Basics of Quality Management

Lecture 4

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Goal

TQM

Principles

- Customer focus
- Process improvement
- Total involvement

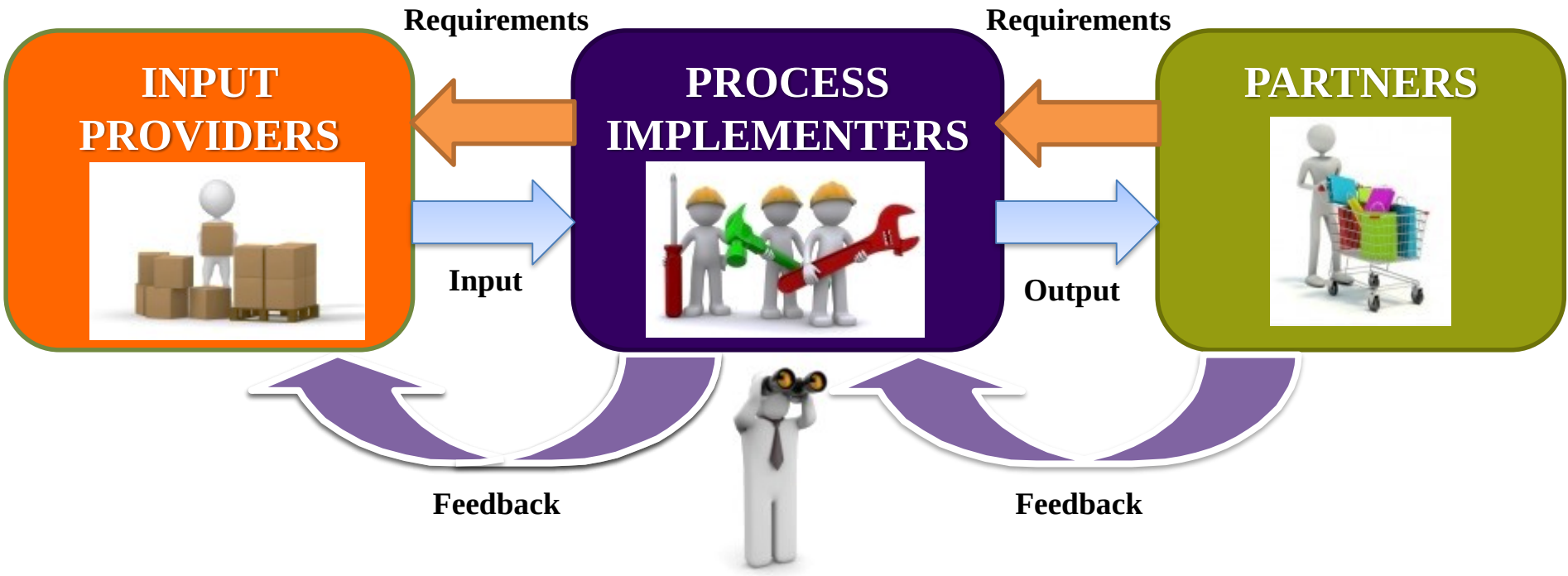
Supporting elements

- Leadership
- Supportive structure
- Communication
- Education and training
- Reward and recognitions
- Measurement

Total Quality Management

2. Continuous improvement of processes

The process is one or more tasks that converts inputs into outputs for the partner or for other processes, with the help of people, procedures, and tools.



What a process is?

A number of chains of defined sequence of **activities** that convert **inputs** into **outputs** to a partner or another person,

processes,

tools (**resources**).

Requirements

Requirements

SUPPLIER

WORK GROUP

CUSTOMER

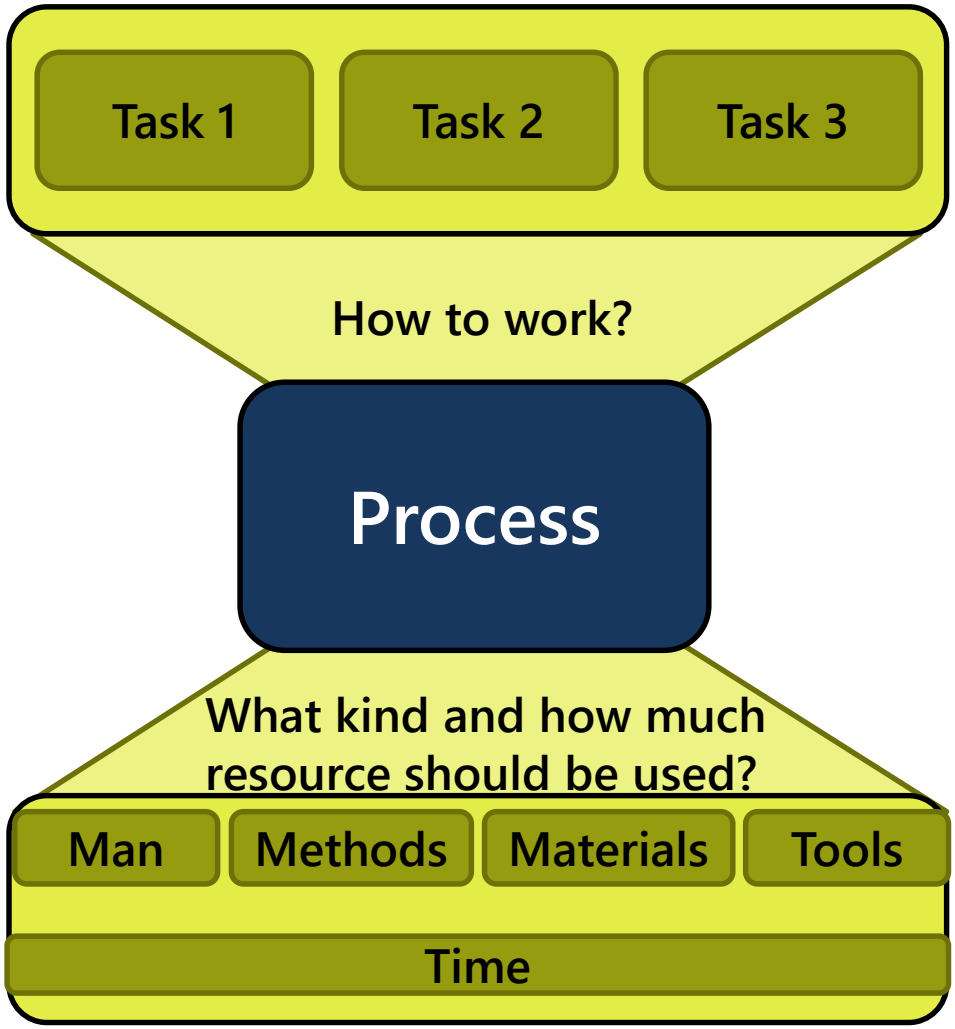
Inputs

Outputs

Feedback

Feedback

Process approach



Process

- goal oriented
- gives value
- transformative

Process

Four groups of people are involved in the operation and improvement of processes:

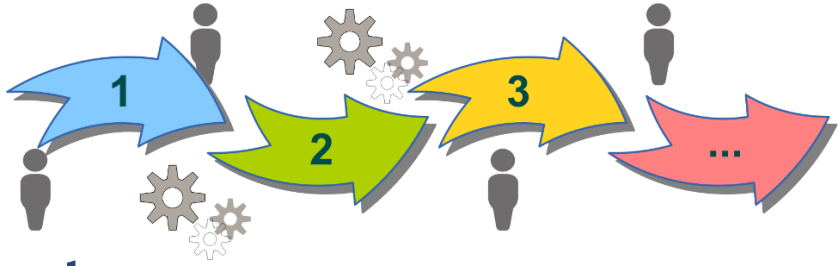
- **Customers:** the people (or person) for whom the output (product or service) is being produced.
- **Work group:** the people (or person) who work in the process to produce and deliver the desired output.
- **Supplier:** the people (or person) who provide input to the work process.
- **Owner:** the person who is responsible for the operation of the process *and* for its improvement.

Total Quality Management

2. Continuous improvement of processes

Classification of processes

- Main processes – why it works
- Supporting processes – without them can't operate
- Supplementary (additional) processes – e.g. HR



- Management processes - strategy

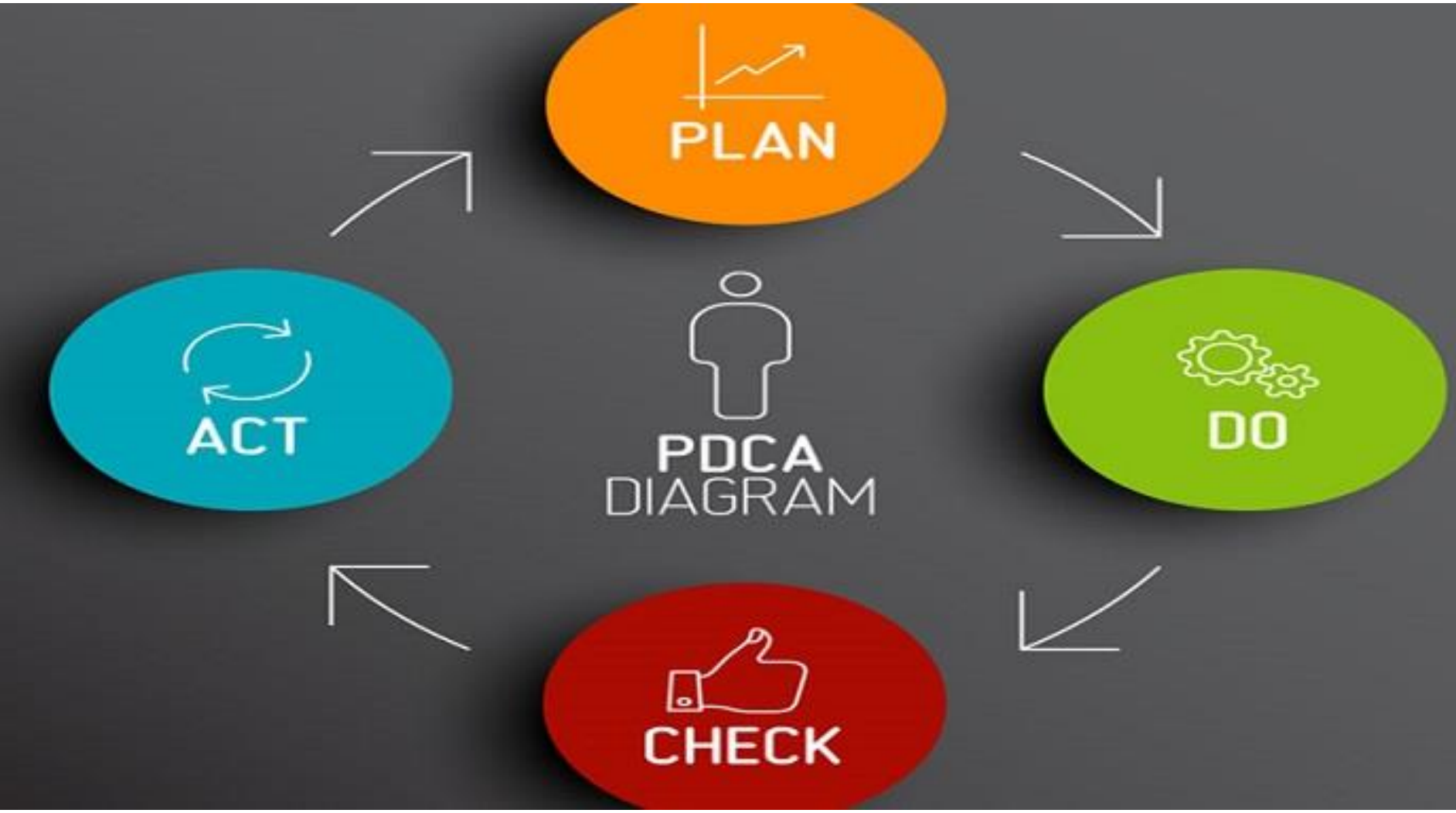
- Key (important) processes - success

Continuous process improvement

Continuous monitoring and development of all steps in the process to reduce disparities and improve reliability.

Process Improvement

- Continuous improvement
  - ✓Six steps process improvement model
  - ✓PDCA
  - ✓DMAIC


PLAN
DO
CHECK
ACT
PDCA
DIAGRAM

PDCA

- Plan
  - ✓heterogeneous professional team
  - ✓clear, detailed problem
  - ✓measurable goals
  - ✓planning the process development
  - ✓identification of process (s)
  - ✓gathering and analyzing possible causes

PDCA

- Do
  - ✓solutions evaluation system
  - ✓development of possible solutions
  - ✓choosing solution
  - ✓putting the solution into practice, with a "pilot" signal

PDCA

- Check
  - ✓data collection, control over the experimental solution
  - ✓impact and outcome analysis and evaluation

If you have not achieved the intended goals, step back!

PDCA

- **Act**
  - ✓ required systemic change
  - ✓ full introduction
  - ✓ continuous monitoring of the solution
  - ✓ refining options

  - ✓ a new development opportunity?!

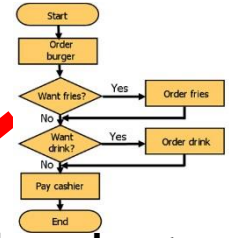

DEFINE
MEASURE
ANALYZE
IMPROVE
CONTROL
SIX
SIGMA
6σ

- Define: defining the goals of the project
- Measure: establishing and applying metrics
- Analyze: evaluation of the data obtained during the measurement
- Improve: gathering developing ideas
- Control: tracking a new, improved system

Six steps process improvement

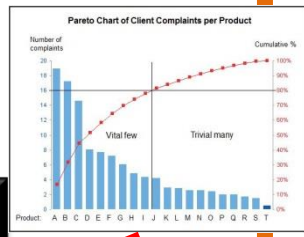
1. Define the problem

2. Identify and document the process



Flowchart

Pareto analysis



3. Measure performance

Brainstorming

4. Understand why

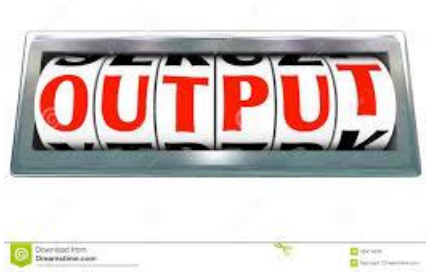
5. Develop and test ideas

6. Implement solutions and evaluate

Cause and effect diagram (Ishikawa)

Step 1. Define the problem in the context of the process

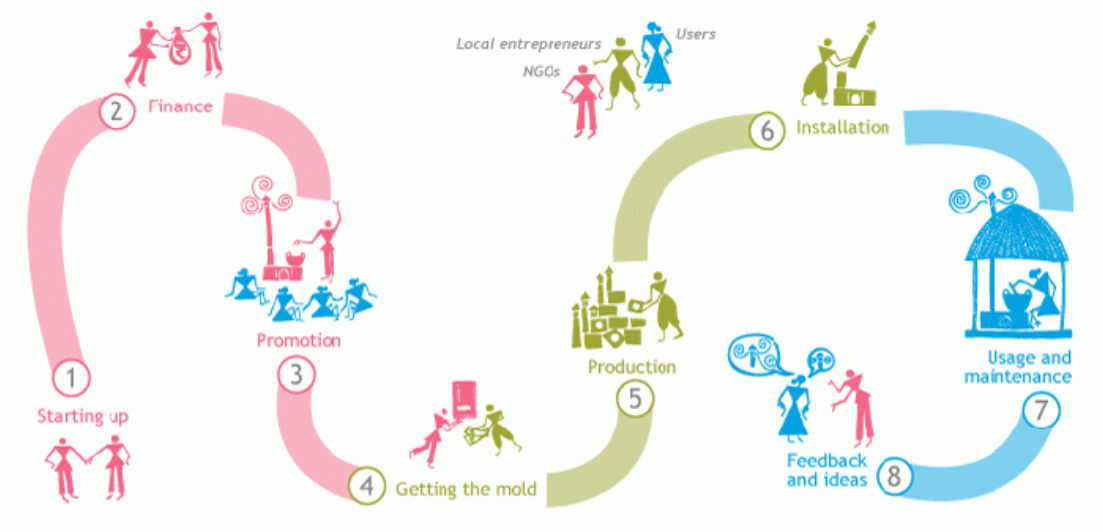
- Clarifying which systems are involved, efforts focused on processes not outputs.
- Specific activities:
  - Identify the output
  - Identify the customers
  - Define the customers' requirements
  - Identify the processes producing these outputs
  - Identify the owner(s) of the processes

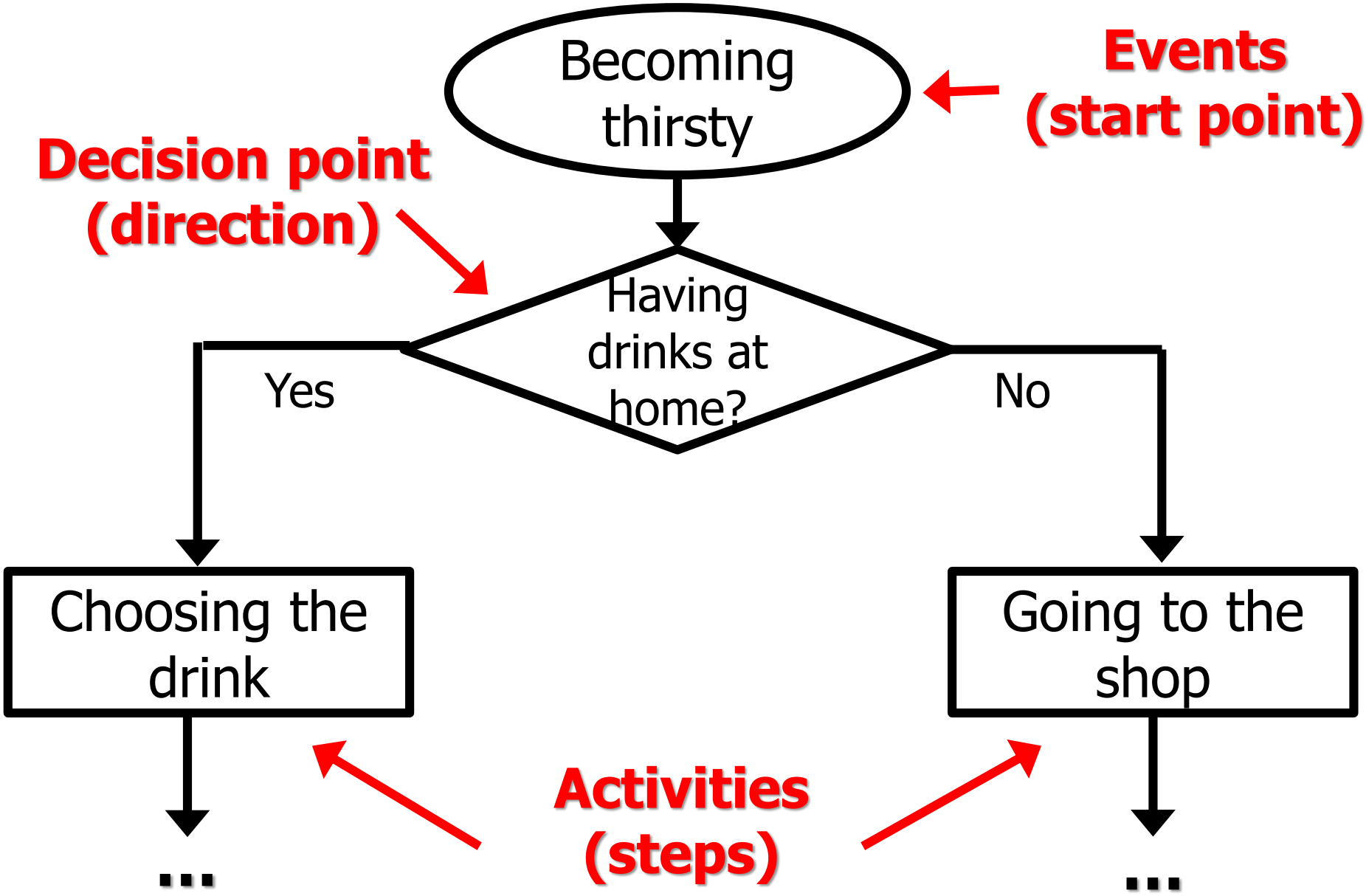


Step 2. Identify and document the process

- The process should be described in understandable terms
  - Picture, model, written description

фразе «номен эст омен», то есть «имя это обязательство» Иштван Козма сознательно старается всегда подчинить содержимому своеобразный, индивидуальный мир цветов и форм своих картин, даже декоративное влияние тоже. Мужское имя «Козма» происходит из латинской формы «Косма» греческого имени «Козмас» с значением: украшеный, нарядный. В этот раз с ответственностью и совестью я могу ограничиться только всего решением вопроса: разве эти художественные произведения можно действительно подозревать в искусстве? Этот вопрос возникается для нас, знатоков искусства или доверчивых наслаждающихся искусством, когда в обоих случаях мы более-менее подчиняемся власти нашей эпохи. Если бы кто-то считал презрительной отметку «подозрение в искусстве», тогда я посмел бы заявить этому человеку что картины мастера Козма смогли бы находиться хоть на главном месте в любом музее современных искусств во всём мире. Между прочим круг произведений и мастеров, фигурирующих в этих музеях определяются уже давно точками зрения, находящимися совсем вне искусства. Ну, в данной творчестве, завоевшем себе признание не только по объёму, но и по качеству




Becoming thirsty
Events (start point)
Decision point (direction)
Having drinks at home?
Yes
No
Choosing the drink
Going to the shop
Activities (steps)
...
...

Step 3. Measure performance

How well is the system performing? Measures must be defined and evaluated in the context of customer expectations.

- **Measuring performance at three levels: process, outputs and outcomes**

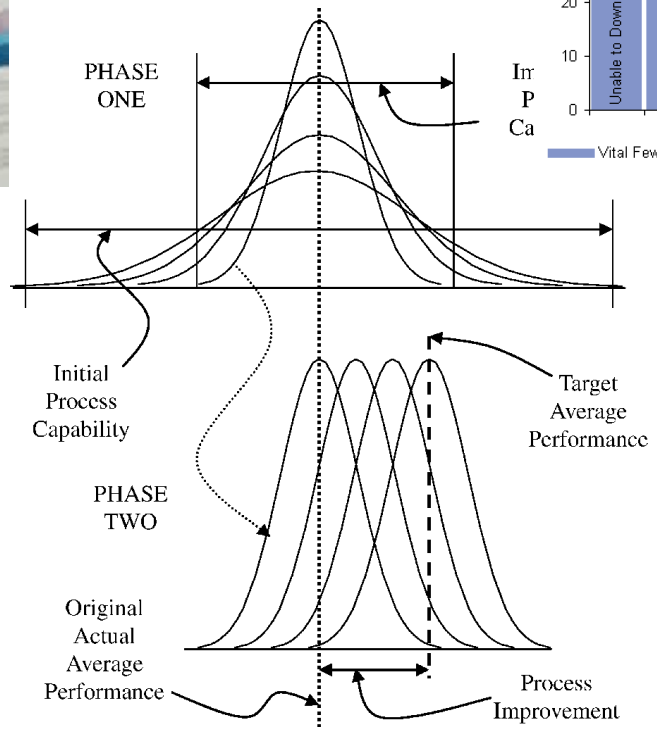
Outcome	Customer satisfaction
Output	Characteristics desired by customer Characteristics delivered by process
Process	Performance measures

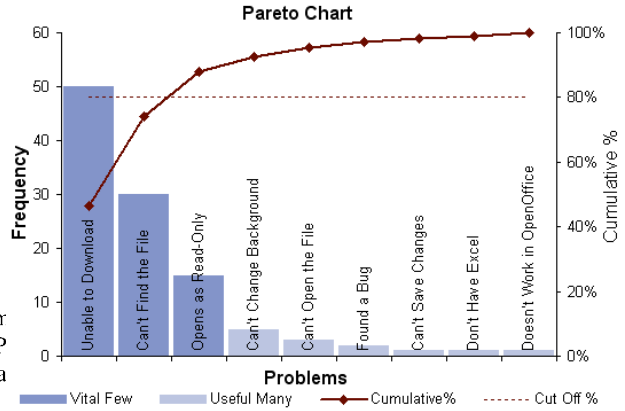
Summary of measurement

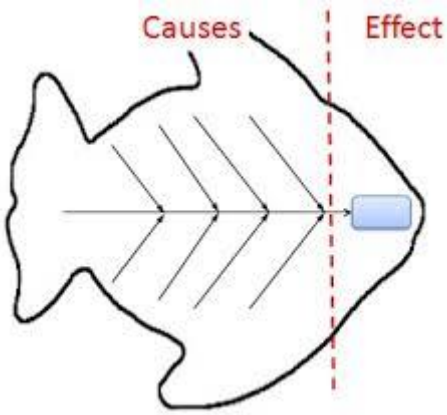
1. Every product and service can be characterized by a set of performance measures.
2. The job begins by understanding your customers and identifying the set of characteristics that fully define their needs.
3. These customer-driven characteristics must be translated into process measures and learn the performance level that your process is capable of delivering for each characteristic.
4. Then it should be determined how satisfied customers are with performance at current level, and the relative importance customers place on changing the level of each characteristic.

Step 4: Understand why

- **Step 4 offers methods to gain a profound understanding of the process**







Step 4 – Understand why

- Which causes can result in the poor performance of our processes?
- Which problems have the greatest impact on poor quality?
- Quality Management tools:
  - Brainstorming (Affinity diagram)
  - Cause and Effect Analysis
  - Pareto Analysis

Brainstorming participants

- Leading person, moderator (clear description of the problem, compliance with the rules, team shake / provoke, ideas writing, closing)
- Members (professionals working in other fields outside the field of expertise - heterogeneous 5-15 people)
- Layman, external members (occasionally, eg customers, buyers, partners)

Brainstorming rules

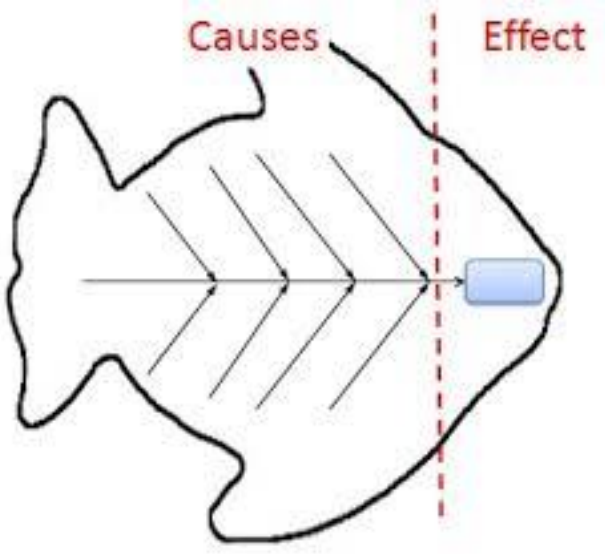
- Solid, short suggestions
- There is no qualified opinion
- Ideas are not personal, the whole group's opinion
- Suggestions can be freely presented by everyone
- Get rid of our daily practice
- Proposals will only be summarized and evaluated later
- To be visible to everyone
- Accurate recording, even if it's foolish
- Quantity is more important than quality !!!

Brainstorming method

1. Formulation of Brainstorming Goal, acceptance of game rules, few minutes preparation.
2. Collect ideas (about 20 minutes) in structured or unstructured form.
3. Arrange, organize, weight, evaluate ideas, combine identical or overlapping suggestions, brainstorming summary (vote, ranking).

Step 4. Cause and effect diagram
Ishikawa/Fishbone

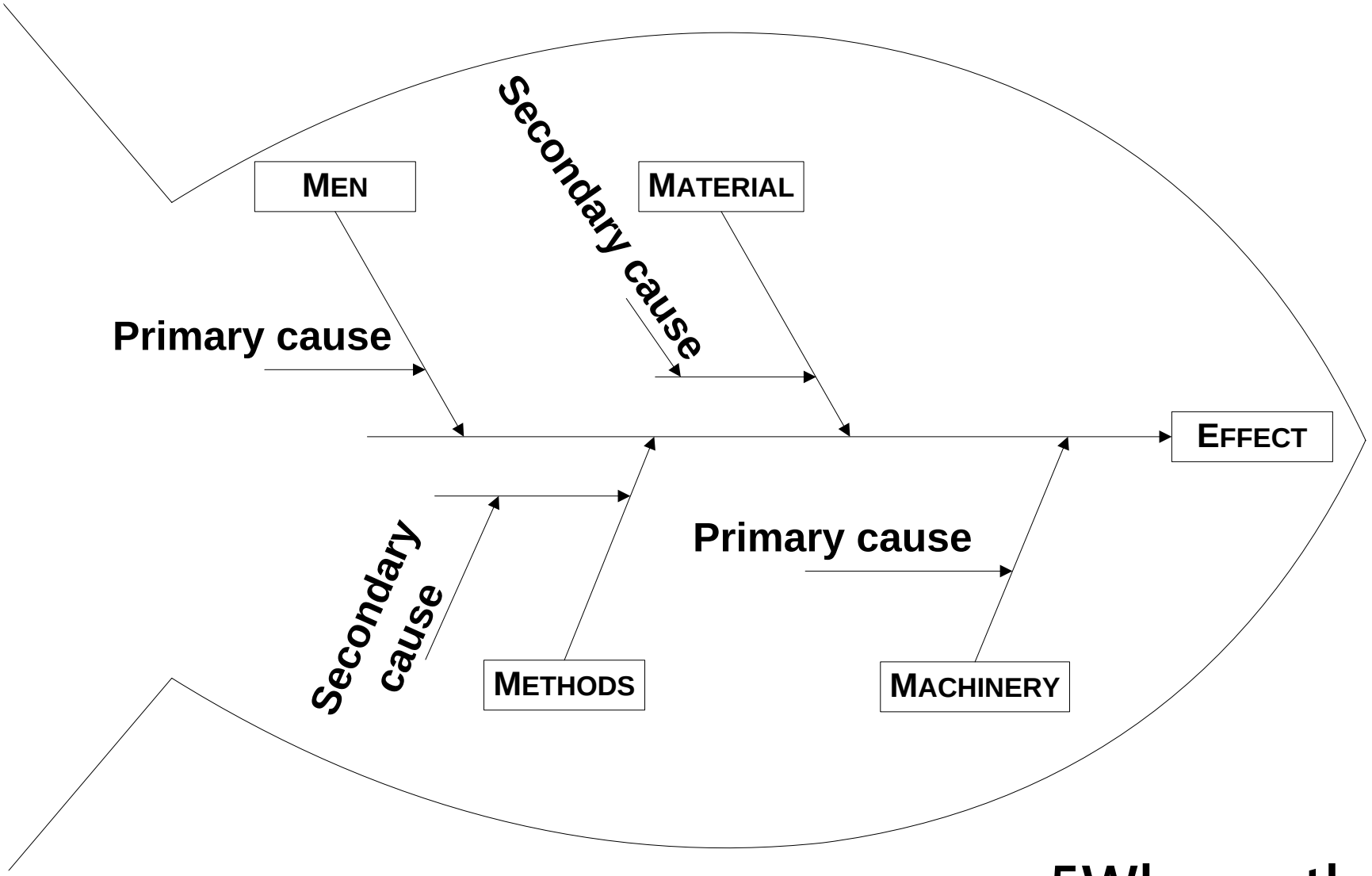
- The output or result of the process can be attributed to a multitude of factors, and a cause-and-effect relation can be found among those factors.
- A cause-and-effect diagram is a method of expressing the chain of causes and effects simply and easily.
- It shows the relation between a quality characteristic and factors.



9M

- Men
- Methods
- Machines
- Materials
- Measurement
- Milieu (environment)
- Management/Motivation
- Maintenance
- Money

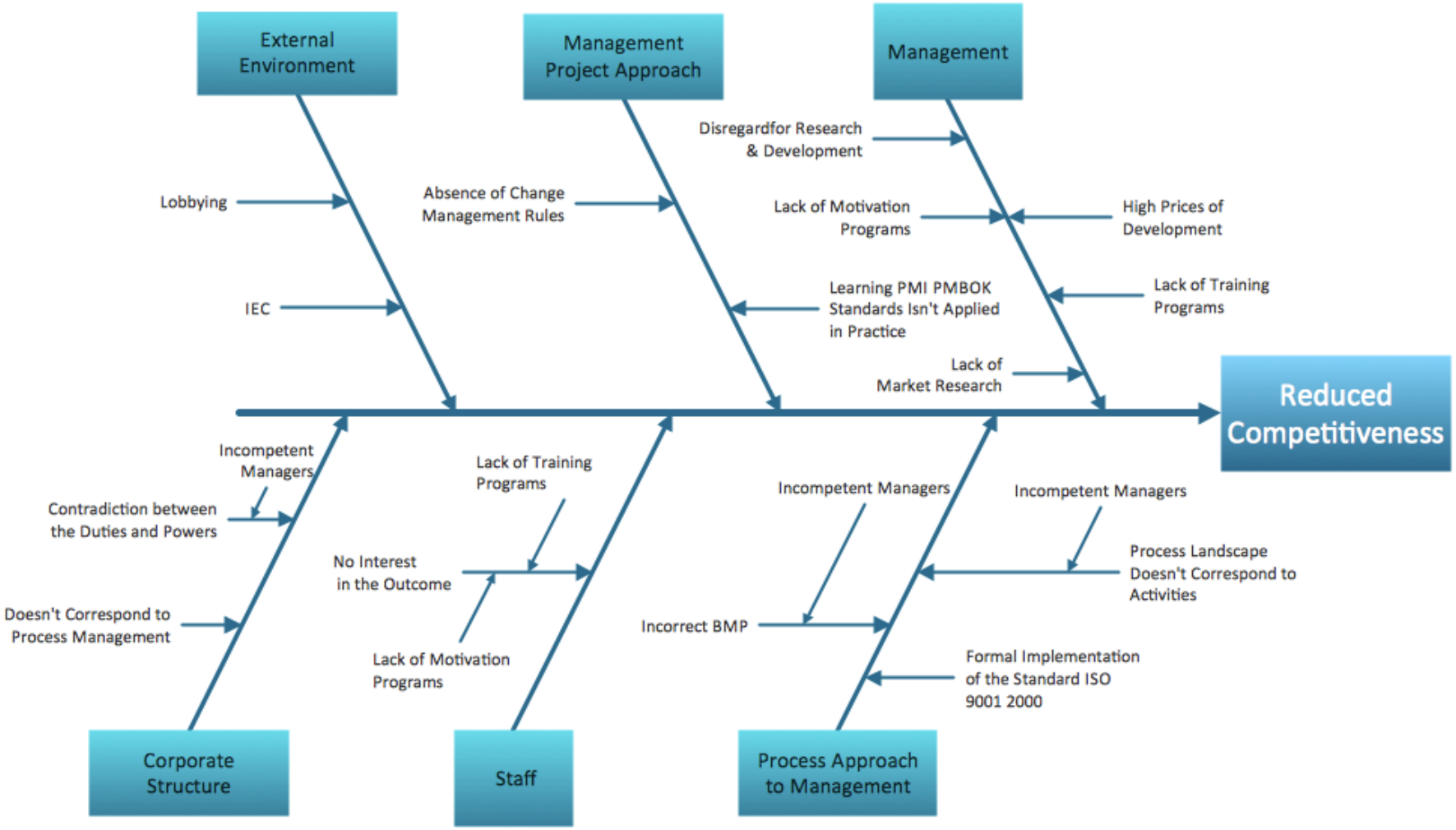
Cause-and-effect diagram



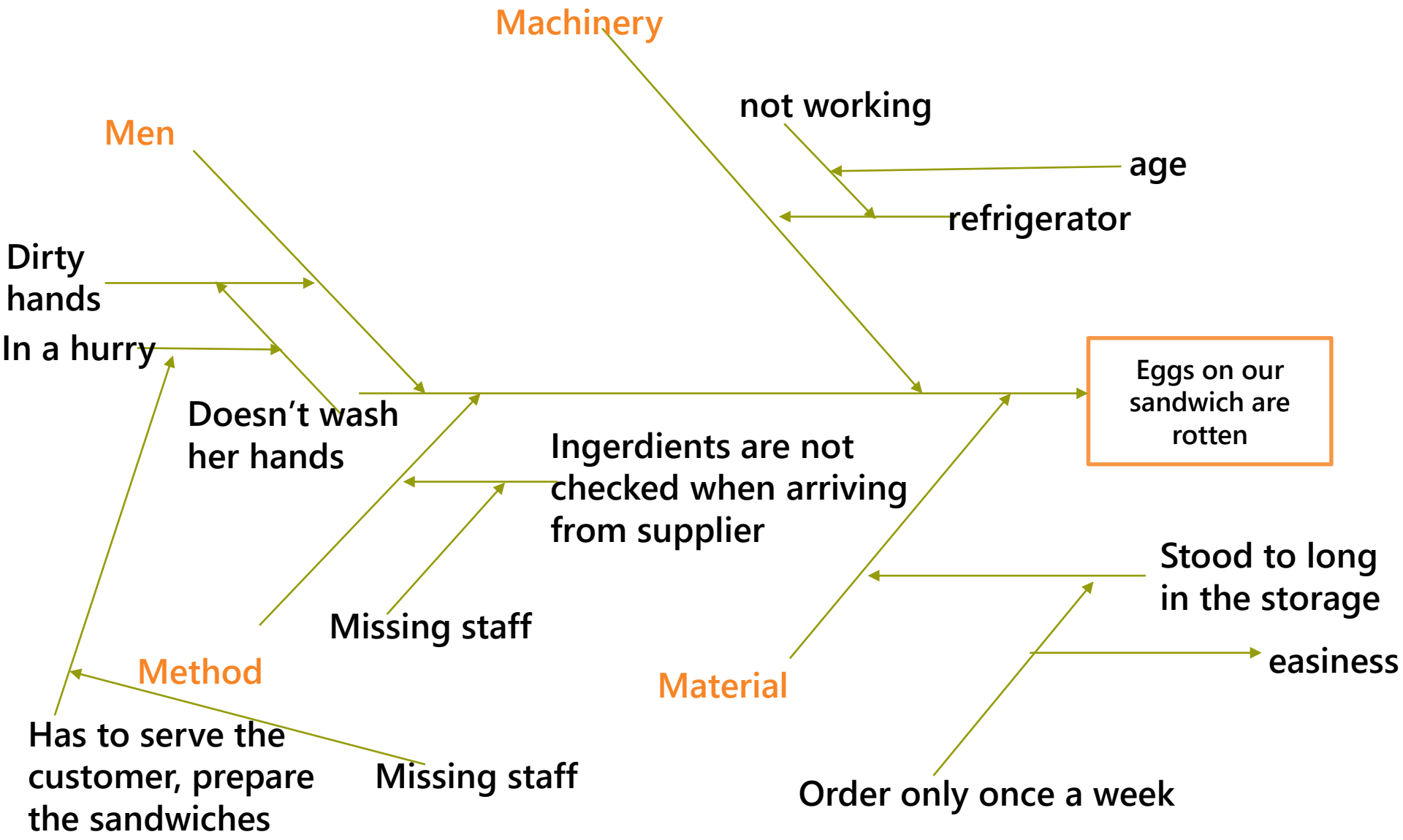
5Why method

Fishbone Diagram

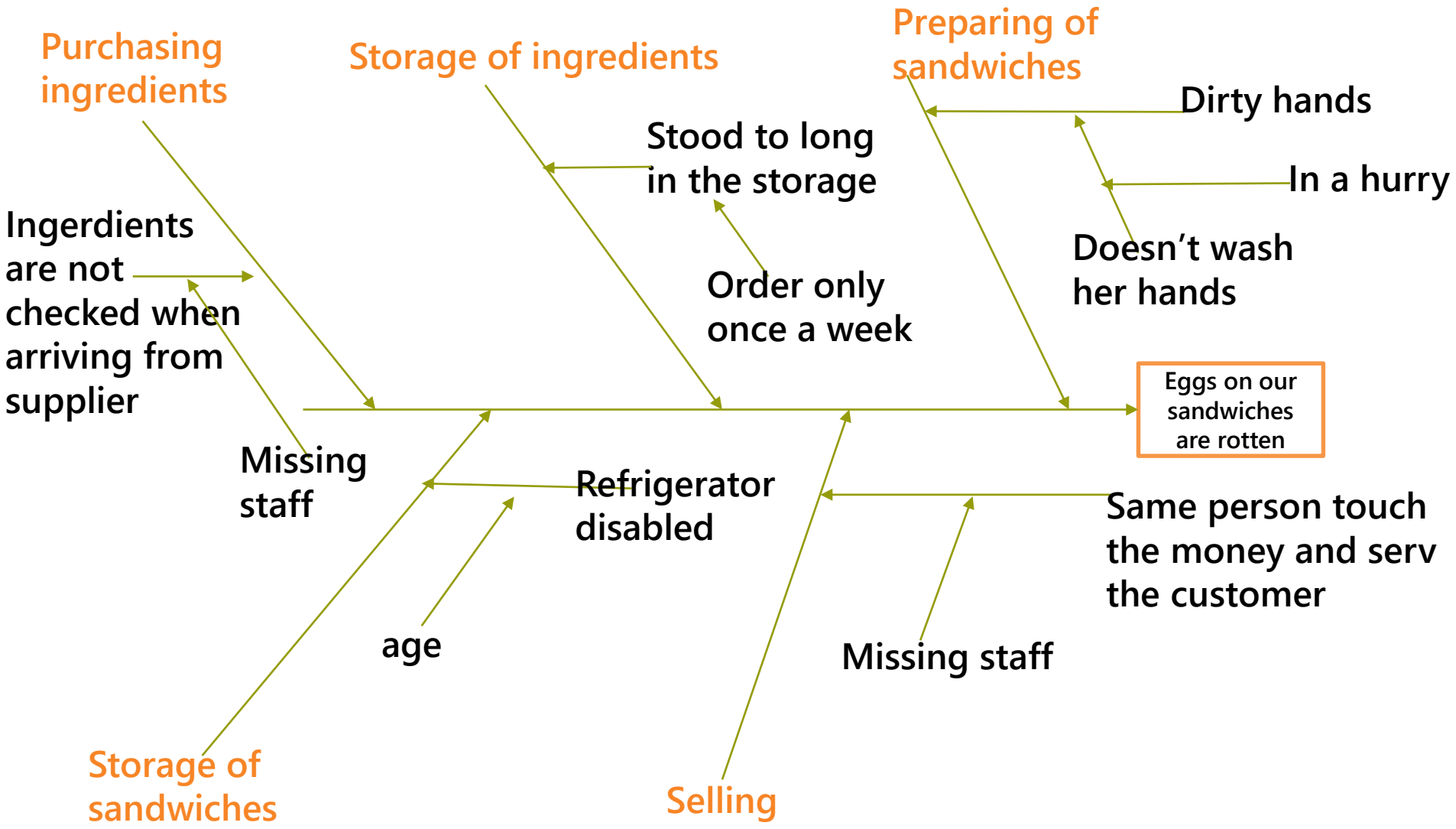
Factors Reducing Competitiveness



Ishikawa example (4M)



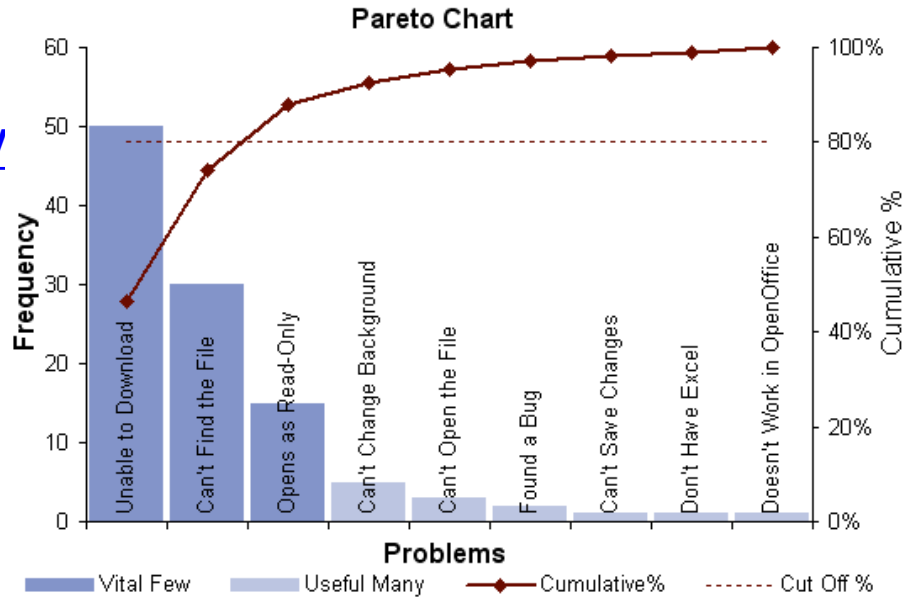
Ishikawa exapmle (Process steps)



Pareto/ABC diagram

- Formal statistical technique
- Powerful and effective tool in continuous improvement
- 80/20 rule – Vilfredo Pareto
- Vital few – Trivial many

- https://www.youtube.com/watch?v=F-I-BV



Pareto/ABC diagram

- Pareto diagrams by phenomena
  - ✓ Quality
  - ✓ Cost
  - ✓ Delivery
  - ✓ Safety
- Pareto diagrams by causes
  - ✓ Operator
  - ✓ Machine
  - ✓ Raw material
  - ✓ Operation method

Pareto diagram

- Grouping error types (causes, products, etc.) (ABC diagram):

  A – critical errors, vital few

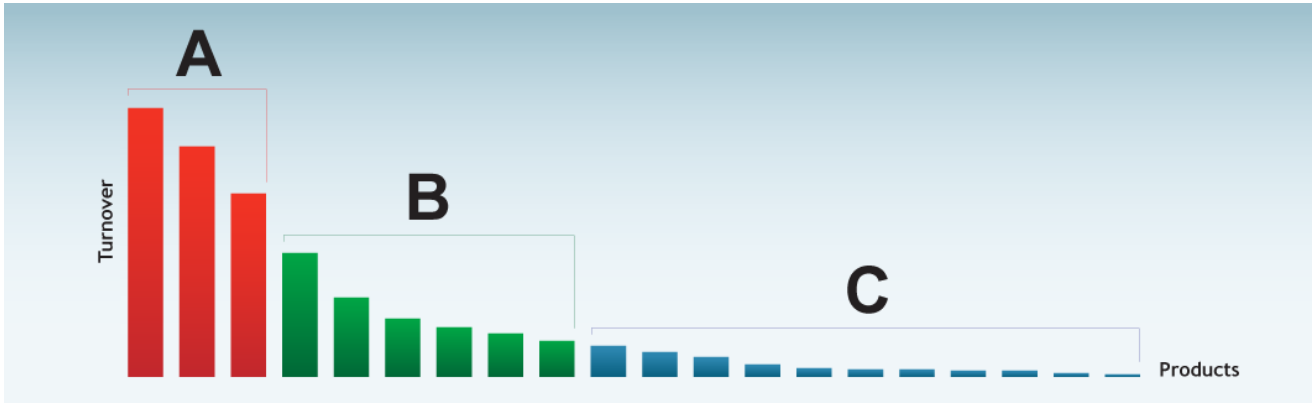
  B – short term no, but later can be ‚A' type

  C – their effect, their weight is not significant

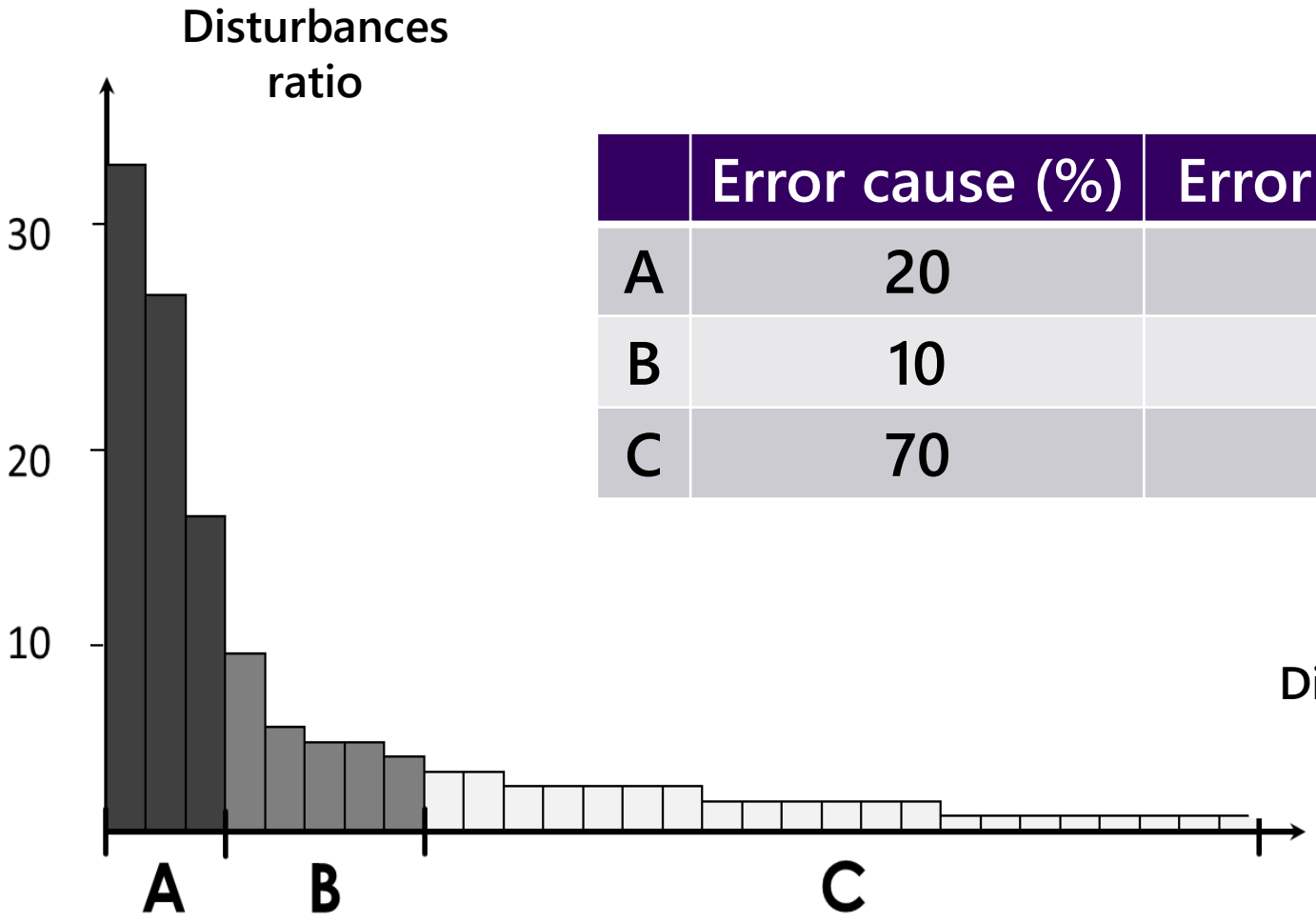
- Defining error types, defect categories, observing and counting the occurrences of mistakes!

Pareto/ABC diagram

- Bar graph: The lengths of the bars represent frequency or cost (time or money), and are arranged with the longest bars on the left and the shortest to the right
- Displays the relative importance of problems in a simple, quickly interpreted, visual format
- Helps to identify the top portion of causes that need to be adressed to resolve the majority of the problems



Pareto diagram



	Error cause (%)	Error effect (%)
A	20	80
B	10	10
C	70	10

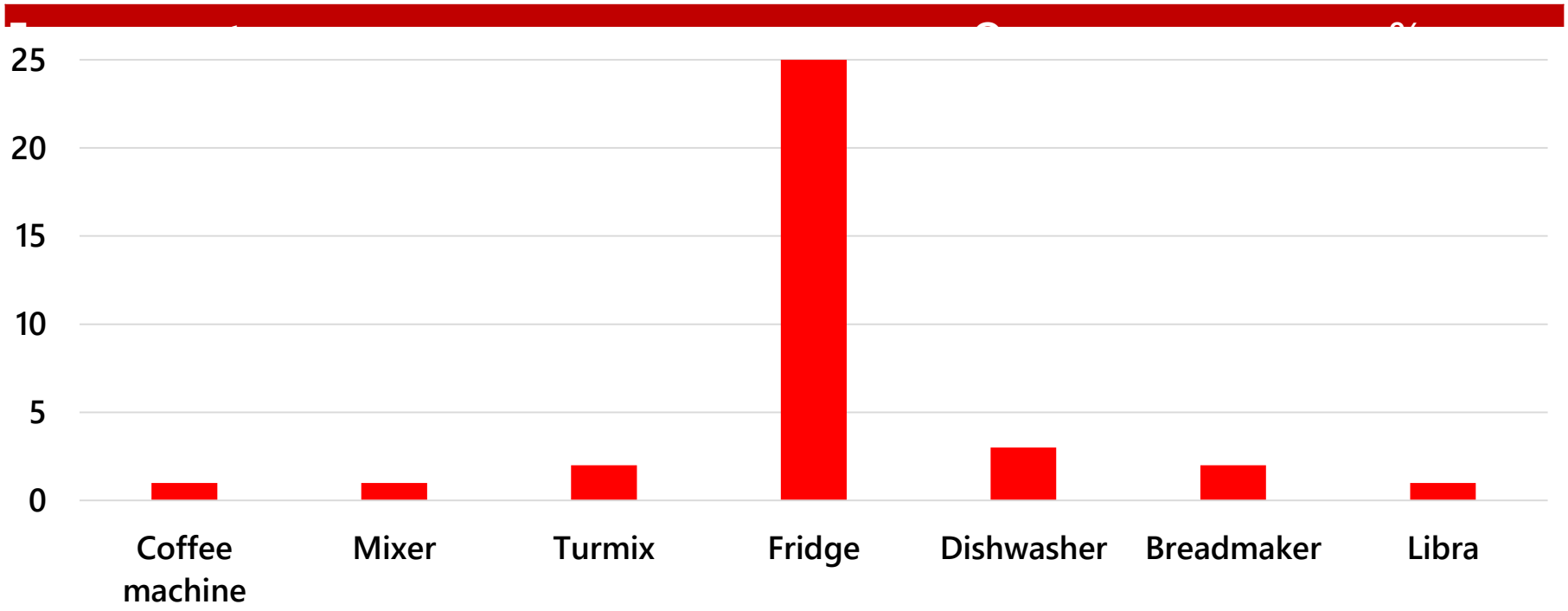
Pareto diagram

How to use it:

Problem and information to be collected

Example: "How are the customers dissatisfied?"

Distribution of incoming complaints ... (eg over the past 1 year)



Pareto diagram

How to use it:

1. Problem and information to be collected

   Example: "Why are customers unsatisfied with refrigerators?"

   The types and frequency of complaints at the customer service

   Complaints reasons:

   - Damaged package
   - Delayed delivery
   - Defective product
   - Administrative objections
   - Amount other than the order

2. Determine the duration of the test.

Select the time period that is typical for the given situation.

Example: 6 months

Pareto diagram

How to use it:

3. Collection of information, data collection

   We are collecting data in the chosen unit about the causes picked at the 1st point through the time defined at the 2nd point

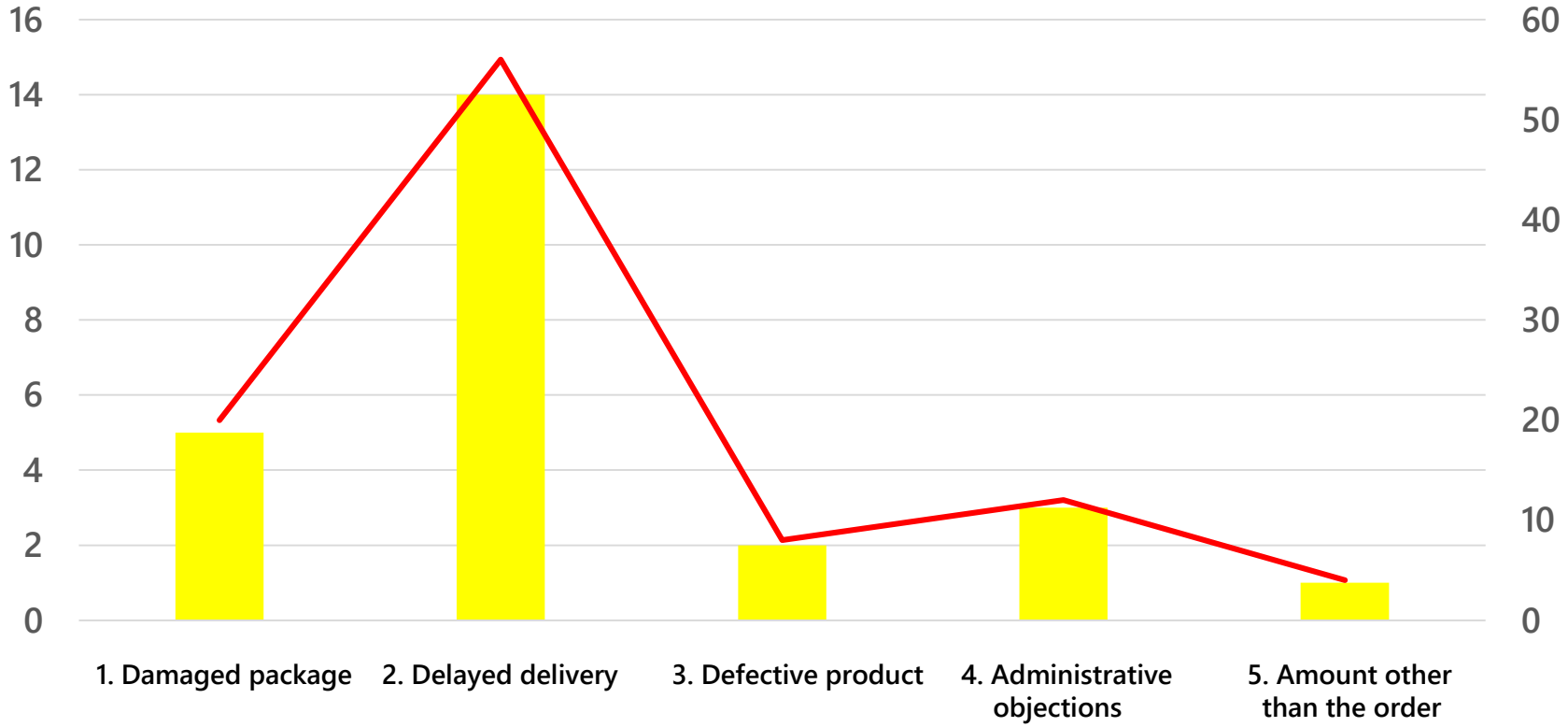
4. Calculating the ratios

Error cause types	Occurence	%
1. Damaged package	5	20
2. Delayed delivery	14	56
3. Defective product	2	8
4. Administrative objections	3	12
5. Amount other than the order	1	4
SUM	25	100

Pareto diagram

How to use it:

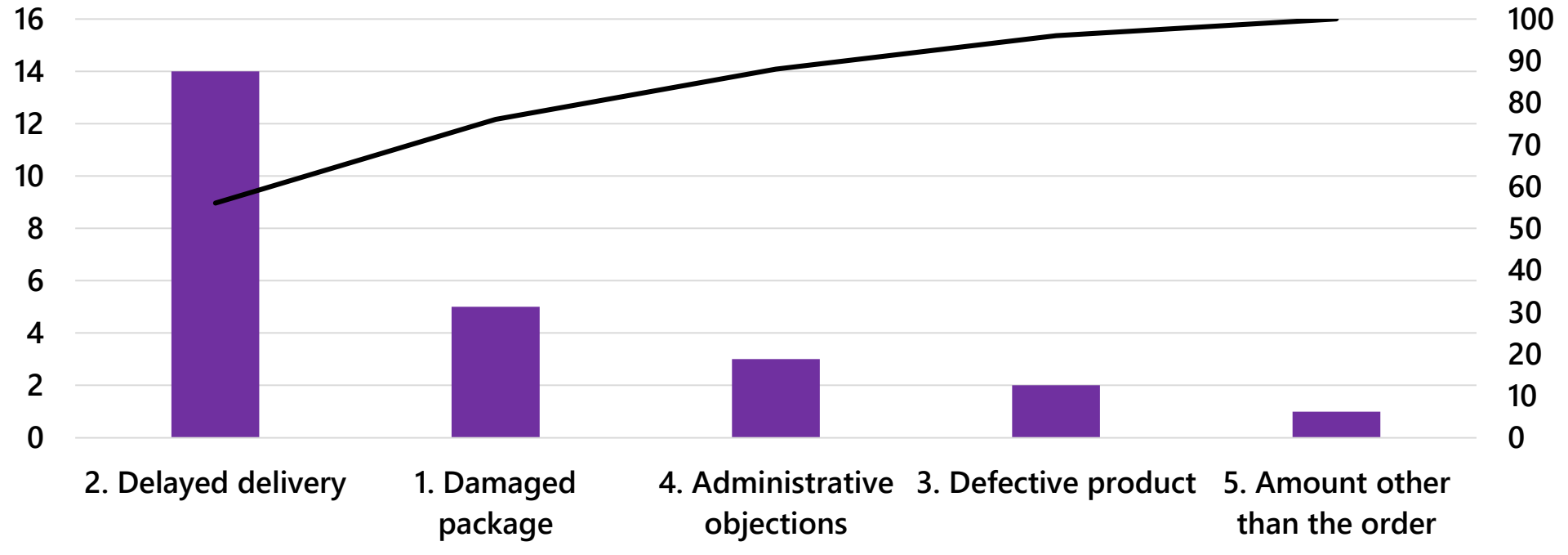
5. Show the data in a bar graph!



Pareto diagram

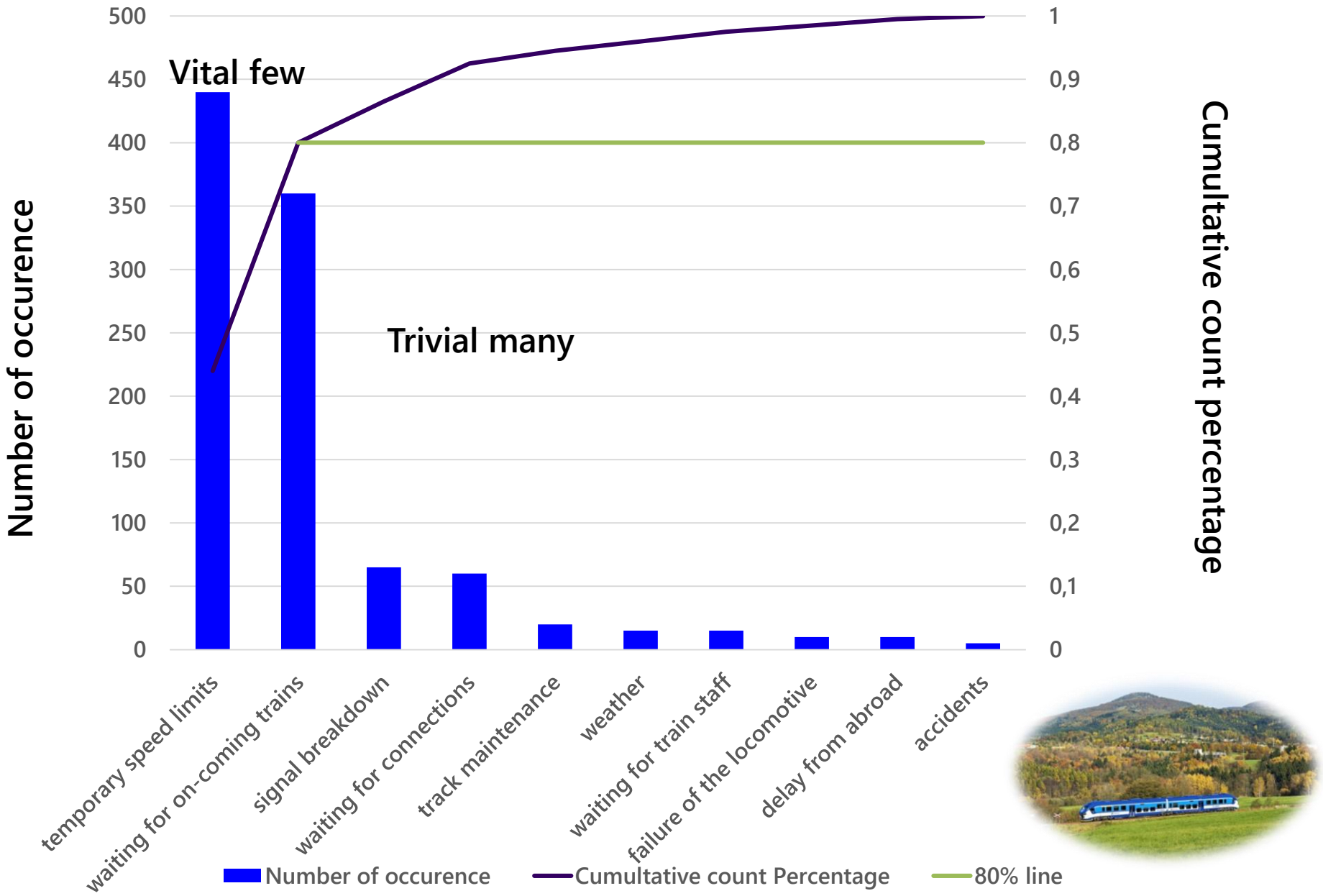
How to use it:

6. Draw the cumulative percentage line!
7. Analyze the results!



Pareto example

Cause of the delay	Number of occurence	Cumultative count percentage
temporary speed limits	440	0,44
waiting for on-coming trains	360	0,8
signal breakdown	65	0,865
waiting for connections	60	0,925
track maintenance	20	0,945
weather	15	0,96
waiting for train staff	15	0,975
failure of the locomotive	10	0,985
delay from abroad	10	0,995
accidents	5	1
SUM	1000	


Vital few
Trivial many
Number of occurence
Cumultative count percentage
500
450
400
350
300
250
200
150
100
50
0
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
temporary speed limits
waiting for on-coming trains
signal breakdown
waiting for connections
track maintenance
weather
waiting for train staff
failure of the locomotive
delay from abroad
accidents
Number of occurence
Cumultative count Percentage
80% line

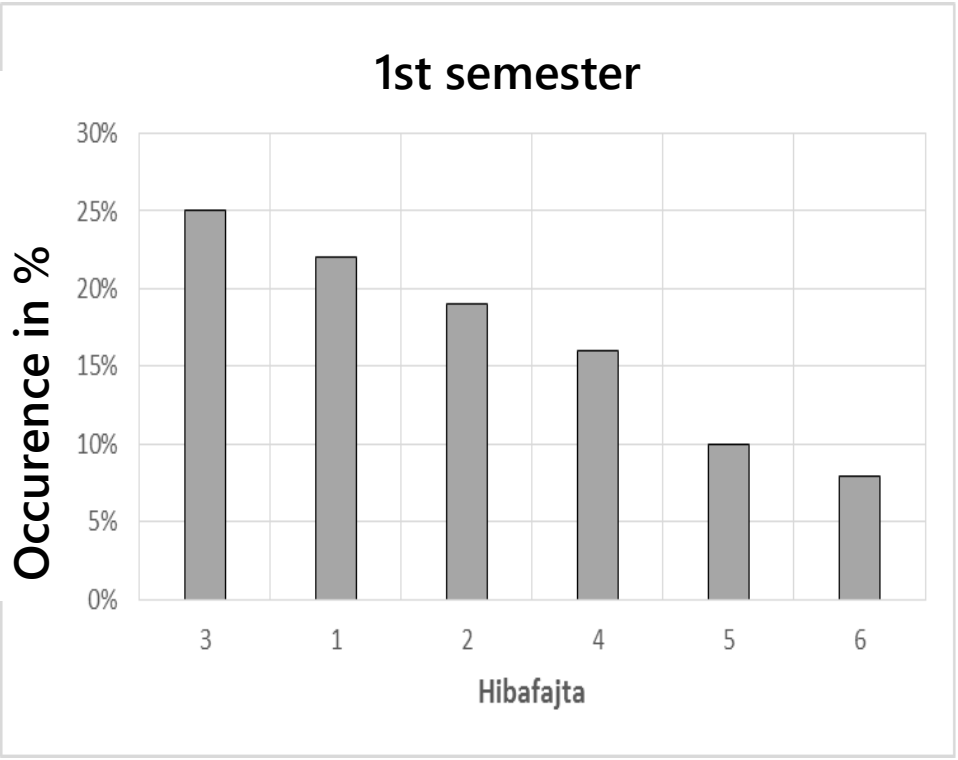
Notes on Pareto diagrams

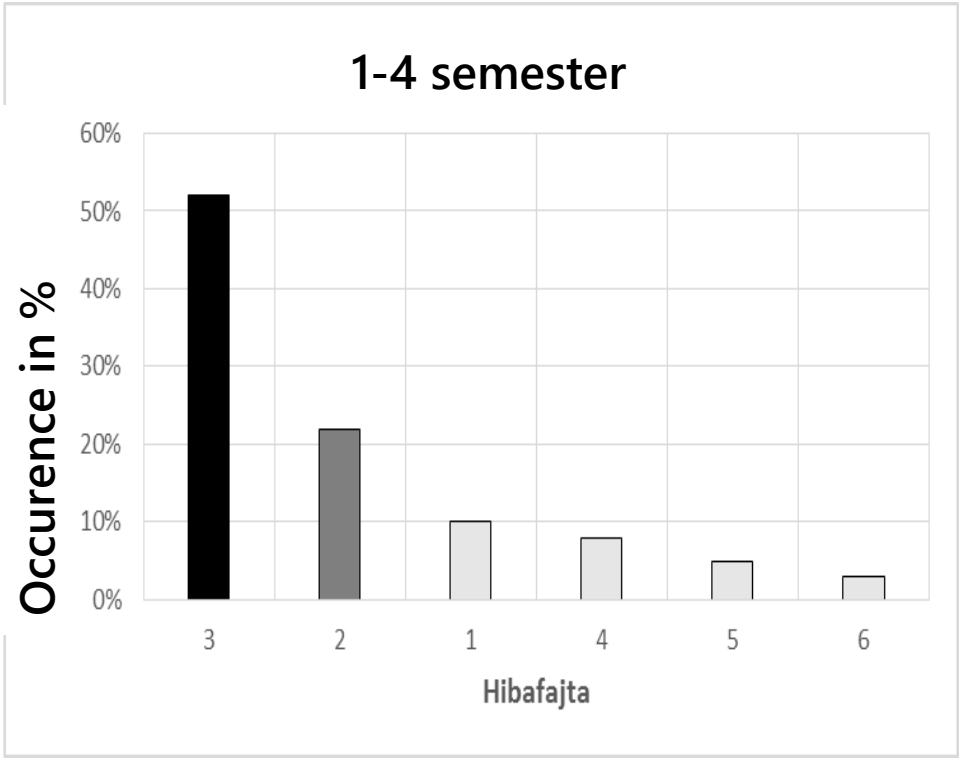
- Various methods of classification
- Others group
- Monetary value should be added if available
- If an item is expected to be amenable to a simple solution, it should be tackled right away even if it is of relatively small importance.
- After identifying the problem by making a Pareto diagram by phenomena, it is necessary to identify the causes in order to solve the problem (e.g with Ishikawa)

Pareto diagram

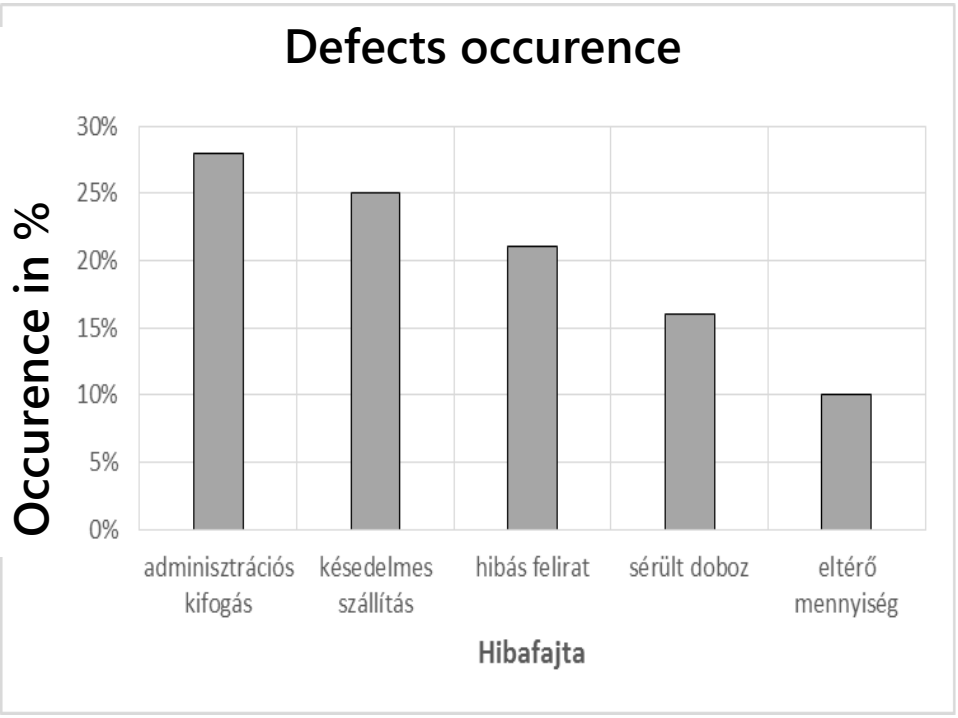
- **What if we cannot see the priority sequence of the causes?**
  - ✓ **There may not be enough data available.**
  - ✓ **The occurence table is not mistake-free.**
  - ✓ **The y axis is not given in the correct dimension.**
  - ✓ **The errorr groups are not correct.**

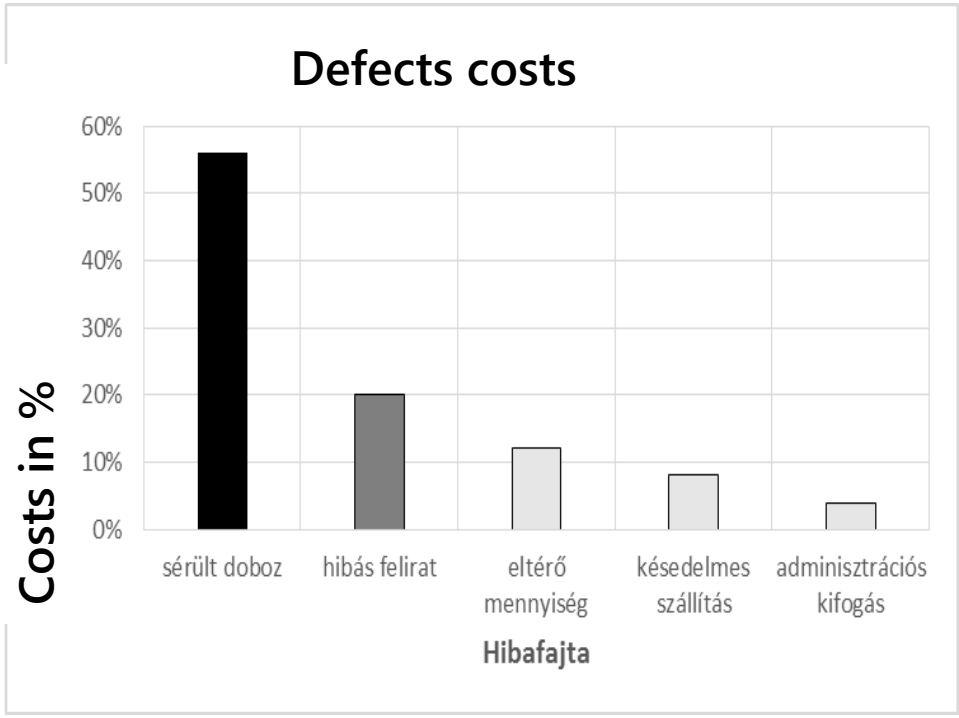
Pareto diagram example





Pareto diagram example





1. Administrative objections
2. Delayed delivery
3. Defective sign
4. Damaged box
5. Amount other than the order

1. Damaged box
2. Defective sign
3. Amount other than the order
4. Delayed delivery
5. Administrative objections

Pareto diagram

- Condition: Provide sufficient, reliable data
- Its data and information background is often passive
- Rather static
- Mostly it does not refer to the cause-effect background
- "Efficiency Limit":¼ - ¾ (1/3 – 2/3)

Step 6. Implement solutions and evaluate

- Step 6
  - plans and implements the improvements identified and verified in Step 5.
  - measures and evaluates the effectiveness of the improved process
  - evaluates the six-step process itself, reward the participants

Process improvement

	Six steps	PDCA	DMAIC
Planning	1-4 step	Plan	Define
			Measure
			Analyse
Improvement, testing	5th step	Do	Imrove
		Check	Control
Implementing, monitoring	6th step	Act	

Thank you for your kind attention!

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