I. Overall Process
II. Defining the Problem
III. Formulating the Hypothesis
IV. Collecting the Facts
V. Conducting the Analysis
VI. Developing the Solution
Objectives of the lecture

* Provide a fundamental understanding of how analytical thinking works
* Identify specific tools and techniques that an Assistant Secretary can use during the problem solving life cycle
* Give a potential Assistant Secretary a complete framework for managing problem solving issues – from identification to resolution
At the end of this session, participants should be able to…. 

* Understand the systematic process of problem solving
* Define the issue as a starting point for your project
* Focus on the “drivers” behind your issue
* Know how to apply specific techniques, such as brainstorming, root cause analysis, and SWOT
* Know how to test your proposed solutions before submission to the customer
* Know how to present viable solutions for solving critical problems
THE ROLE OF THE ASSISTANT SECRETARY

* FRONTLINER
  * He/she is the first one to do the groundwork
  * Requires good analytical skills
    * Creativity
    * Capability to think out of the box
    * Be innovative
    * Use state of the art technique in making recommendations
    * Capable of defending the options proposed and the reasoning and wisdom behind any proposal
Who are your customers?

* It ranges from
* THE CABINET OF MINISTERS
* AN INTERMINISTERIAL COMMITTEE
* THE MINISTER
* THE PERMANENT SECRETARY
* THE PRINCIPAL ASSISTANT SECRETARY
* THE PUBLIC AT LARGE
* ONE PARTICULAR SEGMENT OF SOCIETY
* ONE LOBBY GROUP
* ONE INDIVIDUAL
OVERALL PROCESS
Analytical Thinking follows the scientific approach to problem solving.
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 public or the Minister. What do we really need to solve?

Basic Concepts:

Most of the problems are initially identified by our customers

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
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
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 and force field analysis are some of many analytical techniques that can applied
Definition:
* Solutions are the final recommendations presented to our clients based on the outcomes of the hypothesis testing

Importance:
* Solutions are what our CUSTOMERS expect from us...

Basic Concepts:
* It is important to ensure the solution fits the customer – 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"
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.
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

Employee turnover rate has been increasing

Why?

Why?

Why?

Why?

Why?

Why?

Employees are leaving for other jobs

Employees are not satisfied

Employees feel that they are underpaid

Other employers are paying higher salaries

Demand for such employees has increased in the market
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
Force field analysis

<table>
<thead>
<tr>
<th>Pushing/Driving forces</th>
<th>Pulling/Restraining forces</th>
</tr>
</thead>
<tbody>
<tr>
<td>forces for change</td>
<td>restrainer 1</td>
</tr>
<tr>
<td>driver 1</td>
<td>restrainer 2</td>
</tr>
<tr>
<td>driver 2</td>
<td>forces for status quo</td>
</tr>
</tbody>
</table>

FORCE FIELD ANALYSIS – KURT LEWIN

DRIVING FORCES
(Positive forces for change)

RESTRAINING FORCES
(obstacles to change)

www.change-management-coach.com
Basic Questions to Ask in Defining the Problem (regardless of the technique used)

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

Who

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

What

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

Where

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

When

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

Why

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

How
FOR

"FORMULATING THE HYPOTHESES"
Issue Diagram is an effective method for breaking down problems and formulating hypotheses.
Key Components of Issue Diagram

- **Issues**: Questions which need to be answered or topics which need to be explored in order to solve a problem.

- **Hypotheses**: Speculative answers for issues that are phrased as questions and/or areas of exploration for issues phrased as topics.

- **Key Questions**: Questions that probe hypotheses and drive the primary research required to solve the problem.
Government wants to introduce the toll system for some roads in Mauritius

Problem

Issue #1

Issue #2

Issue #3

What key topics should we explore to help the client solve this problem?
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

Introducing toll on roads

Problem

Issue #1

Impact on the traffic?

Hypothesis #1A

Hypothesis #1B

Etc.

Issue #2

Cost Effectiveness?

Hypothesis #2A

Hypothesis #2B

Etc.

Issue #3

Impacts on the public?

Hypothesis #3A

Hypothesis #3B

Etc.

What are some possible answers to the issues?

The traffic jam is cleared

public refuse to use the roads
Framing the Key Questions

Problem

Issue #1
- Effect on Investment?
- Key Question #1A
  - Hypothesis #1A
  - Key Question #1A-a
  - Key Question #1A-b
  - Key Question #1A-c

Issue #2
- Cost Effectiveness?
- Key Question #1B
  - Hypothesis #1B
  - Key Question #1B-a
  - Key Question #1B-b
  - Key Question #1B-c

Issue #3
- Impacts on Employees?
- Key Question #2A
  - Hypothesis #2A
  - Key Question #2A-a
  - Key Question #2A-b
  - Key Question #2A-c

- Key Question #2B
  - Hypothesis #2B
  - Key Question #2B-a
  - Key Question #2B-b
  - Key Question #2B-c

- Key Question #3A
  - Hypothesis #3A
  - Key Question #3A-a
  - Key Question #3A-b
  - Key Question #3A-c

- Key Question #3B
  - Hypothesis #3B
  - Key Question #3B-a
  - Key Question #3B-b
  - Key Question #3B-c

Traffic jam affecting the country

Investors may move away.

Effect on Investment?

What effect this would have on employment

What questions need to be answered to prove/disprove the hypothesis?

Effect on the productivity of the country
<table>
<thead>
<tr>
<th>Issues</th>
<th>Issues which are:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Too broad, which expand beyond the objectives</td>
</tr>
<tr>
<td></td>
<td>• Too narrow</td>
</tr>
<tr>
<td></td>
<td>• Too many to be easily remembered</td>
</tr>
<tr>
<td></td>
<td>• Of uneven weight</td>
</tr>
<tr>
<td></td>
<td>• Not sequenced effectively</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>Hypotheses which are:</td>
</tr>
<tr>
<td></td>
<td>• Too few to cover the issue</td>
</tr>
<tr>
<td></td>
<td>• Too many to be easily remembered</td>
</tr>
<tr>
<td></td>
<td>• Not supportable by data</td>
</tr>
<tr>
<td></td>
<td>• Not directly relevant to the issue</td>
</tr>
<tr>
<td>Key Questions</td>
<td>Key questions which are:</td>
</tr>
<tr>
<td></td>
<td>• Too few to test the hypotheses</td>
</tr>
<tr>
<td></td>
<td>• Too many to be easily remembered</td>
</tr>
<tr>
<td></td>
<td>• Irrelevant to the hypotheses</td>
</tr>
<tr>
<td></td>
<td>• Not answerable with data</td>
</tr>
</tbody>
</table>
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 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.
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.
A MIND MAP

TIME MANAGEMENT

MONITORING
- Progress
- Follow-up
- Balance
- Negotiation

COMMUNICATION
- Feedback
- Support
- Praise
- Review
- Correction
- Improve

ERGONOMIC
- User-friendly
- Efficient
- Value-added
- Positive

BIG PICTURE
- Chunking
- Bite-sized
- Multi-tasking
- Diversity

WHO
- What
- Where
- When
- Why
- How

5W1H

METHODS
- Smart
- Specific
- Measurable
- Attainable
- Relevant
- Time-bound

KEY ISSUES
- Checkpoints
- Deadlines
TOOLS AND TECHNIQUES

FOR

"COLLECTING 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.
### Data Collection Techniques

<table>
<thead>
<tr>
<th>Technique</th>
<th>Description</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using Available Information</td>
<td>Using data that has already been collected by others</td>
<td>Eyes and ears</td>
</tr>
<tr>
<td>Observing</td>
<td>Systematically selecting, watching and recording behavior and characteristics of people, objects or events</td>
<td>Data compilation forms</td>
</tr>
<tr>
<td>Interviewing</td>
<td>Oral questioning of respondents, either individually or as a group</td>
<td>Interview guide, Data compilation forms</td>
</tr>
<tr>
<td>Administering Written Questionnaires</td>
<td>Collecting data based on answers provided by respondents in written form</td>
<td>Survey, Questionnaire</td>
</tr>
<tr>
<td>Conducting Focus Groups</td>
<td>Facilitating free discussions on specific topics with selected group of participants</td>
<td>Flip charts</td>
</tr>
</tbody>
</table>
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

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"
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:

<table>
<thead>
<tr>
<th>Question</th>
<th>Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the most important issues?</td>
<td>Pareto Analysis</td>
</tr>
<tr>
<td>What performance areas are weak?</td>
<td>Benchmarking</td>
</tr>
<tr>
<td>What are the strengths and weaknesses?</td>
<td>SWOT</td>
</tr>
<tr>
<td>What forces can influence the problem?</td>
<td>Force Field Analysis</td>
</tr>
</tbody>
</table>
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

Benchmarking

What analysis needs to be done to answer this question?

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
- Risk assessment analysis – use of a grid to assess impact and likelihood
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.
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.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services are in high demand in most parts of the world</td>
<td>Client has limited resources for expanding its global reach</td>
</tr>
<tr>
<td>Key processes are not very cost competitive when compared to other service providers</td>
<td>Untapped demand exists in almost half of the World</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Technologies make it possible to expand service reach</td>
<td>Other clients are investing in newer technologies</td>
</tr>
<tr>
<td>Some clients are entering into strategic partnerships to expand their global footprint</td>
<td></td>
</tr>
</tbody>
</table>
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: introducing a new name plate for vehicles

Positive Forces – Promotes the Solution

Negative Forces – Inhibits the Solution

Direct – More Important

Indirect – Less Important
Stakeholders analysis
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

Cost Benefit Example

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

The Costs (minuses)                                   The Benefits (pluses)

Choice B: Do Nothing – Status Quo

Net Benefit = Rs 250,000

Change in Costs Choice A – B = Rs 700,000
Change in Benefits Choice A – B = Rs 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 organisation/Ministry? 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
Risk impact assessment grid
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
A Pareto Chart showing categories such as Downtime, Errors, # of Employees, etc., plotted against Causes, Products, Mfg. Lines, Operators Machines, Defect Types, etc.
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"
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 public or customer – if the public 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
Once a problem is defined, Administrative Staff must have some ability to develop a possible solution. If the Officer has no control to make recommendations for a problem, then there is a problem or the problem has not been properly defined.

The definition of the problem may not be correct. The customer may lack the knowledge and experience that staff have.

Since most problems are not unique, a person 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 public and the customer to implement. So be careful about recommending the optimal solution to a problem. Most solutions require some degree of compromise for implementation.
Analytical Thinking follows the Scientific Approach

Five Step Process for problem solving:
- Define the Problem
- Test in the form of Hypothesis
- Focus on Facts
- Analysis (Various Analytical Tools)
- Recommend a Solution
Questions and Comments

Thanks for your attention!

Questions, if any?