ANALYTICAL PROBLEM-SOLVING

Arnaud Chevallier / July 2010 (Revised)

See more at powerful-problem-solving.com
We all solve problems daily

- “How should we complement our product portfolio?”
- “Why haven’t we met our sales target?”
- “How can we reduce illegal immigration?”
- …
But most of us haven’t received formal training on how to do it.
This presentation shows how basing your resolution on key questions can help

We’ll see how to:
- Define optimally your problem
- Solve it with an issue tree
This presentation shows how to define a problem and how to plan its solution.

We all solve problems. But we don’t do it optimally. Basing your problem-solving on key questions can help.

Define the problem:
- Define the key question
- Understand the context

Identify the solution:
- Build the issue tree
- Improve it

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
Basing your problem-solving on key questions can help

Define the problem
- Define the key question
- Understand the context

Identify the solution
- Build the issue tree
- Improve it
Basing your problem-solving on key questions can help

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First, you **have** to identify **the** right key question (we’ll consider only “how” and “why” questions)
This can be more difficult than it sounds

Problem: the cars of the employees of a company don’t fit into the parking lot

What’s the key question?
For instance, it is easy to consider only one aspect of the problem.

How can we increase the capacity of the lot?

After M. Jones, *The Thinker's Toolkit*
For instance, it is easy to consider only one aspect of the problem.

- Expending its dimensions
- Putting more cars in the current space
- How can we increase the capacity of the lot?

After M. Jones, *The Thinker’s Toolkit*
For instance, it is easy to consider only one aspect of the problem.

How can we increase the capacity of the lot?

- Expending its dimensions
- Putting more cars in the current space
- Building a new floor
- Using a new parcel

After M. Jones, *The Thinker’s Toolkit*
For instance, it is easy to consider only one aspect of the problem.

How can we increase the capacity of the lot?

- Expending its dimensions
- Putting more cars in the current space
- Reducing the size of each space
- Building a new floor
- Using a new parcel
- Reducing the area not dedicated to parking

After M. Jones, *The Thinker's Toolkit*
For instance, it is easy to consider only one aspect of the problem (cont’d)

How can we reduce the number of cars?

After M. Jones, *The Thinker’s Toolkit*
For instance, it is easy to consider only one aspect of the problem (cont’d)

How can we reduce the number of cars?

- Reducing the number of employees
- Increasing the number of employees per car

After M. Jones, *The Thinker’s Toolkit*
For instance, it is easy to consider only one aspect of the problem (cont’d)

How can we reduce the number of cars?

- Reducing the number of employees
- Increasing the number of employees per car
- Moving part of the company elsewhere
- Eliminating jobs

After M. Jones, *The Thinker’s Toolkit*
For instance, it is easy to consider only one aspect of the problem (cont’d)

How can we reduce the number of cars?

- Reducing the number of employees
- Increasing the number of employees per car
- Moving part of the company elsewhere
- Eliminating jobs
- Making that more employees use other means of transportation
- Promoting car pooling

After M. Jones, The Thinker’s Toolkit
So ensure you are solving the right problem (not a part, not a symptom)

How can we solve the saturation of the lot?

- Expending its dimensions
  - Building a new floor
  - Using a new parcel
  - Reducing the size of each space
  - Reducing the area not dedicated to parking
  - Moving part of the company elsewhere
  - Eliminating jobs
  - Making that more employees use other means of transportation
  - Promoting car pooling

How can we increase the capacity of the lot?

- Putting more cars in the current space
  - Reducing the size of each space
  - Reducing the area not dedicated to parking
  - Moving part of the company elsewhere
  - Eliminating jobs
  - Making that more employees use other means of transportation
  - Promoting car pooling

How can we reduce the number of cars?

- Increasing the number of employees per car
  - Reducing the number of employees
    - Eliminating jobs
    - Making that more employees use other means of transportation
    - Promoting car pooling
The key question encompasses all the other relevant ones.
The key question must have the right scope: neither too narrow nor too wide

Make the key question...
- Neither too vague
- Nor too narrow / oriented in the wrong direction / based on a hypothesis / compounded
To fully describe your problem you must complement your key question with an introductory flow...

**Situation:**
The non controversial, relevant information about the problem. ONLY the relevant information

**Complication:**
The unique need for change (potentially illustrated by some of its symptoms/consequences)

**Key question:** THE question you want to answer

Adapted from Barbara Minto, *The Minto Pyramid Principle*
... and a definition of the environment

**Criteria for a high-quality tree:**
Optional actions that will ensure that your tree is of superior quality

**Implementation parameters:**
Deadlines, budget, numerical objectives, etc.

**Out of scope:**
Actions that you could take but decide upfront not to

Use only action verbs
At the end, you might find it convenient to summarize your problem in a problem identity card.

**Problem Identity Card**

**Project:**

- **Context:**
  - **Situation:**
    The key issue: the non controversial, relevant information about the problem. ONLY the relevant information
  - **Complication:**
    The unique need for change (potentially illustrated by some of its symptoms/consequences)

- **Scope:**
  - **Criteria for a high-quality tree:**
    Optional action that will ensure that your tree is of superior quality
  - **Implementation parameters:**
    Deadlines, budget, numerical objectives, etc.
  - **Out of scope:**
    Actions that you could take but decide upfront not to

**Key question:** THE question you want to answer

After Andersen Consulting, *Issue-Based Problem Solving*
Basing your problem-solving on key questions can help

Define the problem
- Define the key question

Identify the solution
- Understand the context
- Build the issue tree
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See more at http://powerful-problem-solving.com
Friday, July 9, 2010
Issue trees have four basic rules

- Go from the key question to the analysis
- Are MECE
- Are perspicacious
- Keep asking “why” or “how”
How can we increase our profitability.
A tree goes from the key question to the data sources

Key question | Sub-issue

How can we increase our profitability

How can we reduce our costs?

How can we increase our revenues?
A tree goes from the key question to the data sources

Key question

How can we increase our profitability?

How can we
our revenues?

Sub-issue

prices?

volume?

Sub-sub-issue

How can we
our costs?
How can we increase our profitability?

- How can we increase our revenues?
  - Volume?
  - Prices?

- How can we reduce our costs?
  - Raw materials costs?
  - Employee costs?
  - Other costs?
How can we increase our profitability?

How can we increase our revenues?

How can we increase our costs?

How can we increase prices?

Sub-issue:

Key question:

Sub-sub-issue:

Of all products?

Of only specific products?

Sub-sub-sub-issue:

Volume?

Raw materials costs?

Employee costs?

Other costs?
A tree goes from the key question to the data sources

How can we increase our profitability?
- How can we increase our revenues?
  - volume?
  - prices?
- How can we reduce our costs?
  - Raw materials costs?
  - Employee costs?
  - Other costs?
- How can we impact our revenues?
  - Of all products?
  - Of only specific products?
- How can we impact our costs?
  - publicity?
  - offers?
A tree goes from the key question to the data sources

Key question: How can we increase our profitability?

Sub-issue 1: How can we reduce our costs?
   - Raw materials costs?
   - Employee costs?
   - Other costs?

Sub-issue 2: How can we increase our revenues?
   - Volume?
   - Prices?

Sub-sub-issue 1: Of all products?
   - Publicity?
   - Offers?

Sub-sub-issue 2: Of only specific products?
   - the quantity of raw materials?
   - Get cheaper raw materials?
A tree goes from the key question to the data sources

Key question: How can we increase our profitability?

Sub-issue: How can we reduce our costs?
  - Raw materials costs?
  - Employee costs?
  - Other costs?

Sub-sub-issue: Of all products?
  - Prices?

Sub-sub-sub-issue: For all products?
  - Volume?

Sub-sub-sub-sub-issue: Of only specific products?
  - Prices?
  - Publicity?
  - Offers?

Sub-sub-sub-sub-sub-issue: Only for specific products?
  - Switching suppliers
  - Negotiating better

Sub-sub-sub-sub-sub-sub-issue: Get cheaper raw materials?

Sub-sub-sub-sub-sub-sub-sub-issue: Of all products?
  - The quantity of raw materials?

Sub-sub-sub-sub-sub-sub-sub-sub-issue: Of only specific products?
  - For all products

Sub-sub-sub-sub-sub-sub-sub-sub-sub-issue: Raw materials?

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
A tree goes from the key question to the data sources

Key question: How can we increase our profitability

Sub-issue: How can we increase our revenues?
- volume?
- prices?
- publicity?
- offers?

Sub-sub-issue: For all products
- Raw materials costs?
- Employee costs?
- Other costs?

Sub-sub-issue: Of all products?

Sub-issue: How can we decrease our costs?
- Raw materials costs?
- Employee costs?
- Other costs?

Sub-sub-issue: For all products
- Raw materials costs?

Sub-issue: How can we increase our revenues?
- Volume?
- Prices?
- Publicity?
- Offers?

Hypothesis
H1: Increasing the price of our entire family product will generate more revenue than the one lost because of the associated sales volume decrease

Analysis
A1: Conduct simulation, benchmark
D1: Client interviews

Data needed / Source
H2: ...
A2: ...
D2: ...
H3: ...
A3: ...
D3: ...
H4: ...
A4: ...
D4: ...

The analysis tests if the hypothesis makes sense; it doesn’t explain how to implement it!
Each column describes in further detail—or solves—the previous one...

Key question: Why aren't there more instructors taking improvement courses online?

Sub-issue: Because they don't want to take a first one

Sub-sub-issue: Because they don't take courses

Sub-sub-sub-issue: Because they didn't like it

Sub-sub-sub-sub-issue: Because they think they don't need it

Sub-issue: Because they don't want

Sub-sub-issue: Because they can't

Sub-sub-sub-issue: Because they think they don't need it

Sub-sub-sub-sub-issue: Because they are lazy
Items in the tree are ideas: questions, action verbs, hypotheses. They aren’t just titles
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How can we increase profitability?

How can we increase revenue?

How can we reduce costs?
Items in the tree are ideas: questions, action verbs, hypotheses. They aren’t just titles

How can we increase profitability?

How can we increase revenue?

How can we reduce costs?

How can we increase profitability?

Increasing revenues

Reducing costs

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
Items in the tree are ideas: questions, action verbs, hypotheses. They aren’t just titles.

How can we increase profitability?

How can we increase revenue?

How can we reduce costs?

Increasing revenues

Reducing costs

Raw materials?

Employees?

Costos?
Items in the tree are ideas: questions, action verbs, hypotheses. They aren’t just titles.

How can we increase profitability?
- How can we increase revenue?
- How can we reduce costs?

How can we reduce costs?
- Raw materials?
- Employees?
- Costos?

Increasing revenues:
- Revenue

Reducing costs:
- Costs

Doesn’t work because you have to infer what to do with the revenue and costs.

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
Each move to the right must bring some value

Why aren’t there more instructors taking improvement courses online?

Because they don’t want to take a first one

Because they don’t take courses

Because they don’t want

Because they can’t

Because they prefer to use other delivery methods

Because they think they don’t need it

Because they think they don’t need it

Because they are lazy

Because they didn’t like it

Because they tried it but don’t want to take another

Because they think they don’t need it

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
Issue trees always diverge: each column has more elements than the previous one...

How can we maintain the personnel database up to date?

- Adding the info of the new personnel
- Eliminating the info of the personnel leaving the company
- Capturing the changes in the personnel moving within the company
Issue trees always diverge: each column has more elements than the previous one...

How can we maintain the personnel database up to date?

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Own personnel
- Outsourced personnel
How can we maintain the personnel database up to date?

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Own personnel

Outsourced personnel
... similarly, each item has, at least, two sub-items

- An issue with a single sub-issue has a problem:
  - Either there are other possibilities or
  - The group \{issue / sub-issue\} is redundant
... similarly, each item has, at least, two sub-items

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How can we get more students?  
Increasing the inscription of new students

See more at http://powerful-problem-solving.com
Issue trees rely on mutually exclusive and collectively exhaustive (MECE) groupings

Mutually exclusive sets

Collectively exhaustive sets

MECE sets
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Mutually exclusive sets

Collectively exhaustive sets

MECE sets

MECE?

Why are the grades of my students mediocre?

Because they don’t study enough
Because I grade very steeply
Because my evaluation tool is inappropriate
Because the material of the exam wasn’t covered in class
Because they don’t have the intellectual abilities

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
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Mutually exclusive sets

Collectively exhaustive sets

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MECE?

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Friday, July 9, 2010
Issue trees are perspicacious

- Where am I?

From Cartoonbank.com
Issue trees are perspicacious

- Where am I?

- In a car, M’am
Issue trees are perspicacious

- Where am I?

- In a car, M’am

- At the intersection of Westheimer and Fourth.

From Cartoonbank.com
Each tree progresses to the right consistently asking “why” or “how” (only one type for any given tree)
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Diagnostic - “Why?”

Break the problem in its potential causes

Problem
  - Cause
  - Cause
  - Cause
Each tree progresses to the right consistently asking “why” or “how” (only one type for any given tree)

**Diagnostic - “Why?”**
Break the problem in its potential causes

**Solution - “How?”**
Identify alternative solutions for the problem
Each tree progresses to the right consistently asking “why” or “how” (only one type for any given tree)

Diagnostic - “Why?”
Break the problem in its potential causes

Solution - “How?”
Identify alternative solutions for the problem

Each tree follow the same pattern (either it is a “how” or a “why” but not both
“How” trees do not describe a sequential process; they show alternative solutions to the problem.
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How can I go from NYC to London?

1. Electing a means of transportation
2. Buying a ticket
3. Going to the port/airport
4. Boarding

Cartoons are from Cartoonbank.com
“How” trees do not describe a sequential process; they show alternative solutions to the problem.

How can I go from NYC to London?

1. Electing a means of transportation
2. Buying a ticket
3. Going to the port/airport
4. Boarding

How can I go from NYC to London?

- **Flying**
  - Using a plane
  - Using a helicopter
  - Using a balloon
  - Using a rocket

- **Traveling by sea**
  - Using a submarine

- **Traveling on the surface**
  - Swimming
  - With a raft

Cartoons are from Cartoonbank.com

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
“How” trees lead to actions that can solve the key question, no to some analysis.

How can we improve the elaboration of invoices?
“How” trees lead to actions that can solve the key question, no to some analysis

How do we make the clients’ specifications clear?

How can we improve the elaboration of invoices?
“How” trees lead to actions that can solve the key question, no to some analysis

How do we make the clients’ specifications clear?

How can we improve the elaboration of invoices?

How do we know if our employees understand the specifications?

✔

✘
“How” trees lead to actions that can solve the key question, no to some analysis

How do we make the clients’ specifications clear?

How do we know if our employees understand the specifications?

How do we ensure that our employees understand the specifications?
A few tips can help improve your trees

How do you improve your trees?

- Make them parallel
- Diverge
- Accept alternatives
- Enlist others
- Change as you go
- Make sense
- Adapt your level of confidence
Effective trees are parallel

- They are parallel in action
Effective trees are parallel

- They are parallel in action

How can we improve our clients’ experience?

- Improving the shopping experience
- Following up after the sales

- Improving the post-sale experience

How can we improve our clients’ experience?

Friday, July 9, 2010
Effective trees are parallel

- They are parallel in action
  - How can we improve our clients’ experience?
  - Improving the shopping experience
  - Following up after the sales

- They are parallel in construction

How can we improve our clients’ experience?

Improving the shopping experience

Following up after the sales

Improving the post-sale experience
Effective trees are parallel

- They are parallel in action
  
  How can we improve our clients’ experience?
  
  **Improving** the shopping experience
  
  **Following up** after the sales

- They are parallel in construction
  
  How can we improve the post-sale experience?
  
  **Reducing** our delivery time
  
  **Increasing** our friendliness
  
  **How** can we solve the problem the first time out?

  **Improving** the post-sale experience
  
  **Reducing** our delivery time
  
  **Increasing** our friendliness
  
  **Solving** the problem the first time out

See more at [http://powerful-problem-solving.com](http://powerful-problem-solving.com)

Friday, July 9, 2010
Columns have elements of similar weight. You can check for this by ensuring that no column has an outlier.

How do we increase revenues?
Columns have elements of similar weight. You can check for this by ensuring that no column has an outlier.

How do we increase revenues?

- Adding new services
- Increasing prices
- Increasing volumes

✘
Columns have elements of similar weight. You can check for this by ensuring that no column has an outlier.

How do we increase revenues?

- Adding new services
- Increasing prices
- Increasing volumes

How do we increase revenues with our current services?

- Adding new services
- Increasing revenues with our current services
- Increasing prices
- Increasing volumes
You will need to be creative to have exhaustive trees, which will require to get out of your comfort zone.

Value of the idea

Difficulty of implementation

Creative

Obvious

Absurd

Source: Accenture, Tools and Frameworks Pocket Guide
To be creative, be prepared to ignore the consequences of your ideas, at least at the beginning.

“Nice, but we’ll need an environmental-impact study, a warranty, recall bulletins, recycling facilities, and twenty-four-hour customer support.”
You can solve each problem with more than just one tree

Ensure that for each division in your tree, you can find a name for the group of sub-issues you are creating
You can solve each problem with more than just one tree

How do we reduce our costs?

- Reducing variable costs
- Reducing fixed costs

Classifying by cost type

Direct
Indirect

Ensure that for each division in your tree, you can find a name for the group of sub-issues you are creating
You can solve each problem with more than just one tree.

How do we reduce our costs?

- Reducing variable costs
  - Reducing fixed costs
- Reducing production costs
  - Reducing marketing costs
  - Reducing administrative costs
  - Reducing other costs

Classifying by cost type ✔
Classifying by the origin of the cost ✔

Ensure that for each division in your tree, you can find a name for the group of sub-issues you are creating.

See more at http://powerful-problem-solving.com
As your analysis moves forward, be prepared to modify your tree.

- Apply judgement between “satisficing” (accepting the first acceptable solution) and “maximizing” (keep on searching for the optimal solution).
- Modify your tree as your analysis reveals if your hypotheses are true or false.

See also Barry Schwartz, *The Paradox of Choice*
As your build your analytical structure, review it periodically to ensure it makes sense

“Farewell my dear fellows, I am off to the Seven Years War!”
Problems have different orders of complexity

<table>
<thead>
<tr>
<th>Complexity</th>
<th>Role of facts</th>
<th>Role of expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deterministic, Direct</td>
<td>A direct answer exist</td>
<td>E.g. What is the height of the Eiffel Tower?</td>
</tr>
<tr>
<td>Deterministic, Computed</td>
<td>You can compute the answer</td>
<td>E.g. How do you convert liters to gallons</td>
</tr>
<tr>
<td>Random, Finite</td>
<td>You can identify all the possible answer but cannot pick the correct one</td>
<td>E.g. Who will be the largest car manufacturer in ten years?</td>
</tr>
<tr>
<td>Random, Continuous</td>
<td>The answer is part of a continuum, you can only determine its range</td>
<td>E.g. How profitable will we be next quarter?</td>
</tr>
</tbody>
</table>

Adapted from Morgan Jones, *The Thinker’s Toolkit*
You need to adapt your confidence in your solutions accordingly

Problem types

<table>
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<tr>
<th>Complexity</th>
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<th>Role of expertise and probability of error</th>
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Adapted from Morgan Jones, *The Thinker’s Toolkit*

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
Closing, basing your problem solving on key questions can improve it drastically

We all solve problems
But we don’t do it optimally

Basing your problem-solving on key questions can help

Define the problem
Identify the solution

Define the key question
Understand the environment
Build the issue tree
Improve it

Define S, C, KQ
Don’t make it too narrow nor too vague
Identify the quality criteria
Define the scope
Go from key question to analysis
Be MECE
Be perspicacious
Ask “why” or “how”

Be parallel
Diverge
Accept alternatives
Enlist others
Change as you go
Make sense
Adapt your confidence

See more at http://powerful-problem-solving.com

Friday, July 9, 2010
References

- Strategic Services, Tools and Frameworks Pocket Guide, Internal Publication, Accenture
- *Issue-Based Problem Solving*, Internal Publication, Accenture
- Edward de Bono, *Serious Creativity: Using the Power of Lateral Thinking to Create New Ideas*
- Michael Michalko, *Thinkertoys: A Handbook of Business Creativity for the 90s*