Idea generation & evaluation:
- Training to iDEA Lab staff -

Sarah Schöllhammer, University of Stuttgart, Germany
The process of creative problem solving: Idea Generation and Idea Selection - Overview

1) The process of creative problem solving

2) Ideation as a key activity of the process

- General Principles of Idea Generation
- Different approaches to idea generation
- Selected methods: explanation, example, group exercise, reflection
  - Brainwriting
  - SCAMPER
  - Morphological Matrix

3) Discussion
4) Idea evaluation and selection as second key activity

- General Principles of Idea evaluation and selection
- Which method is adequate when?
- Early-stage Methods
  - Checklist (kill-criteria)
  - Scoring methods
  - Evaluation Matrix
- Later-stage Methods (to make sure the selected idea is viable)
  - Ten questions to evaluate a business idea

5) Reflection
1 Ideation: How to generate innovative ideas
-Training to iDEA Lab staff -

Sarah Schöllhammer, University of Stuttgart, Germany
1 The circular process of creative problem solving: A general process model

1. Defining the problem / opportunity
   - Many ideas
   - Open
   - Anything can be suggested
   - Topic is explored

2. Generating ideas
   - Ideas/possible solutions

3. Evaluating ideas
   - Focus/selection
   - Few suggestions
   - Feasible
   - Effective
   - Efficient
   - Profitable

4. Deciding on implementing ideas

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2 Ideation

as a key activity of the creative problem solving process

- More than 100 creativity techniques
- Suitability in a certain situation depends on type of problem, goals, preferences of participants

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### Ideation

#### Different approaches to idea generation

<table>
<thead>
<tr>
<th>Approach</th>
<th>Free Association</th>
<th>Structured association</th>
<th>Combination techniques</th>
<th>Confrontation Techniques</th>
<th>Imagination techniques</th>
</tr>
</thead>
</table>
| **Description** | • Free ideation  
• Participants are inspired by the contributions of their peers | • Creative process takes place within given boundaries  
• Aim: look at an issue from different perspectives | • New solutions are generated by (re)combining solution elements in a novel way | • Creative thinking is facilitated through functional/structural principles from other/analogue contexts (pictures, words, technical) | • Visual imagination as central element  
• Abstract the key problem, find solutions on irrational level, transfer these back to original problem |
| **Examples** | • Brainstorming  
• Brainwriting  
• Mind-mapping | • Thinking Heads  
• SCAMPER | • Morphological Matrix  
• Attribute listing | • TRIZ  
• Confrontation with pictures or terms | • Synectics  
• Imaginary journey |
| **Suitability** | • Any kind of problem  
• Easy, mainly idea collection rather than generation | • Improve a product/service  
• Idea collection  
• Search for new applications | • Develop a product/service (system solution) with new features/benefits  
• Analytical approach, suitable for rational personality types | • Combination of analytical and creative approach | • More difficult, goes beyond collecting obvious solutions  
• Requires open attitude/preparedness to state “crazy” ideas |

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1) Quantity is #1 over quality of ideas
2) Suspend all judgment on functionalities and usability
3) Maintain 100% survival rate for all ideas.
## Selected methods – Free association

### a) Brainwriting

<table>
<thead>
<tr>
<th>Person</th>
<th>Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1</td>
<td>1</td>
</tr>
<tr>
<td>Person 2</td>
<td>2</td>
</tr>
<tr>
<td>Person 3</td>
<td>3</td>
</tr>
<tr>
<td>Person 4</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
<th>Idea 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person 2</td>
<td></td>
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<td>Person 3</td>
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<tr>
<td>Person 4</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Fostering students' entrepreneurship and open innovation in university-industry collaboration

### Selected methods – Free association

**a) Brainwriting: Group exercise**

<table>
<thead>
<tr>
<th></th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
<th>Idea 4</th>
<th>Idea 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1</td>
<td></td>
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<tr>
<td>Person 2</td>
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<tr>
<td>Person 3</td>
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<tr>
<td>Person 4</td>
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<tr>
<td>Person 5</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Description/Steps**

- Each participant has a sheet of paper with rows and columns
- In the first round, every participant fills the first row with her/his ideas on her/his own in silence
- After a certain time (2-3 minutes), all participants hand over their sheet to their neighbour for the second round
- Now the participants fill the second row of the sheet with further ideas, trying to develop further the ideas of their peers if possible (in row one)
- After the time limit, the participants hand over their sheets once more for the next round
- There are as many rounds as participants per team
### Selected methods – Free association

**a) Brainwriting: Reflection within your group**

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Idea Generation, intuitive/creative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group size</td>
<td>3-5 (any background)</td>
</tr>
<tr>
<td>Type of problem</td>
<td>Any (product/service improvement, process improvement)</td>
</tr>
<tr>
<td>Expected innovativeness</td>
<td>Low to medium</td>
</tr>
<tr>
<td>Time required</td>
<td>30-45 min.</td>
</tr>
<tr>
<td>Difficulty/experience</td>
<td>None/Easy</td>
</tr>
</tbody>
</table>

**Comments**

- Use in the beginning of creativity sessions (mainly collection of rather obvious ideas)
- Written idea collection without discussion: more introverted participants are not dominated by extroverted group members
- Inspiration through ideas brought forward by peers earlier
- Pressure to produce ideas by strict time limits in each round (disadvantage: ideas might be stated in headlines only, difficult for others to understand and build on them; alternative: allow for more time)

<table>
<thead>
<tr>
<th>Person 1</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
<th>Idea 4</th>
<th>Idea 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person 3</td>
<td></td>
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</tr>
<tr>
<td>Person 4</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Person 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Selected methods – Structured Association

**b) SCAMPER: Explanation**

<table>
<thead>
<tr>
<th>Description/Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>- State the task</td>
</tr>
<tr>
<td>- Ask the questions provided in each column</td>
</tr>
<tr>
<td>- Write down possible answers below</td>
</tr>
</tbody>
</table>

**SCAMPER**

<table>
<thead>
<tr>
<th>S</th>
<th>C</th>
<th>A</th>
<th>M</th>
<th>P</th>
<th>E</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBSTITUTE</td>
<td>COMBINE</td>
<td>ADAPT</td>
<td>MODIFY</td>
<td>PUT TO ANOTHER USE</td>
<td>ELIMINATE</td>
<td>REARRANGE</td>
</tr>
<tr>
<td>What could be used instead? What kind of alternate material can I use?</td>
<td>What could be added? How can I combine purposes?</td>
<td>How can it be adjusted to fit another purpose? What else is like this?</td>
<td>What happens if a component is made larger? How can it be made smaller?</td>
<td>Who else might be able to use it? What else can it be used for other than its original purpose?</td>
<td>What can be removed or taken away from it? What can be expanded or developed more?</td>
<td>What can be turned around? Can any components be interchanged?</td>
</tr>
</tbody>
</table>
Selected methods – Structured Association

b) SCAMPER: Group exercise
### Selected methods – Structured Association

**b) SCAMPER: Reflection within your group**

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Idea Generation, structured association/creative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group size</td>
<td>3-5 (any background)</td>
</tr>
<tr>
<td>Type of problem</td>
<td>Development of new features/other improvements to products/services, new fields of application for existing products, for improving services</td>
</tr>
<tr>
<td>Expected innovativeness</td>
<td>Medium</td>
</tr>
<tr>
<td>Time required</td>
<td>60-90 min.</td>
</tr>
<tr>
<td>Difficulty/experience</td>
<td>None/Easy</td>
</tr>
<tr>
<td>Comments</td>
<td>Use in the rather early phase of creativity sessions</td>
</tr>
<tr>
<td></td>
<td>Inspiration through given boundaries/directions for creative thinking</td>
</tr>
<tr>
<td></td>
<td>Might be necessary to abstract the questions when applying the method to a service/process/non-physical product</td>
</tr>
</tbody>
</table>

### SCAMPER:

- **S**ubstitute: What could be used instead? What kind of alternate material can I use?
- **C**ombine: What could be added? How can I combine purposes?
- **A**adapt: How can it be adjusted to fit another purpose? What else is like this?
- **M**odify: What happens if a component is made larger? How can it be made smaller?
- **P**ut to another use: Who else might be able to use it? What else can it be used for other than its original purpose?
- **E**liminate: What can be removed or taken away from it? What can be expanded or developed more?
- **R**earrange: What can be turned around? Can any components be interchanged?
### Selected methods – Combination Techniques

**c) Morphological Matrix: Explanation**

#### Parameters (example: lamp)

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Bulb Type</th>
<th>Size</th>
<th>Style</th>
<th>Finish</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>Halogen</td>
<td>Very</td>
<td>Modern</td>
<td>Black</td>
<td>Metal</td>
</tr>
<tr>
<td>Mains</td>
<td>Bulb</td>
<td>Large</td>
<td>Antique</td>
<td>White</td>
<td>Ceramic</td>
</tr>
<tr>
<td>Solar Generator</td>
<td>Daylight</td>
<td>Medium</td>
<td>Roman</td>
<td>Metallic</td>
<td>Concrete</td>
</tr>
<tr>
<td>Crank</td>
<td>Colored</td>
<td>Small</td>
<td>Art Nouveau</td>
<td>Terracotta</td>
<td>Bone</td>
</tr>
<tr>
<td>Gas</td>
<td>Handheld</td>
<td>Industrial</td>
<td>Enamel</td>
<td>Glass</td>
<td></td>
</tr>
<tr>
<td>Oil/Petrol</td>
<td>Flame</td>
<td>Natural</td>
<td>Fabric</td>
<td>Wood</td>
<td></td>
</tr>
<tr>
<td>Flame</td>
<td></td>
<td></td>
<td>Stone</td>
<td>Plastic</td>
<td></td>
</tr>
</tbody>
</table>

**Description/Steps**

- Clearly state the task
- Break down the problem (product/service) into relevant parameters (e.g., components of the product incl. packaging and non-physical aspects e.g. brand) and put them into the matrix (column headings)
- Come up with many different possible attributes for each parameter and list them in the rows
- Randomly select and discuss different combinations by choosing one attribute from each of the parameters
- Explore the different combinations
- Select some of the possible combinations and examine them in more detail

**Result:** Lamp with battery, coloured bulb, medium size, natural finish, glass material

Source: [http://www.mindtools.com/pages/article/newCT_03.htm](http://www.mindtools.com/pages/article/newCT_03.htm)
Selected methods – Combination Techniques

c) *Morphological Matrix: Group exercise*

<table>
<thead>
<tr>
<th>Parameter 1</th>
<th>Parameter 2</th>
<th>Parameter 3</th>
<th>Parameter 4</th>
<th>Parameter 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic 2</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Characteristic 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
c) Morphological Matrix: Reflection within your group

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Idea Generation, combination technique/analytical approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group size</td>
<td>1-5, often used by pure engineering teams</td>
</tr>
<tr>
<td>Type of problem</td>
<td>Development of new features/other improvements to products/services, new fields of application for existing products, for improving services</td>
</tr>
<tr>
<td>Expected innovativeness</td>
<td>Medium</td>
</tr>
<tr>
<td>Time required</td>
<td>60-90 min.</td>
</tr>
<tr>
<td>Difficulty/experience</td>
<td>None/Easy</td>
</tr>
<tr>
<td>Comments</td>
<td>- More analytical than creative approach to idea generation</td>
</tr>
<tr>
<td></td>
<td>- Results in big number of possible combinations of different parameter-characteristics (recombination of existing elements)</td>
</tr>
<tr>
<td></td>
<td>- Suitable for more “rational” characters</td>
</tr>
</tbody>
</table>

![Morphological Matrix Diagram]
3 Methods for Ideation

*Joint Discussion: Share the results of your group reflections!*

E.g. When would you suggest to use which method?

- Brainstorming
- SCAMPER
- Morph. Matrix
- Brainwriting
- Design Thinking
- TRIZ
- Synectics
- Walt Disney Method

**New applications for a technology**
*limited time available*
*group of engineering students*

**Improve a process**
*large group*
*Multidisciplinary team*
*very small group*
*reserved/sceptical participants*

**Improve a product**
*Find a name*
Thank you for your interest and participation!

Questions? Comments?

sarah.schoellhammer@iat.uni-stuttgart.de

Fostering students' entrepreneurship and open innovation in university-industry collaboration
Idea Evaluation: How to select the best ideas for implementation
-Training to iDEA Lab staff -

Sarah Schöllhammer, University of Stuttgart, Germany
The process of creative problem solving: 

**Idea Generation and Idea Selection - Overview**

4) Idea evaluation and selection as second key activity
- General Principles of Idea evaluation and selection
- Which method is adequate when?
- Early-stage Methods
  - Checklist (kill-criteria)
  - Scoring methods
  - Evaluation Matrix
- Later-stage Methods (to make sure the selected idea is viable)
  - Quantitative methods
  - Ten questions to evaluate a business idea

5) Reflection
4) Idea evaluation and selection

**as key activity of the creative problem solving process**

**Situation:** Ideation typically results in vast number of ideas

**Aim:** Identify the most promising ideas

**How:** reduction of ideas through stepwise selection process
Idea evaluation and selection

as key activity of the creative problem solving process

number of ideas decreases

--> enables to evaluate the remaining ones in increasing detail

information available increases

--> ideas develop into suggestions and concepts for realisation

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Idea evaluation and selection

Which method should be applied when?

- Qualitative methods (checklists, scoring)
- Mixed methods (criteria evaluation matrix)
- Quantitative methods (e.g. ROI calculations)
- Additional checklists for future entrepreneurs

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Selecting the best ideas for implementation

a) Checklists

*Early-stage method: For filtering out less promising ones from a big number of ideas*

1. Make a list of exclusion criteria (e.g. technical feasibility, risks, ...)
2. Check for each of the ideas if they should be voted out (‘No Go’) or not (‘Go’)
3. Exclude all ideas that got a ‘No Go’ from the list of ideas
Early-on Methods

b) Scoring Models

*Early-stage method: For selecting the most promising ones from a big number of ideas*

1. Cluster ideas you have generated
2. Decide on number of votes per person
3. Decide if double voting is permitted
4. Decide on number of top ideas that will be analysed further
5. Vote
6. Count votes, top ideas will proceed to the next round
Early-on Methods

b) Scoring Models: Group exercise

1. Put all the ideas you have generated in the first session on a board

2. Every person has 5 votes, no double voting, top 3 ideas will be analysed further

3. Vote

4. Count votes, top ideas will proceed to the next round
Early-on Methods

c) Criteria Evaluation Matrix

*Mid-stage method: For comparing different concepts*

1. Set possible product ideas across the top row.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
<th>Idea 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1</td>
<td>____%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 2</td>
<td>____%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 3</td>
<td>____%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 4</td>
<td>____%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 5</td>
<td>____%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals (x4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Agree on criteria to evaluate ideas (maybe incl. weights for higher accuracy)

3. Rate each idea using a scale (e.g. of 0 – 5, with 0 being the worst and 5 the best)

4. Multiply by 4 to get a rating close to 100 points

5. Compare: a worthwhile idea scores between 80 and 100 points

**Early-on Methods**

**c) Criteria Evaluation Matrix: Group exercise**

1. Set possible product ideas across the top row.
2. Agree on criteria to evaluate ideas.
3. Rate each idea on a scale of 0 – 5.
5. Compare the scores: a worthwhile idea has about 80 to 100 points.
Selecting the best ideas for implementation

d) Quantitative methods

Later stage methods when reliable information on market and technology is available (e.g. based on market research and prototype tests)

Return on Investment (ROI): \( \frac{\text{Net Profit}}{\text{Invested Resources}} \times 100 \)

Net Present Value (NPV): present value of a series of cash flows generated by an investment, minus the initial investment

Internal Rate of Return (IRR): type “=IRR” in an empty excel cell and complete the formula


https://www.youtube.com/watch?v=qAhV3xG0i8s
Later-Stage Methods

e) Ten Ways to Evaluate a New Business Idea

- Is this business idea something I really want to do?
- Is this business this business idea something I’m capable of doing?
- Does this business idea tap my personal strengths?
- Can I describe this business idea in 25 words or less?
- What’s the closest thing to this business idea in the marketplace?
- Does this business idea meet a need or solve a problem?
- Does this business idea take advantage of a new opportunity?
- What’s the biggest drawback or limitation to this business idea?
- Will this business idea make money — and how fast?
- Am I willing to remortgage my house to fund this business idea?
5) Idea Evaluation Methods

Reflection

Checklists

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 3</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scoring Models

Criteria Evaluation Matrix

<table>
<thead>
<tr>
<th>Weight</th>
<th>Idea 1</th>
<th>Idea 2</th>
<th>Idea 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1</td>
<td></td>
<td></td>
<td></td>
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<td>Criterion 5</td>
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<tr>
<td>Totals</td>
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<td></td>
<td></td>
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<tr>
<td>Totals (%x4)</td>
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</tbody>
</table>

Quantitative methods

Ten Ways to Evaluate a New Business Idea

- Is this business idea something I really want to do?
- Is this business idea something I'm capable of doing?
- Does this business idea tap my personal strengths?
- Can I describe this business idea in 25 words or less?
- What's the closest thing to this business idea in the marketplace?
- Does this business idea meet a need or solve a problem?
- Does this business idea take advantage of a new opportunity?
- What's the biggest drawback or limitation to this business idea?
The circular process of creative problem solving:

Summary
Thank you for your interest and participation!

Questions? Comments?

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Fostering students' entrepreneurship and open innovation in university-industry collaboration