To be an Inventor…

Introduction

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Philips Group Innovation
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Inventions since 1964

- 1968 Coal heating → Central heating
- 1973 Black and white television → Color television
- 1982 Record player → CD player
- 1986 Main frame computers → Personal computers
- 1986 Writing with a type machine → wordprocessor software
- 1992 High pollution by cars → introduction of catalyst in each car
- 1995 Writing letters → sending emails
- 1995 Searching in books → World Wide Web internet
- 2000 Telephone booths → everyone a mobile phone
- 2005 Camera roll → Digital photo's
- 2006 Cathode ray tube television → LCD television
- 2008 Mobile phone → smart phone
- 2008 Data stored locally → cloud storage
- 2013 Central electricity generation → solar panels
- 2015 Traditional lamps → LED
- 2018 Independent apparatuses → smart spaces, connected systems

Digital revolution

Agenda

- Inventing - what is it ?
- The basic steps of inventing
- Some techniques

Inventing - what is it ?

You heard about inventions and patents, and that you have to have a good idea to write a patent.
But what does inventing actually mean? What is inventing?

Inventing - what is it ?

- Creating something (technical) that has not been there before, and that solves a problem, it fulfils a need (often of humans)

Inventing - what is it ?

How do you get a benefit (make money) from your invention?

Inventing - what is it ?

Need

Invention (Idea to satisfy the need)

Innovation (A way to integrate the idea into a business)

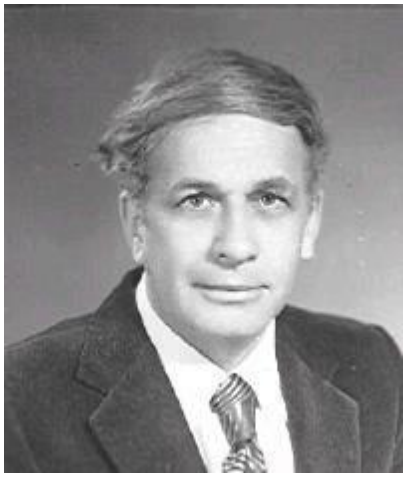
Inventing - what is it ?

Can anyone be an inventor?

You probably know some people who are VERY inventive.
And others who are absolutely not inventive.

Does it mean that you are pre-disposed from birth to be an inventor – or not?

Inventing - what is it ?



Research shows that anyone can be an inventor

Practice helps

A method helps

And I am here to teach you (aspects of) the method called TRIZ

TRIZ=Russian acronym for “Theory of Inventive Problem Solving”

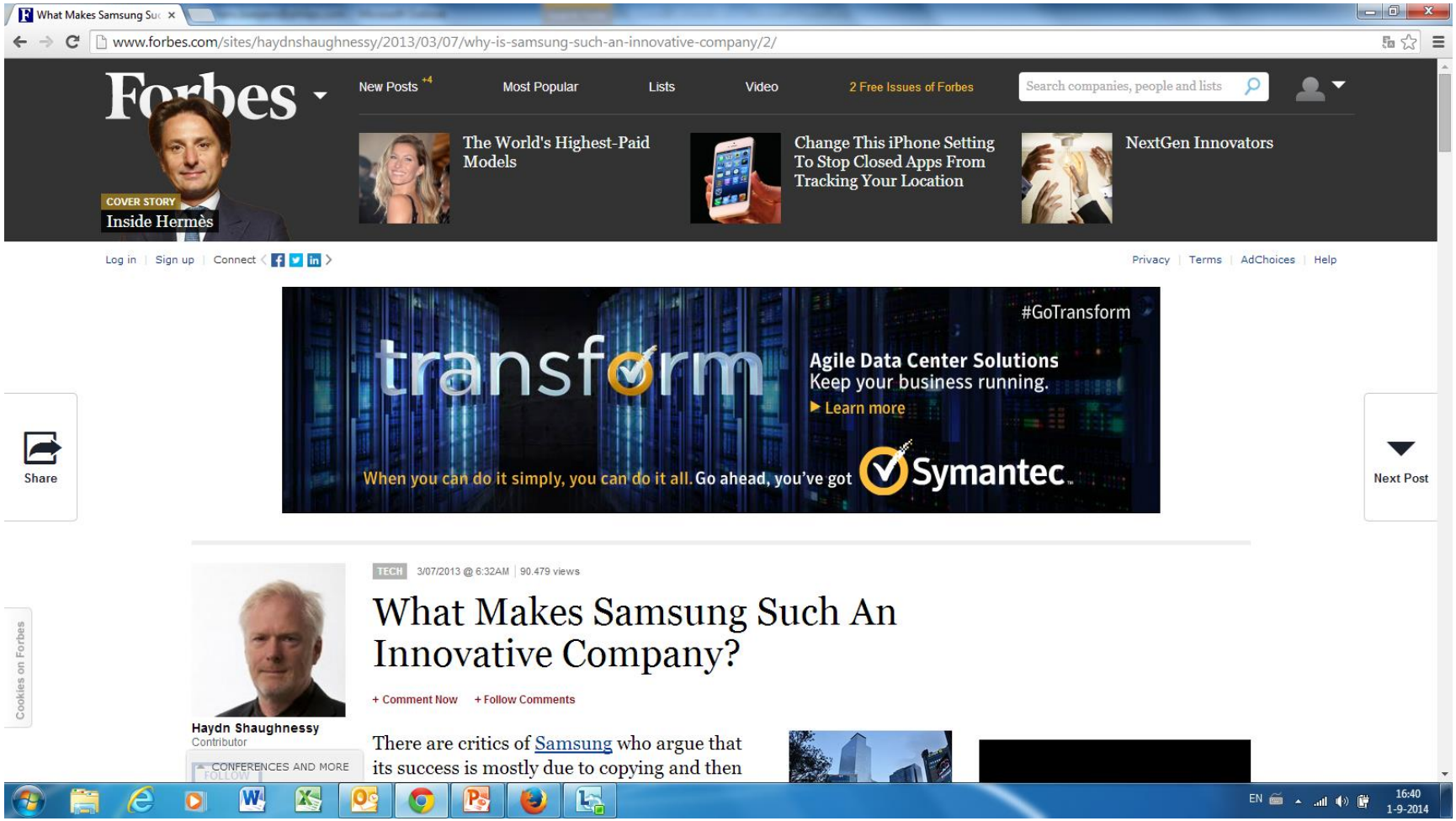
Developed initially by G. Altshuller by analysis of 200.000 of patents

Now several TRIZ associations exist (I followed training of MATRIZ)

Since 1990 TRIZ has spread over the world

It is claimed that TRIZ is the secret behind the success of Samsung

http://www.forbes.com/sites/haydnshaughnessy/2013/03/07/why-is-samsung-such-an-innovative-company/2/



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Beyond technology

- TRIZ has been developed from engineering science using physics
- However, it provides solution models for many problems that are not in the technical domain
  - Logistic, relation conflicts, management dilemma's, …


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The basic steps of inventing

Need

Invention (Idea to satisfy the need)

Innovation (A way to integrate the idea into a business)

Inventing does not take place in a vacuum
To be of value it needs to solve a problem and it needs to be implemented.
To be sure that all aspects are covered it is best to go about it in a step by step approach.

The basic steps of inventing

Step 1: Identify the need

What is a need?

A need is a lack or want of something.

- That can be something obvious (It is a mess to make a cup of coffee, wouldn't it be nice to have coffee machine that is easy to clean?)
- Or something not so obvious (It is boring to always have the same coffee taste, wouldn't it be nice to have a coffee machine that provides different tastes?)

The basic steps of inventing

Step 1: Identify the need

What is a need?

Elements of a need are:

- A statement describing the situation
- A problem (need or want of something) that is appearing
  - It is the task for an inventor to identify unmet needs; you can derive them from negative emotions people have with situations (worries, fear, frustration, angriness, irritation, dissatisfaction)
- Wishful thinking: a question “Wouldn’t it be nice to ...?”

The basic steps of inventing

Step 1: Identify the need

- Example:
  - My grandmother of 80 years old wants to live in her own house as long as possible
  - She has some illnesses and might fall during the night when she goes to the toilet, this is dangerous, she might break something and she would not be able to live anymore in her house
  - Wouldn't it be nice if her house was designed such that this accident cannot easily happen?

It is easiest to find needs in areas that you already know, where it is easy for you to explore and to find information.

Family, friends, your environment.

Ask what they are unhappy with at the moment.

Ask what costs them time, money, effort…

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- Qualitative market research methods (psychology, marketing)
  - Focus group discussion with dedicated groups of customers
  - Interviews
  - Online questionnaires with user panels
  - Test prototypes in real environment, observe user behavior

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

Exploration:

- What are the underlying causes of the problem?
- What are the resources that I do have to solve the problem?
- How can I create solutions to the problem?

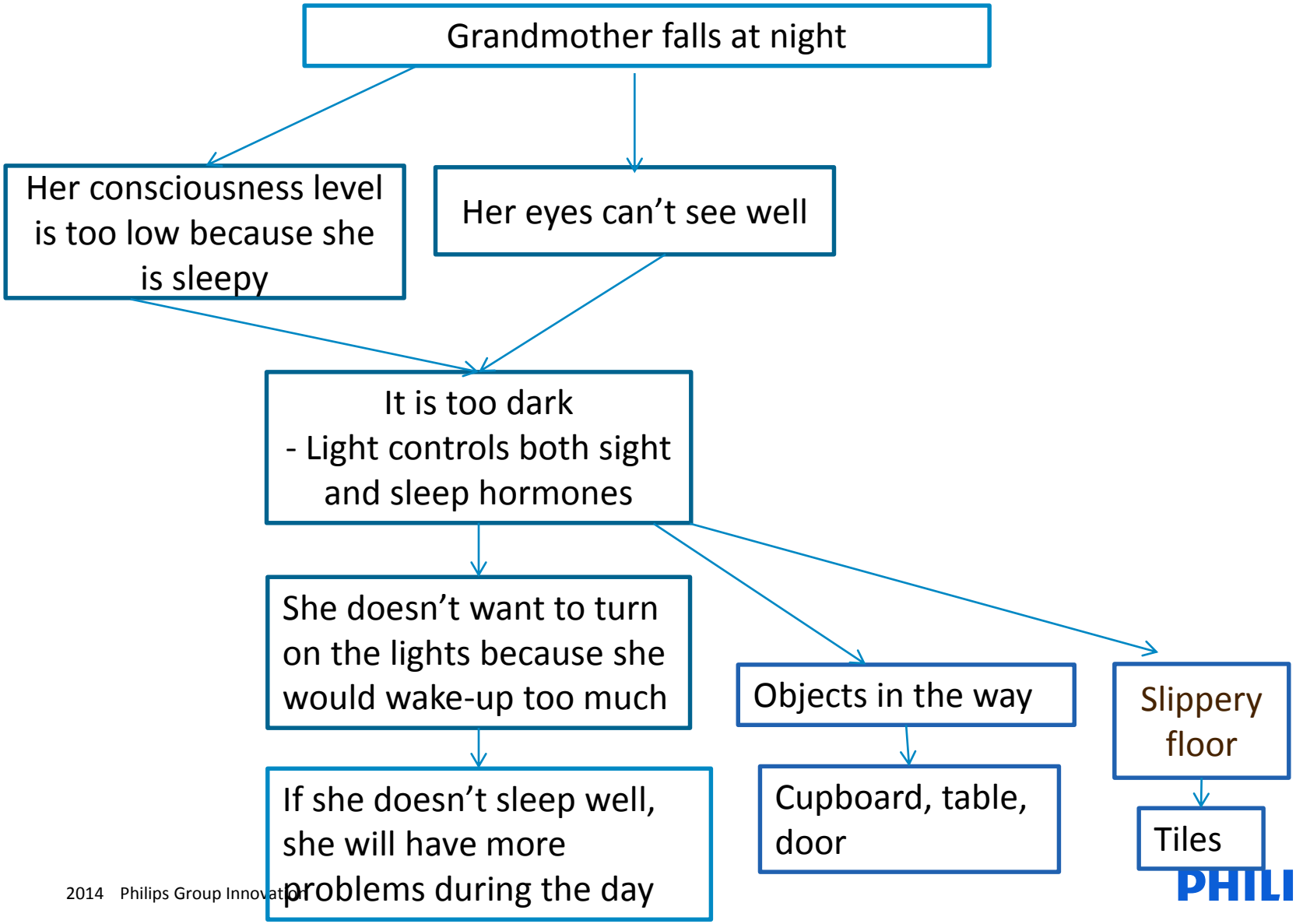
The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

Exploration:

- Various very different inventions can answer a single question
- To find solutions, analyze what are the underlying causes of the problem?
  - Ask “why ?” as much as possible
    - Root cause diagram

Root-cause diagram



Inventing

- What ideas do you have to help this grandmother?

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

Exploration:

What are the resources that I do have to solve the problem?

- Material resources (search in a chemistry book on material properties)
  - things, components, their characteristics and forms, of plastic, wood, metal
- Field resources (search in a physics book or website)
  - forms of energy, magnetic fields, gravity, wireless communication, …
- Space resources (analyze the space in which the solution must work)
  - geometric resources in 3D space, e.g. a window, a ceiling, a wall,…
- Resources in time (what does change in time?)
  - at a point in time, duration, intervals,…
- Information resources
  - data and information that are present in the system but are unused, e.g. a webpage, artificial intelligence,…
- Functional resources
  - functions available in the system and its environment, e.g. a radio-transmitter, a sensor, a camera, a smartphone-app, a light source, a filter, a computer, electronically changing materials (e.g. electrochromic glass coating)

Case – find resources

- “Grandmother falls at night”
  - Surrounding space:
    - Invent something around the grandmother during night
  - At the grandmother:
    - Can she wear a device that helps her? What is it’s main function?
  - In the device:
    - what kind of components can be used that create the function of the device?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The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

If you have a difficult problem it is a dilemma/contradiction:

If	you create solution “A”
then	you improve property “1”
but	you worsen property “2”

Often dilemmas are solved using a few basic principles. The ten most common ones of these principles are listed below.

Example: “Grand mother falls at night”

Contradiction

If “during night the grandmother turns on the light to go to the toilet”

then “she will see all obstacles”

but “she will not fall asleep afterwards easily”

The basic steps of inventing

The 10 most used principles for inventions (there are 40 in total):

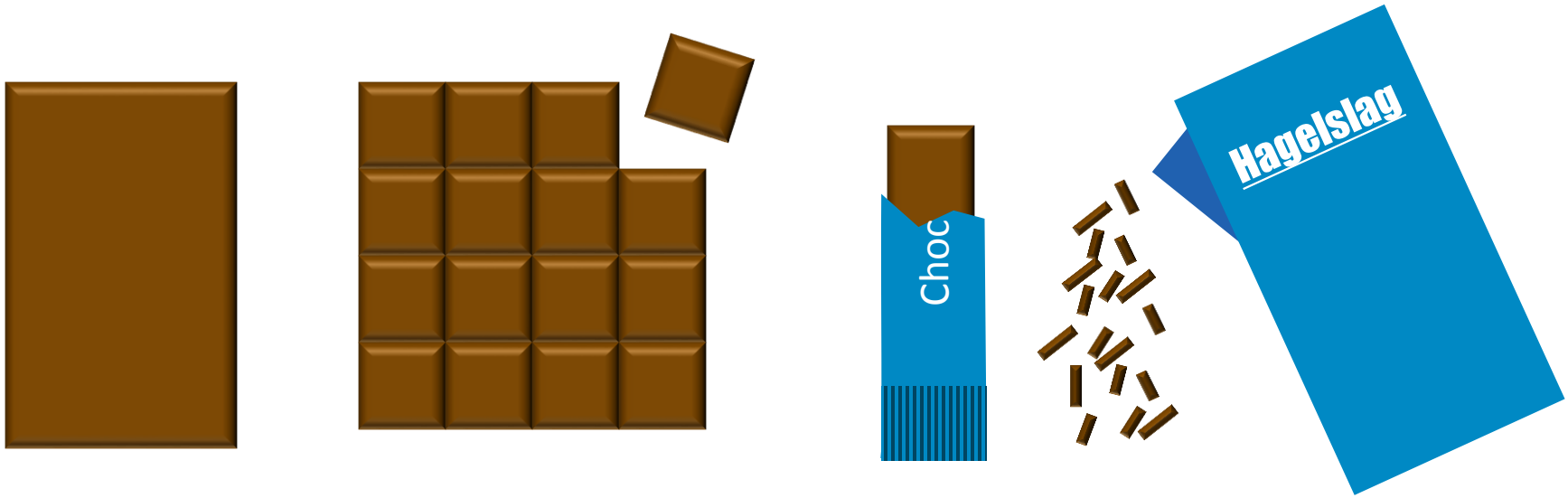
01. Segmentation
02. Taking out
03. Local quality
07. Nesting
10. Preliminary action/prior action
13. The other way round
15. Dynamics
17. Another dimension
25. Self-service
32. Color changes

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

01. Segmentation

Example: Chocolate



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The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

1. Segmentation

   – *Identify the system, or parts or segments of the system that contain a challenge.*
   – *Segment those parts, make them easy to assemble or disassemble, segment them to a higher degree.*

Examples:
Cloud computing
Rather than store all your data on your mobile phone, store it in bits and pieces in the “cloud”. It is always accessible and does not block your memory.

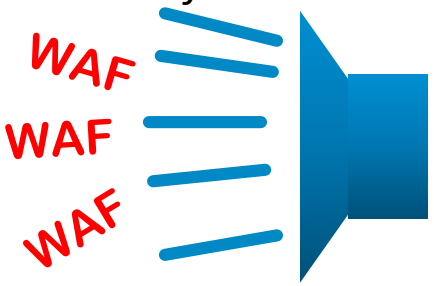
Razor for shaving:
The use of multiple blades in razors increases the cutting performance

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

02. Taking out

- *Identify useful or harmful parts, properties or functions of the system. Identify specific characteristics of that part, property or function that can be used to enable easy extraction.*
- *Separate or take out one or more of these parts, properties or functions.*



Example: Burglar Alarm
Use the sound of a barking dog,
without the dog, as a burglar alarm.

USB stick:
Remove USB stick from computer

Sunglasses:
Glasses filter out harmfull light radiation

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

02. Taking out

Example: mobile phones for kids
In mobile phones specially designed for small children the dial function is restricted to those of the parents (and friends etc.). All other functions are taken out, so the children cannot make expensive calls to strangers etc.

Example: Healthcare App
The in-build camera of a smartphone or pad is used to film a person's face. Only the red channel is looked at, and the level of redness in the skin is measured in time. This gives an indication of the heartbeat of the person.

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

03. Local quality

- *Identify characteristics of the system or parts of the system or its environment in a specific area and/or moment in time.*
- *Change that characteristic to make the overall system non-uniform, to locally optimize each characteristic, or to differentiate their functionality.*

Example: Pencil
A pencil and eraser in one unit

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

03. Local quality

Example: Smartphone
The most often used programs are present as an icon on the start-up page of the smartphone.

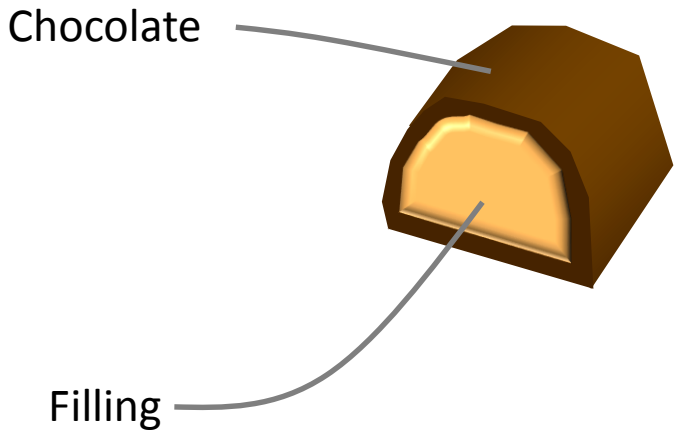
Swimming suits:
Special skin of whole body swimming suits gave record swimming times at World Championships

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

07. Nesting

Example: Chocolate pralines



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The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

07. Nesting

- *Identify any object or system or opening in an object or system*
- *Put one object, system or opening inside the other. Pass one object or system through an opening in the other.*

Example: Software programs
Microsoft office suite contains various programs that can interact with each other in one application. Other examples are imaging programs or the like that interact with Facebook.

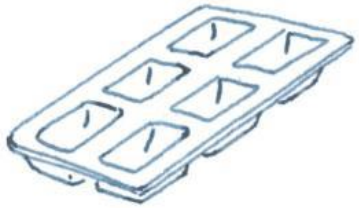
Example: nesting of chairs:

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

- 10 Preliminary action
  - *Identify an action or system or part of a system, which may be harmful or prone to be improved.*
  - *Improve the performance or safety of a system by performing an action before it is needed, or by pre-arranging actions.*

Example:
Ice-cubes (are pre-portioned)



Example:
Antifreezer in car screen washing fluid

Example:
Airbag that is inflated before body crashes against front of car during accident

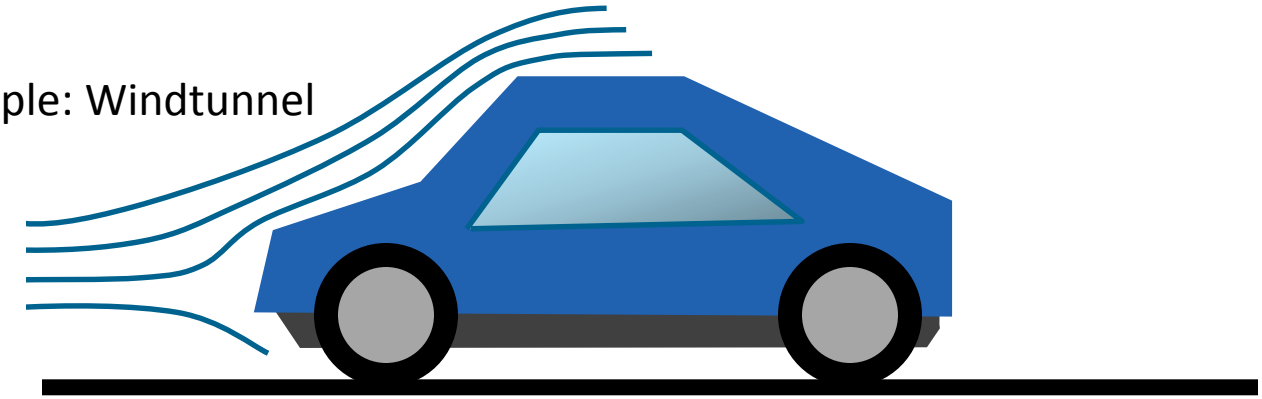
Example:
Smartphone that gives a warning message when a thunderstorm is nearby

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

13. The other way round
    - *Identify an object, action, feature, function, event or condition.*
    - *Introduce the opposite, or upside-down or absence of the object, action, feature, function, event or condition.*

Example: Windtunnel



The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

13. The other way round

Example: Internet search engine
Internet search engines have already indexed the most frequent search terms, so they do not need to find relevant pages on the internet. those pages are already found, and the indexes are used to present the user with a selection very quickly.

Example:
Usually humans decide when the lights in a space are switched on.
When a lighting system contains movement sensors that activate the light when you enter the room, the lighting system decides itself when it is switched on for humans.

Example:
Traditionally, parents raise their children. However, if parents listen well to them, their children will raise the parents as well.

Example: traditionally companies invent what customers need, but more and more customers become inventors (design your own Adidas shoes)

The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

- 15 Dynamics
  - *Identify a system, system element, state or property that is rigid or inflexible*
  - *Improve the system performance by making it more dynamic. Allow the system to change / optimize or adapt to different applications, conditions or the environment. Divide or split the system, make it movable or adaptable, make features flexible.*

- Example: Philips DimTone lamp
  - In hotel restaurants this lamp enables to change intensity and colour temperature by dimming: in the morning people want bright and cool white light to wake up and in the evening they want cosy warm white candle light

- Example: Automatic sunscreens
  - When the sun is present in the summer, houses can have automatic sunscreens to prevent the building from too much heating; in winter time they can be programmed to be used less to allow additional heating

The basic steps of inventing

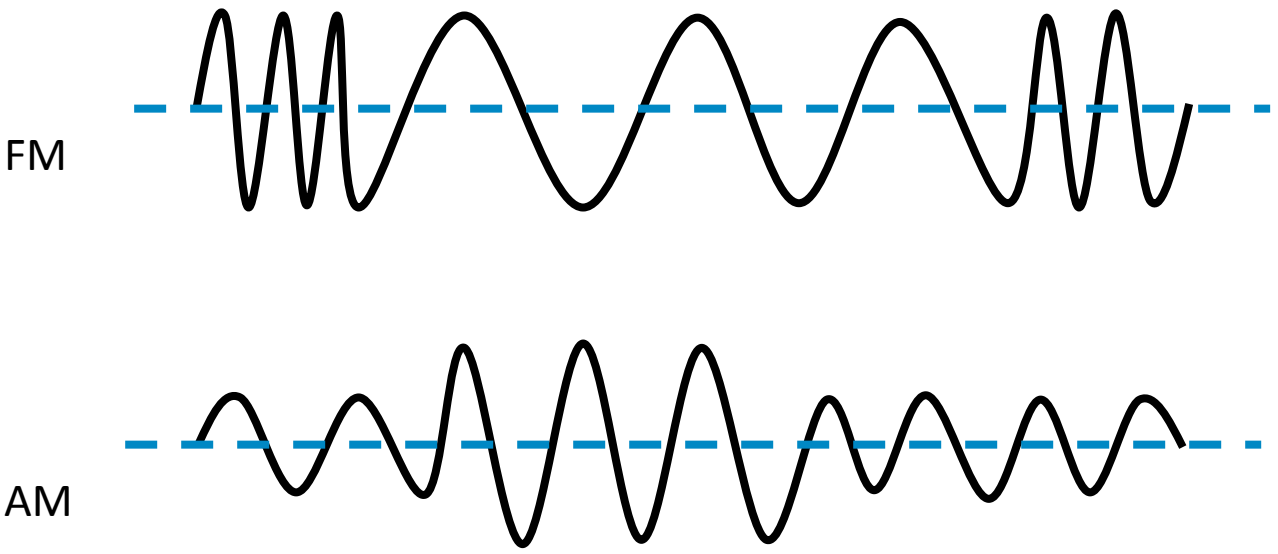
Step 2: Invent – identify ways of satisfying the need

17. Another dimension

- Change the orientation of the objects, systems, part of systems, characteristics, parameters, fields.

Example: Radio transmission

Frequency modulation vs. Amplitude modulation for data transmission in radio waves



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The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

17. Another dimension

Example: Smartphone
In addition to the original function of conveying speech, phones have evolved to include functions such as watching TV, browsing the internet, navigation, etc.

Example: Smartphone
Rather than having to remember numbers, modern smartphones display text and pictures to the user to chose which person to contact.

Example: Lighting system with presence detection
Rather than only dim the light when no one is present, presence detection can be used for other purposes, e.g. detecting if someone is in the room or not; during night this is useful for security of the building.

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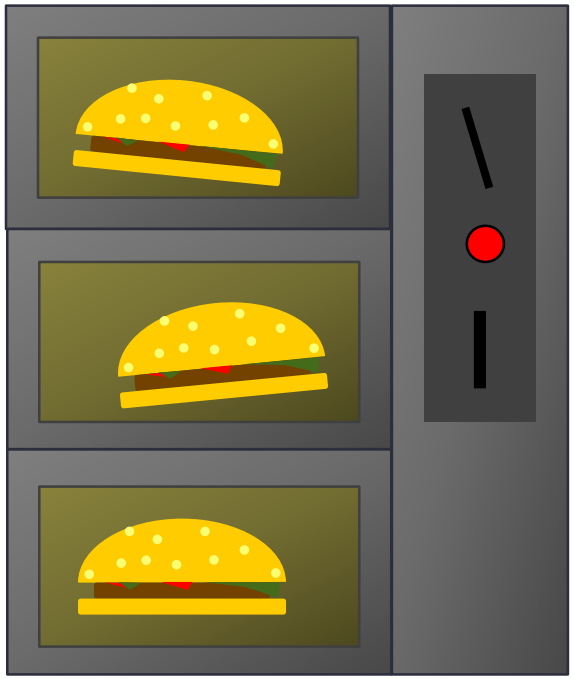
Step 2: Invent – identify ways of satisfying the need

25. Self-service

Example: Eten uit de muur



The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

25. Self-service

Example: Smartphone
The smartphone does certain actions on its own without user involvement, such as identifying the current location, informing about the weather, informing about messages and meeting times, etc.

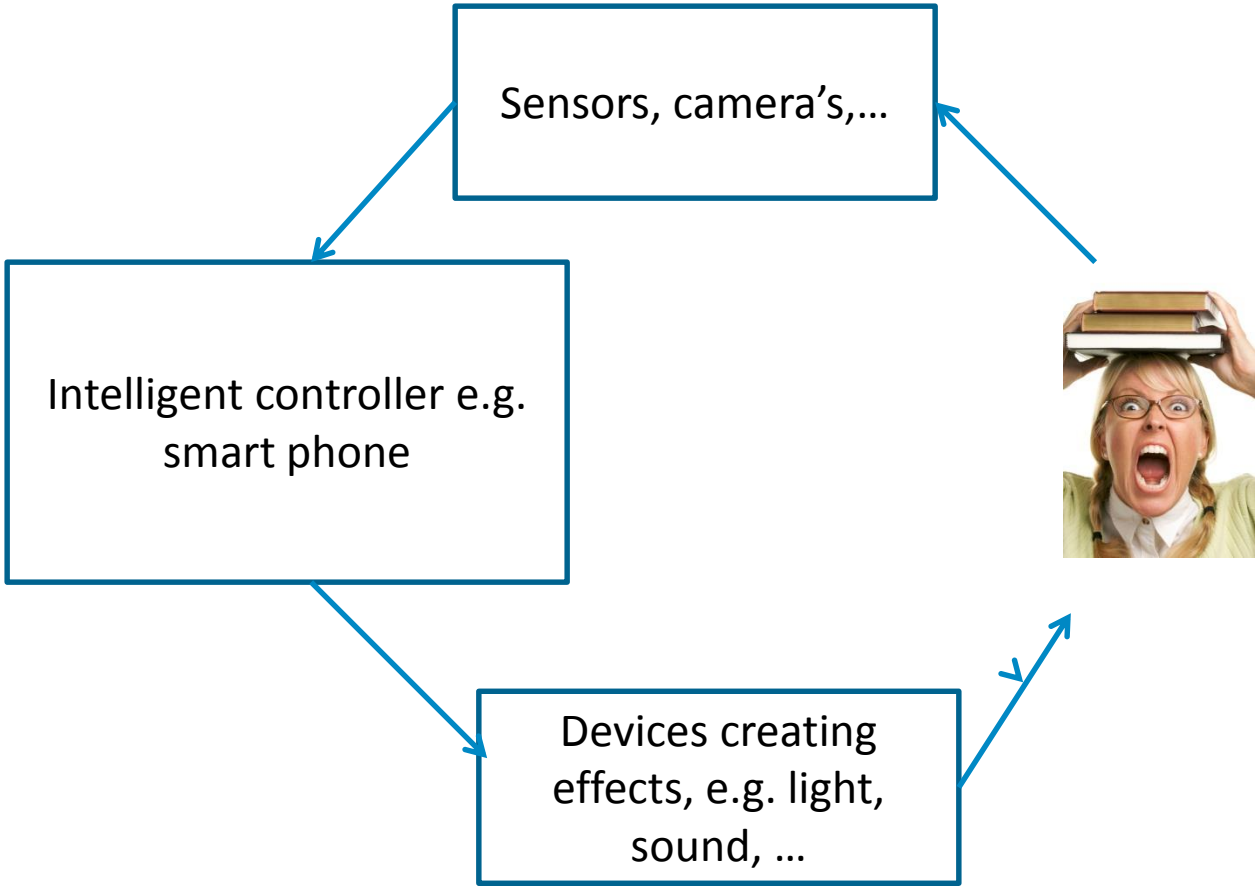
The basic steps of inventing

Step 2: Invent – identify ways of satisfying the need

32. Color changes

Examples:
Colored warning signs at road works
Use of color filters
Use of smoke in the air
Reflective paint to increase visibility of road signs

A general system design



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Inventing “preventing Grandmother falling during night

- Taking out:
  - System that monitors her movements and gives voice instructions
- Self service
  - Care robot helping her navigating through house, like a dog for blinds
  - Lights turned on in a dimmed levels as soon as she walks over floor at night
  - Motion sensors in armwrest turns on the light
- Dynamics
  - Special light sources with other light colour and intensity during night than during evening; e.g. colored lighting guidance strips on floor from bedroom to toilet
- Preliminary action
  - Make sure that the path to the toilet has no obstacles, door is always open, floors are not slippery; a camera system could watch this and warn the grandmother in the evening to take care of these things before she is going to bed

The basic steps of inventing

Brain-dump

How to create ideas together in a team?

1. Present the problem (The more specific the better)
   1. What is the situation?
   2. What is the dilemma? Which needs are conflicting?

2. Give everyone 5 minutes the time to write down ideas they have. Write those ideas down on post-it notes, one idea per post-it note.

3. Go to a flipchart post your idea one-by-one and explain to the others briefly what your idea is about.

4. Listen to the ideas of the others, and write down new ideas or improvements.

5. Cluster the ideas

6. Select the best ones to work out in more detail.


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