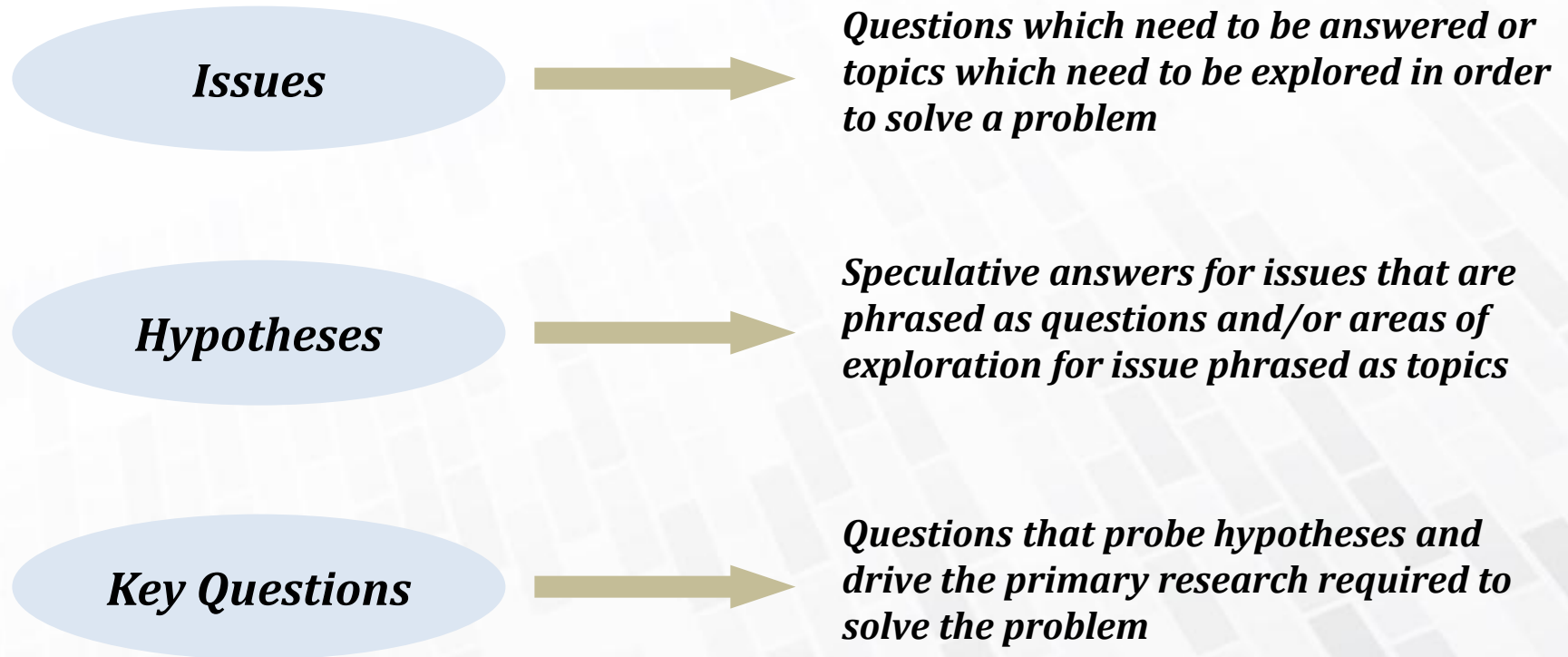




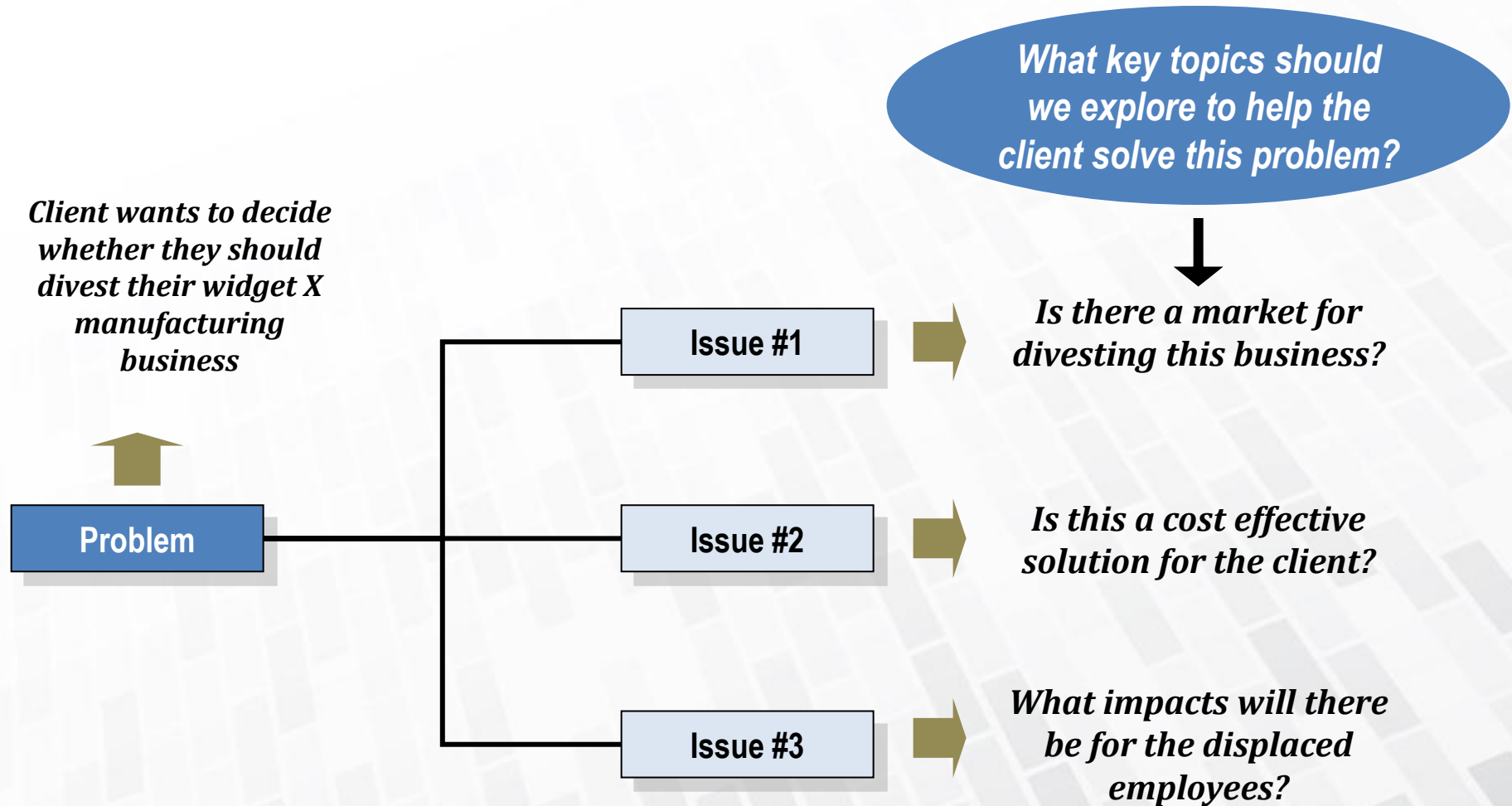
**Issue Diagram** is an effective method for breaking down problems and formulating hypotheses



## Key Components of Issue Diagram



## Identifying the Issues

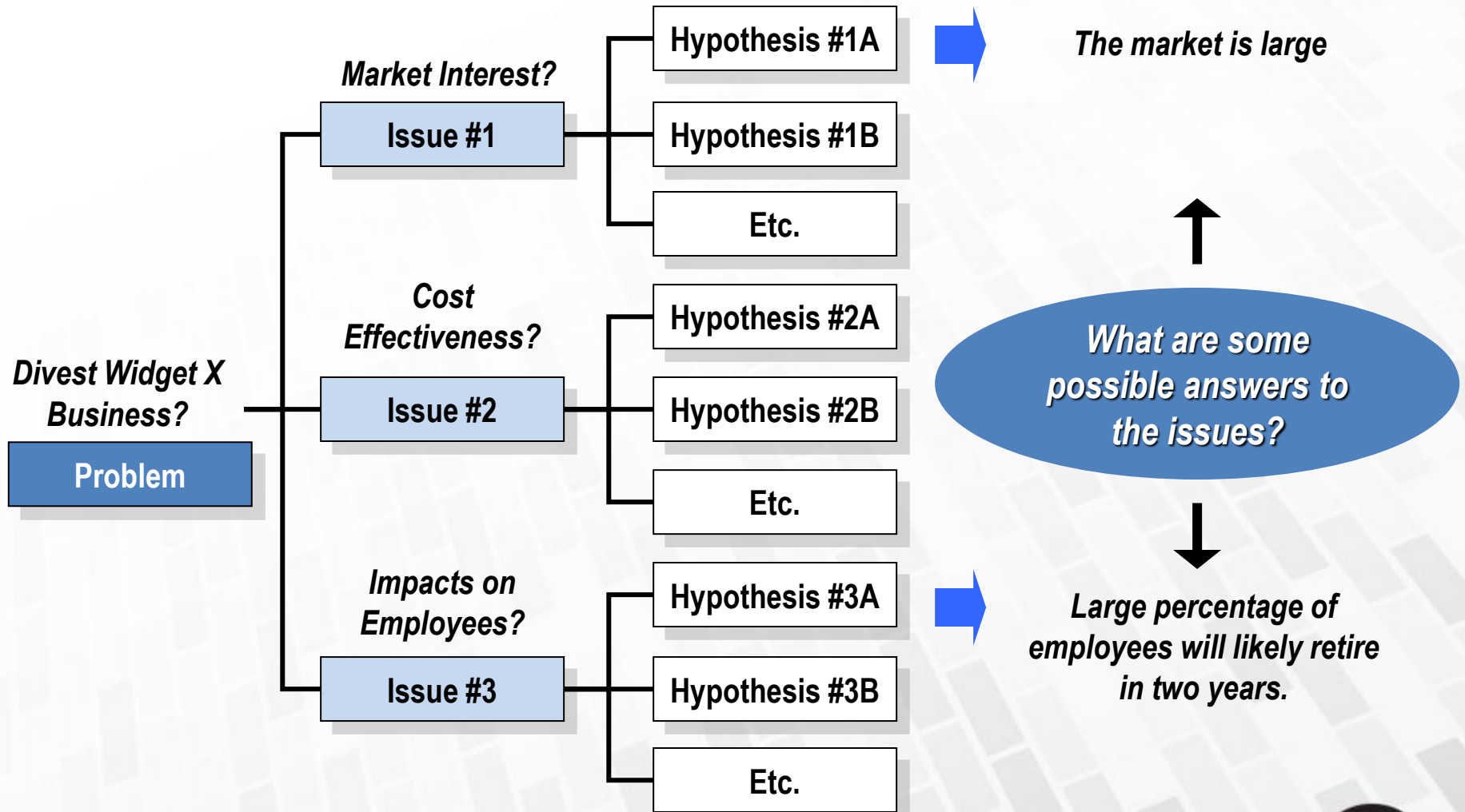


## Key to Identifying Issues

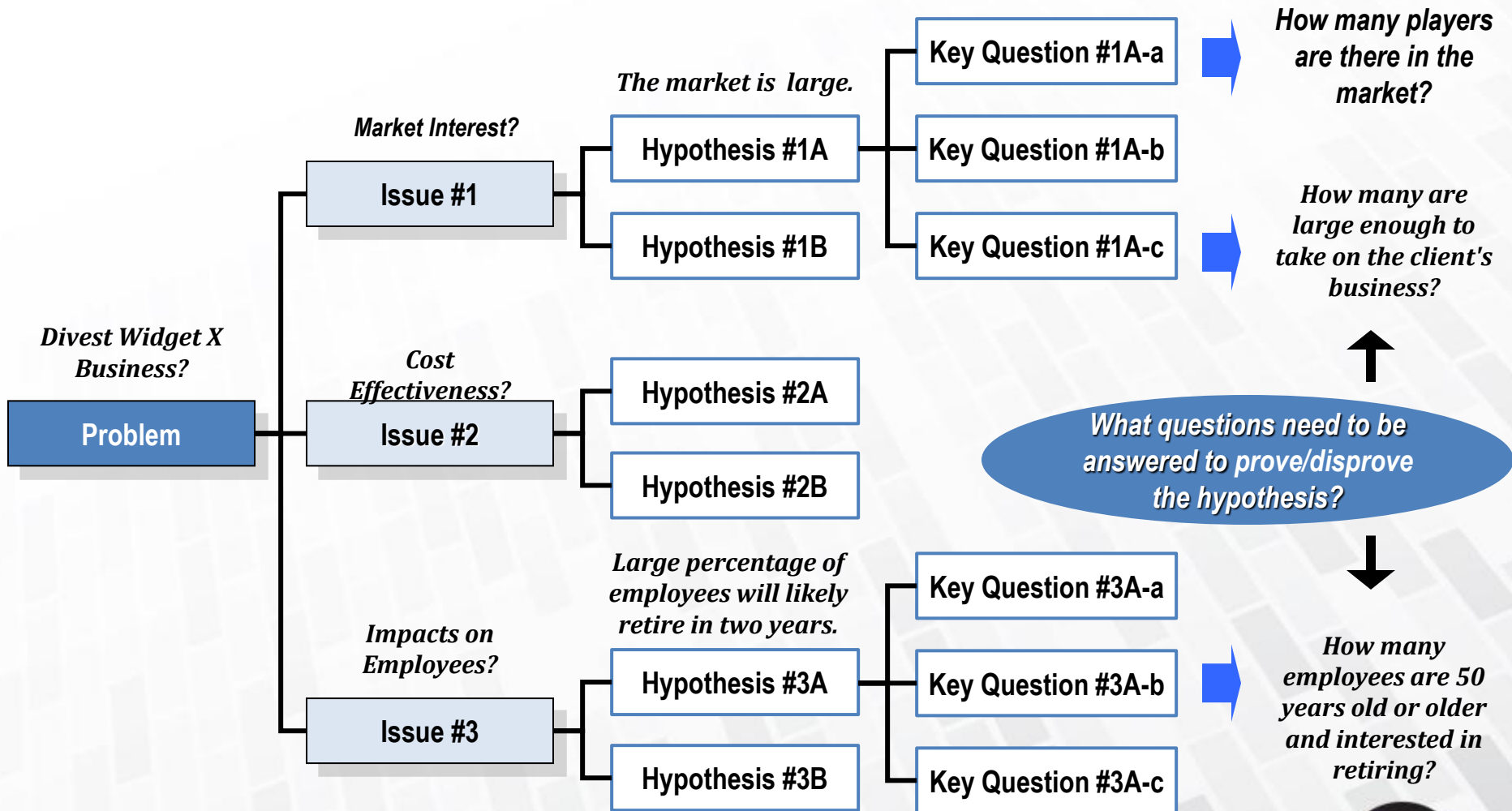
1. Develop a comprehensive list of all possible issues related to the problem
2. Reduce the comprehensive list by eliminating duplicates and combining overlapping issues
3. Using consensus building, get down to a “major issues list” (usually two to five issues)



## Formulating the Hypotheses



# Framing the Key Questions



## Common Pitfalls in Creating Issue Diagram

<b>Issues</b>	<b>Issues which are:</b> <ul style="list-style-type: none"><li>• Too broad, which expand beyond the objectives</li><li>• Too narrow</li><li>• Too many to be easily remembered</li><li>• Of uneven weight</li><li>• Not sequenced effectively</li></ul>
<b>Hypotheses</b>	<b>Hypotheses which are:</b> <ul style="list-style-type: none"><li>• Too few to cover the issue</li><li>• Too many to be easily remembered</li><li>• Not supportable by data</li><li>• Not directly relevant to the issue</li></ul>
<b>Key Questions</b>	<b>Key questions which are:</b> <ul style="list-style-type: none"><li>• Too few to test the hypotheses</li><li>• Too many to be easily remembered</li><li>• Irrelevant to the hypotheses</li><li>• Not answerable with data</li></ul>





## Key Messages

- **Issue diagrams** provide a framework for brainstorming and documenting the issues driving the problem and identifying the facts (i.e. data) required to support conclusions and recommended solutions
- **Hypotheses and the key questions** will help shape data collection requirements and ensure that only relevant data is collected
- **Formulation of hypotheses and key questions is an evolving process** – they will need to be revised as new insights and discoveries are made



## Brainstorming – A Method for Identifying Issues and Formulating Hypotheses

- Brainstorming is useful when there is a wide range of possible issues and solutions
- Brainstorming is not appropriate for testing an idea; it is used to generate ideas
- There are numerous brainstorming techniques, which include group brainstorming, individual brainstorming, and storyboarding
- Individual brainstorming is usually not recommended unless time is too tight, participants are rarely available, group is too large, etc.
- Brainstorming can be useful for Force Field Analysis – identifying all forces impacting the problem



## Tips for Brainstorming

1. State the purpose and objective of the brainstorming session from the onset
2. Set ground rules for participants
3. Give everyone an opportunity to participate
4. Solicit all ideas and opinions – nothing is rejected until consensus building takes place
5. After exhausting all ideas, eliminate certain ideas, e.g. not relevant, duplicative, etc.
6. Finalize outcome of the brainstorming process through consensus: Highest Priority, Assigning Points, etc.



**Session - 2**  
**TOOLS AND TECHNIQUES**  
**FOR**  
**"COLLECTING THE FACTS"**

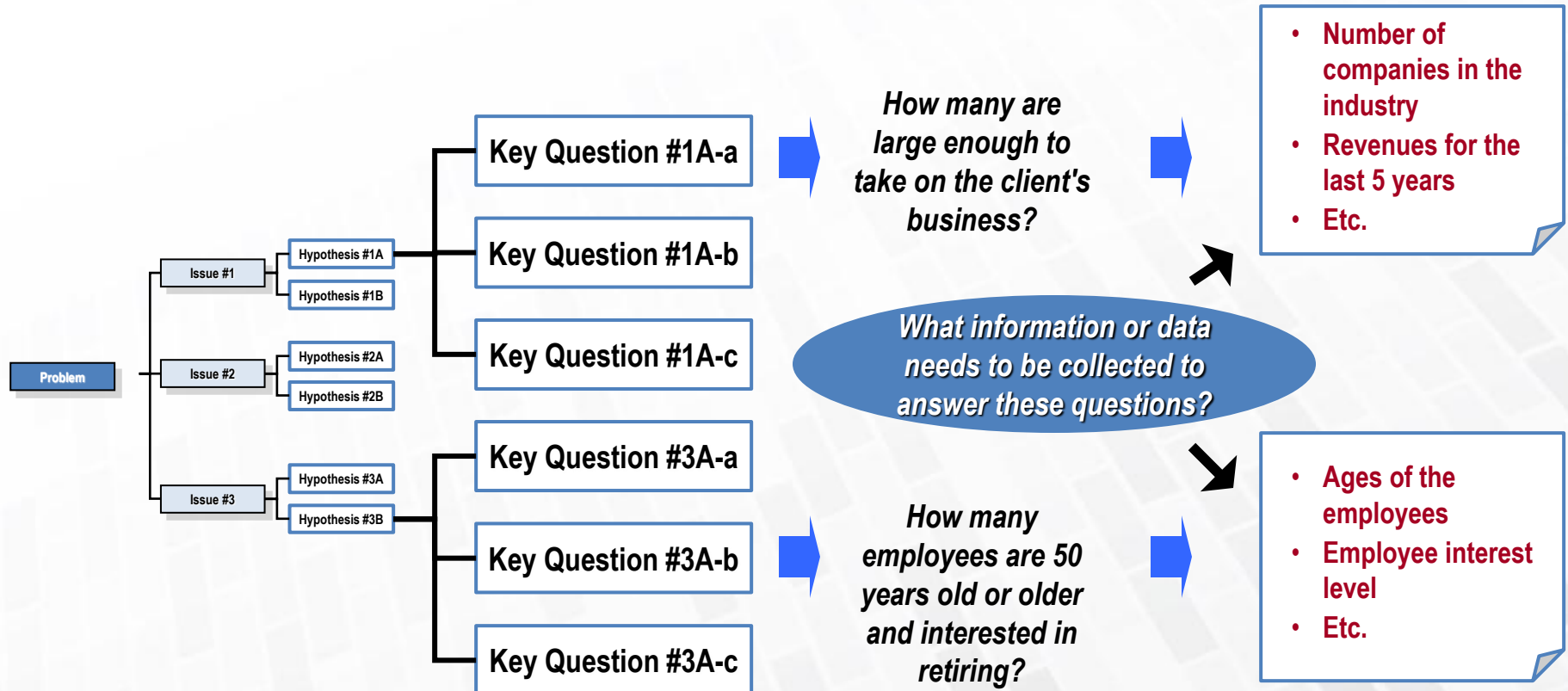


## Getting to the Facts

- In order to answer the key questions and validate the hypotheses (presented in the earlier steps), collection of factual information is necessary
- First critical steps are to identify what information, i.e. data elements, is required and develop a data collection approach/technique
- Depending on the type of problem being solved, different data-collection techniques may be used
- Combining a number of different techniques allows looking at problems from different perspectives
- Data collection is a critical stage in problem solving - if it is superficial, biased or incomplete, data analysis will be difficult



## Using the Issue Diagram to identify data and information needs



## Data Collection Techniques

Technique	Description	Tools
Using Available Information	<i>Using data that has already been collected by others</i>	<ul style="list-style-type: none"> <li>• Checklist</li> <li>• Data compilation forms</li> </ul>
Observing	<i>Systematically selecting, watching and recording behavior and characteristics of people, objects or events</i>	<ul style="list-style-type: none"> <li>• Eyes and ears</li> <li>• Data compilation forms</li> </ul>
Interviewing	<i>Oral questioning of respondents, either individually or as a group</i>	<ul style="list-style-type: none"> <li>• Interview guide</li> <li>• Data compilation forms</li> </ul>
Administering Written Questionnaires	<i>Collecting data based on answers provided by respondents in written form</i>	<ul style="list-style-type: none"> <li>• Survey</li> <li>• Questionnaire</li> </ul>
Conducting Focus Groups	<i>Facilitating free discussions on specific topics with selected group of participants</i>	<ul style="list-style-type: none"> <li>• Flip charts</li> </ul>





## Importance of Combining Different Data Collection Techniques

### ***Qualitative Techniques (Flexible)***

- Produce qualitative data that is often recorded in narrative form
- Useful in answering the "why", "what", and "how" questions
- Typically includes:
  - Loosely structured interviews using open-ended questions
  - Focus group discussions
  - Observations

**VS.**

### ***Quantitative Techniques (Less Flexible)***

- Structured questionnaires designed to quantify pre- or post-categorized answers to questions
- Useful in answering the "how many", "how often", "how significant", etc. questions
- Answers to questions can be counted and expressed numerically

A skillful use of a combination of qualitative and quantitative techniques will give a more comprehensive understanding of the topic



**TOOLS AND TECHNIQUES**  
**FOR**  
**"CONDUCTING THE ANALYSIS"**



## Conducting the Analysis

- The next step in problem solving is to "make sense" of the information collected in the previous step
- There is an abundance of analytical techniques that can be applied for understanding:

**What are the most important issues?**



**Pareto Analysis**

**What performance areas are weak?**



**Benchmarking**

**What are the core competencies of the client?**



**SWOT**

**What forces can influence the problem?**



**Force Field Analysis**



## Specific Sequential Steps that lead up to the Analysis

1

Make sure you know what you are trying to solve – Clearly defined issues or questions drive the analysis!

2

Match up the clearly defined question or issue with the appropriate analytical tool(s)

3

Once you've matched up the analytical tools against the question or issue, then go out and collect the facts



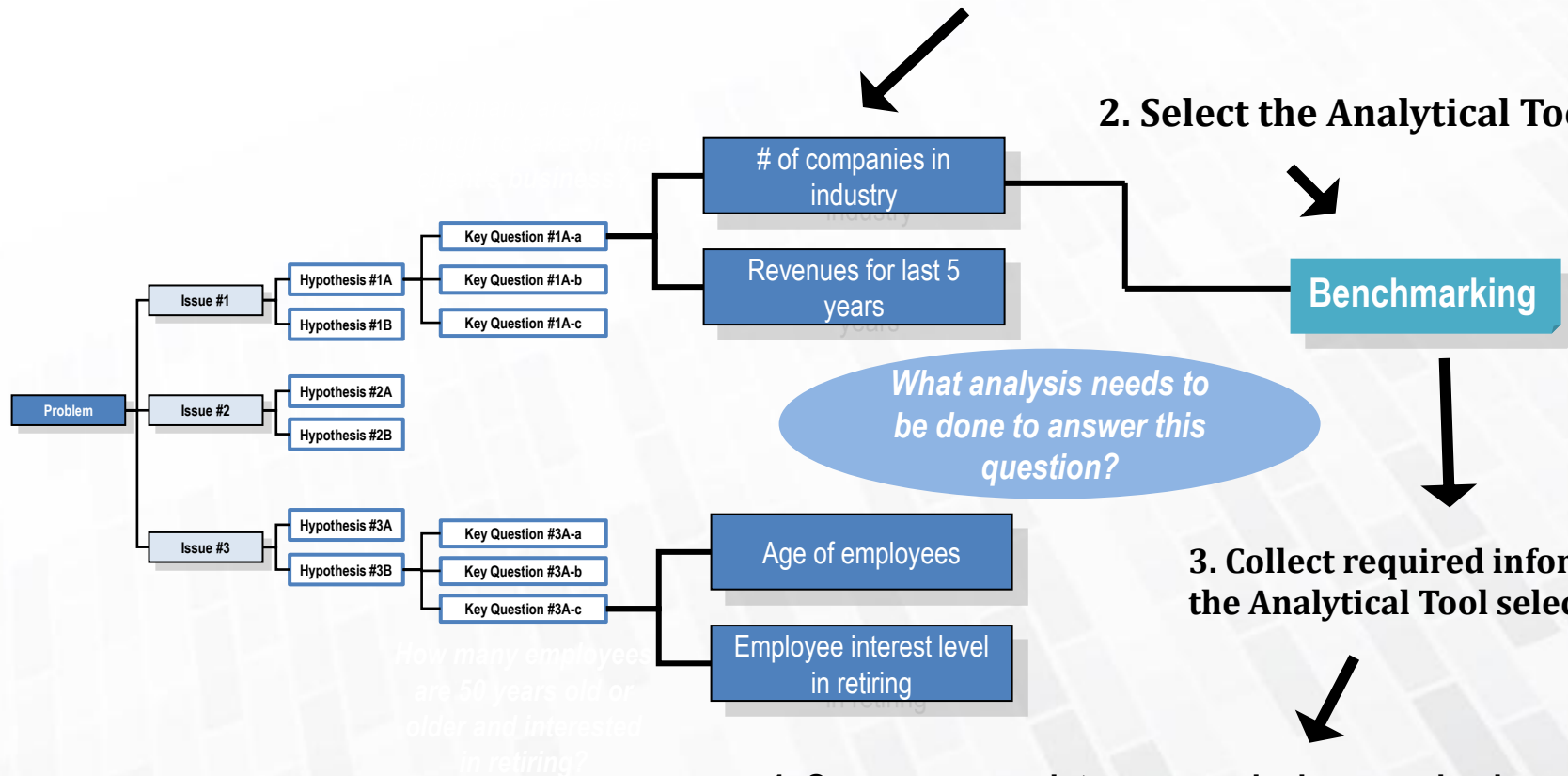
# Apply analytical tools and move back upstream

1. Start with clearly defined issues or questions

2. Select the Analytical Tool

3. Collect required information per the Analytical Tool selected

4. Once you complete your analysis, move back upstream to answer the key question you started with



## Analytical Techniques

- **Benchmarking** – Compare and measure a process or activity against an internal or external source
- **SWOT Analysis** – Assessment of strengths, weaknesses, opportunities, and threats
- **Force Field Analysis** – Overall environmental landscape and how it impacts the subject
- **Cost Benefit Analysis** – Compare total equivalent costs (all the minuses) against equivalent value in benefits (all the pluses)
- **Impact Analysis** – What if type analysis to assess the impact of change on an agency
- **Pareto Chart** – Bar Chart for categorizing issues or other attributes in terms of importance



## Benchmarking

- Measures and compares your performance against other similar activities or processes internally or externally
- Differences indicate possible performance issues
- May be difficult to collect comparable measurement data
- Comparing “best in class” performance is better than comparing average performance
- Best sources of data are in the private sector -Hays Benchmarking, Benchmarking Exchange, The Benchmarking Exchange, etc.





## Benchmarking Example

### Average Days for Source Selection

Air Force ..... 75 Days

Army ..... 96 Days

Navy ..... 116 Days

Canadian Army ..... 145 Days



## SWOT – Strengths Weaknesses Opportunities Threats

- Identifies Strengths, Weaknesses, Opportunities, and Threats by asking: What things are we good at, what things are we not good at, what things might we do, and what things should we not do?
- Probably the most common analytical tool for strategic planning
- Somewhat subjective
- Easy to understand and follow
- Very useful for identifying the core competencies of any organization



## SWOT Example

### Internal Assessment of the organization, its people, services, competencies, etc.

#### Strengths

*Client has a global infrastructure to service all types of customers*

*Services are in high demand in most parts of the world*

#### Weaknesses

*Client has limited resources for expanding its global reach*

*Key processes are not very cost competitive when compared to other service providers*

### External Assessment of direct and indirect forces, social, economic, political, etc.

#### Opportunities

*Untapped demand exists in almost half of the World*

*New Technologies make it possible to expand service reach*

#### Threats

*Other clients are investing in newer technologies*

*Some clients are entering into strategic partnerships to expand their global footprint*



## Force Field

- Visually shows significant forces that impact the problem
- Forces tend to be those factors that promote or hinder a solution to a problem
- Prioritize forces between direct (more important) and indirect (less important)
- May need to brainstorm to generate ideas to list all forces



## Force Field Example

**Problem: Agency is not strategically focused**

**Positive Forces –  
Promotes the Solution**

- *Defense Department is promoting the Balanced Scorecard*
- *Federal Public Sector has mandates such as GPRA*
- *Lower level agencies have balanced scorecards in place*
- *Strategic planning is growing in importance within the entire public sector*

**Negative Forces –  
Inhibits the Solution**

- *Public Sector mandates lack enforcement teeth – no major urgency to become strategically focused.*
- *Agency is not resourced to develop strategic plans and execute on non-strategic issues*
- *Agency has too many other change initiatives going on*

**Direct – More Important**

**Indirect – Less Important**



## Cost Benefit

- Identify all expected costs and benefits to make sure the decision has economic merit.
- Costs includes all tangible outlays (time, money, etc.) and intangible /qualitative factors where you can assign some value
- Compare using a set of decision criteria – oranges to oranges, apples to apples, etc.
- Look at the net changes between making the decision vs. not making the decision
- Office of Management and Budget Circular A-94 provides guidelines on how to do cost benefit analysis in the Federal Public Sector.



## Cost Benefit Example

### Choice A: Proposed Solution - Design and develop an on-line database system

#### The Costs (minuses)

- Software License Fees**
- **Upgrade network capacity**
- **Database development time**
- **Training of end-users**
- **Requires regular maintenance**

#### The Benefits (pluses)

- **Consistent Reporting**
- **Reduced Data Entry**
- **Much faster turnarounds when updating master records**
- **Improved accuracy in reporting**

### Choice B: Do Nothing – Status Quo

- Software License Fees**
- **Maintenance Costs**
- **Planned Upgrades**

Net Benefit =  
\$ 250,000

Change in Costs Choice A – B = \$ 700,000

Change in Benefits Choice A – B = \$ 950,000





## Impact Analysis

- Identifies broad and diverse effects or outcomes associated with a problem and/or the proposed solution
- Answers certain questions: How will this change impact our agency? What are the consequences of not acting on the problem?
- Objective is to minimize adverse or negative impacts going forward
- Very useful in assessing risk of different proposed solutions – helps you reach the right solution
- Numerous tools can be used to assess impacts



## Impact Analysis Tools

- **Scenario Playing** – Storyboarding out how the future will unfold between alternatives: Do Nothing vs. Solution
- **Cost Benefit Analysis** - Used to quantify impacts
- **Decision Tree Analysis** – Build a tree and assign probabilities to each alternative to arrive at the most likely solution
- **Simulation** – Modeling a process and seeing how it changes when one or more variables change
- **Prototype Model** – Build and test the solution on a small scale before implementation to flush out lessons learned



## Pareto Analysis

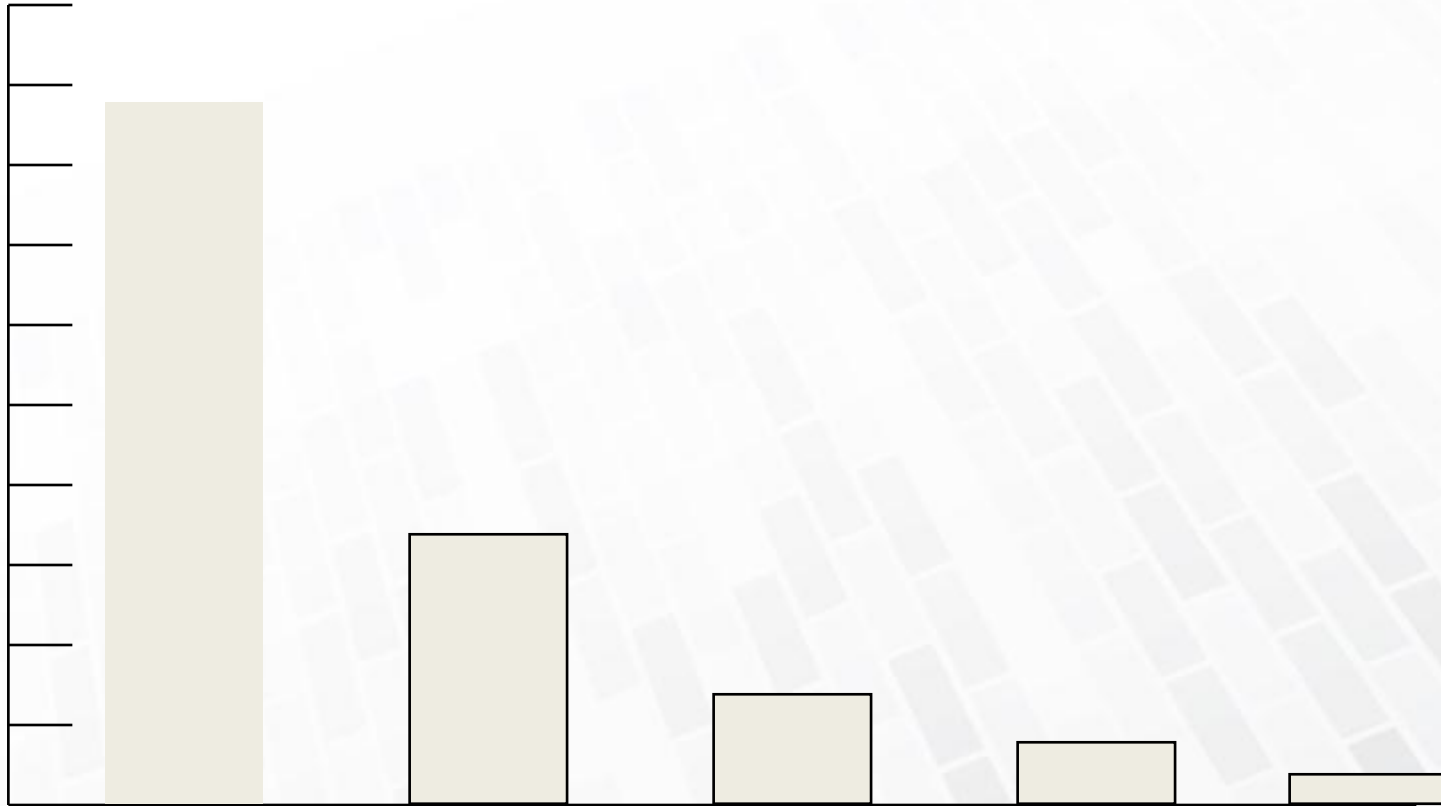
- Quantifies what is most important on a graph – 80 / 20 Rule
- Puts focus on the significant problems or issues
- Must group problems or issues based on a common and measurable attribute (such as reworks, errors, downtime, hours, etc.) = Left Vertical Axis of Bar Chart
- Must categorize problems or issues – what type is it? (poor quality, long wait times, etc.) = Right Horizontal Axis of Bar Chart
- Plot the data and rank according to frequency – descending order from left to right



## Pareto Chart

Measure

Downtime, Errors,  
# of Employees, etc.



Categories

Causes, Products, Mfg. Lines, Operators  
Machines, Defect Types, etc.



## Key Messages

- Don't rush out and collect information until you know what analytical tools you need to use
  - each tool has its own information needs
- Use a combination of tools to cover all the bases
- All decisions involve some assumptions – so you will never have all the facts
- Analysis is a discover driven process, it moves incrementally in baby steps – you learn, adjust and go through numerous iterations until you have insights; i.e. you can now take action on the issue or problem



**TOOLS AND TECHNIQUES**  
**FOR**  
**"DEVELOPING THE SOLUTION"**



## Basic Concepts

- Select and plan the solution that has the greatest impact on solving the problem
- Use a solutions rating matrix to weigh different solutions based on selection criteria (costs, probability of success, ease of implementation)
- Solutions should have support from your previous analysis that you can clearly communicate to the client
- Test your solutions as much as you can – use some of the Impact Analysis Tools





## Key Messages

- 100% out-of-the box solutions don't exist
- No solution is a guarantee – be flexible with implementation and be willing to revisit your requirements
- Solutions rarely work unless you get buy-in and commitment from the client – if the client refuses to accept the solution, it will not work!
- Be prepared to back up your solution with an implementation plan, complete with milestones to measure performance



## Common Land Mines that Blow Analytical Thinking Apart

- Once a problem is defined, Professional Consultants must have some ability to develop a possible solution. If the Consultant has **no control** to make recommendations for a problem, then the problem has been defined **outside the scope** of the project.
- The **client's definition** of the problem may **not** be **correct**. The client may lack the knowledge and experience that Professional Consultants have.
- Since most **problems** are **not unique**, Professional Consultants may be able to validate the problem and possible solutions against other sources (past projects, other experts, etc.).
- The **best solutions** to a problem are often **too difficult** for the client **to implement**. So be careful about recommending the optimal solution to a problem. Most solutions require some degree of compromise for implementation.



## Summary

- Analytical Thinking follows the Scientific Approach
- Five Step Process for Consultants:
  - Define the Problem
  - Test in the form of Hypothesis
  - Focus on Facts
  - Analysis (Various Analytical Tools)
  - Recommend a Solution

