

A stack of white papers with blue lines, slightly blurred, set against a light blue background.A blurred, circular clock face with numbers, set against a pink and purple gradient background.

# Ishikawa fishbone diagram

A stack of white papers with blue lines, slightly blurred, set against a light green background.A yellow analog clock with a red border and black numbers, set against a yellow and orange background.

Skorkovský ESF MU KPH

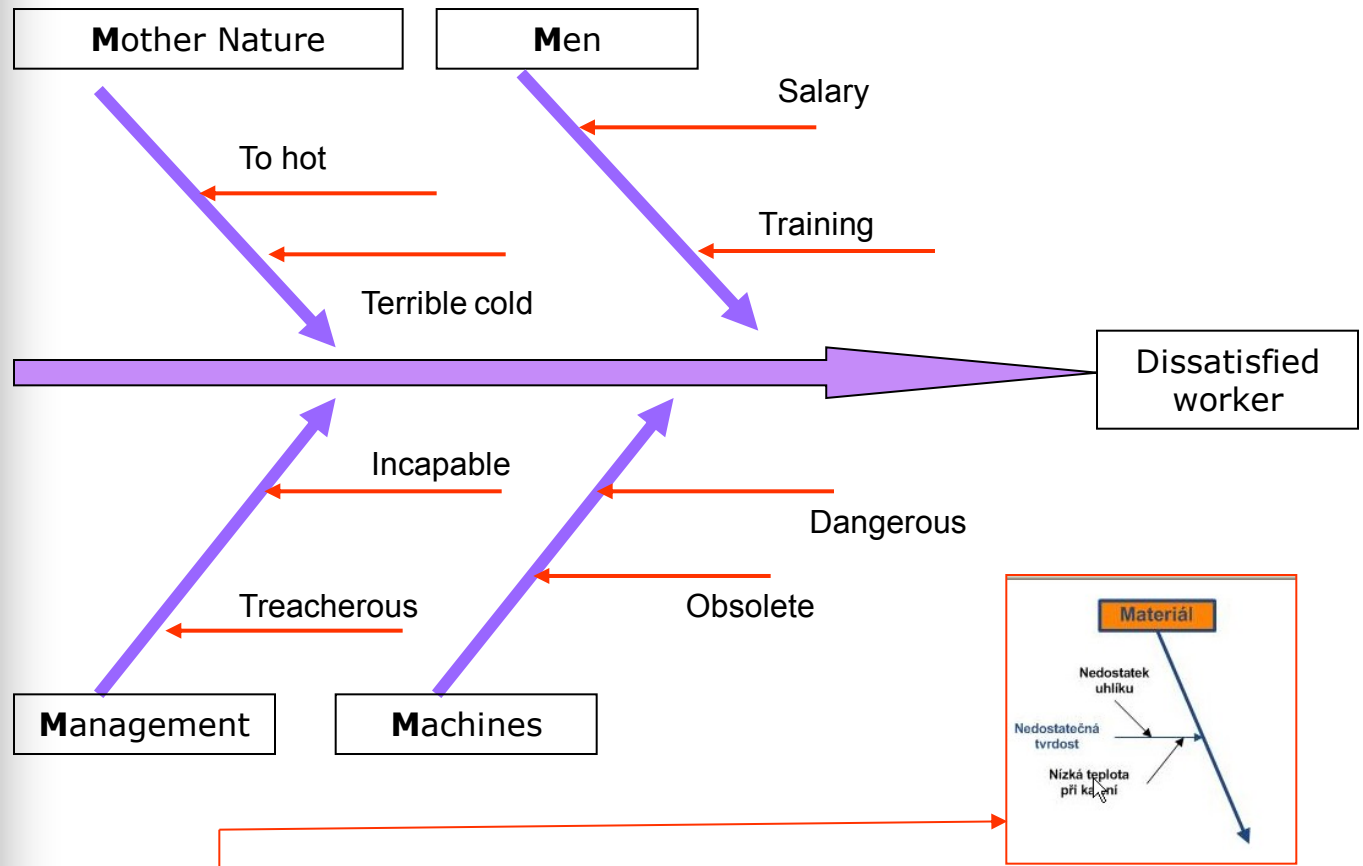
# Introduction (FBD= fishbone diagram)

- FBD is a tool to find out relationships:

Cause → Effect

- Use in QM especially in automotive industry
- One of the tool set used to create so called 8D report (8 disciplines=FBD+5WHYs+PA+QM)
- Another tool : 5 WHYs - will be cleared later
- Another tool : PARETO=PA analysis will be shown later

# Fishbone diagram



(Methods, **Material**, Manpower, Measurement, Machines, Mother Nature, Management)

# Some chosen problems which could be find out during ERP support process I

- long response time to requirements
  - requirement is directed to unsuitable consultant
  - bad documentation about service action (poor log)
  - people ask repeatedly same questions at different moments and different consultants are asked
  - solution of disputes :complaint- standard service
  - payment asked for supplied services
1. how much (to whom, type of task, type of the error- see diagram
  2. starting time for invoiced services, response time
    1. requirement is handed over till the problem is solved
    2. time of starting solving -solved
    3. start of implementaion of the bad object till end of testing
    4. training

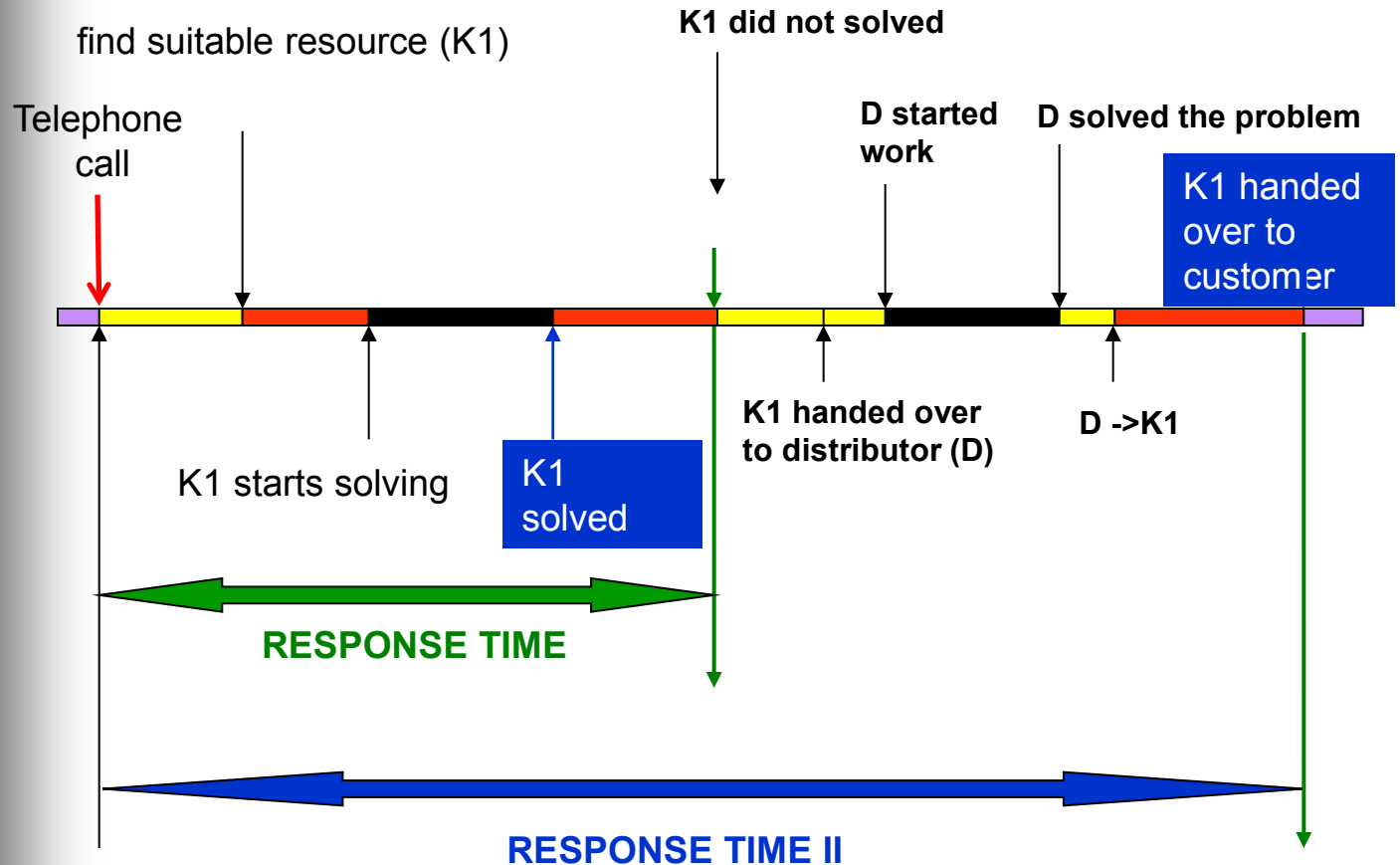


# Some chosen problems which could be find out during ERP support process II

- bad training methodology
- bad consultants
- bad communication protocol
  1. telephone
  2. e-mail
  3. SKYPE
- lack of interest of the management of both parties
- right specification of reaction time
- specification to the error types and related response times
- response time of the distributor (ERP integrator ERP)



# Diagram – response time



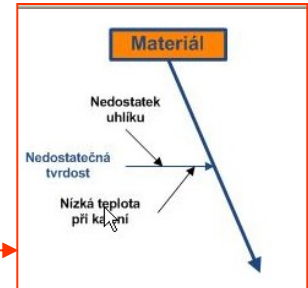
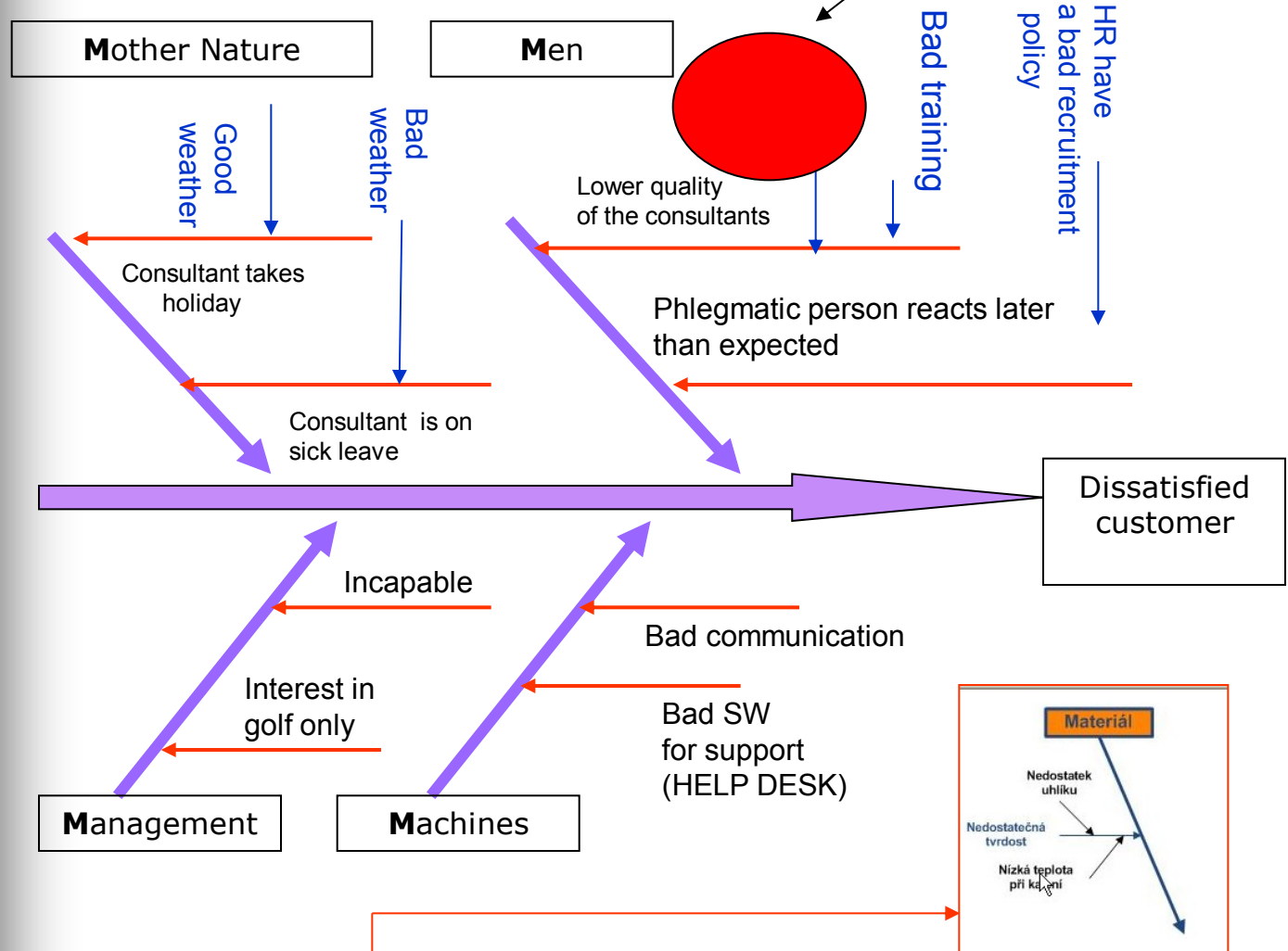
handed over requirement

— = active work

— = idle time

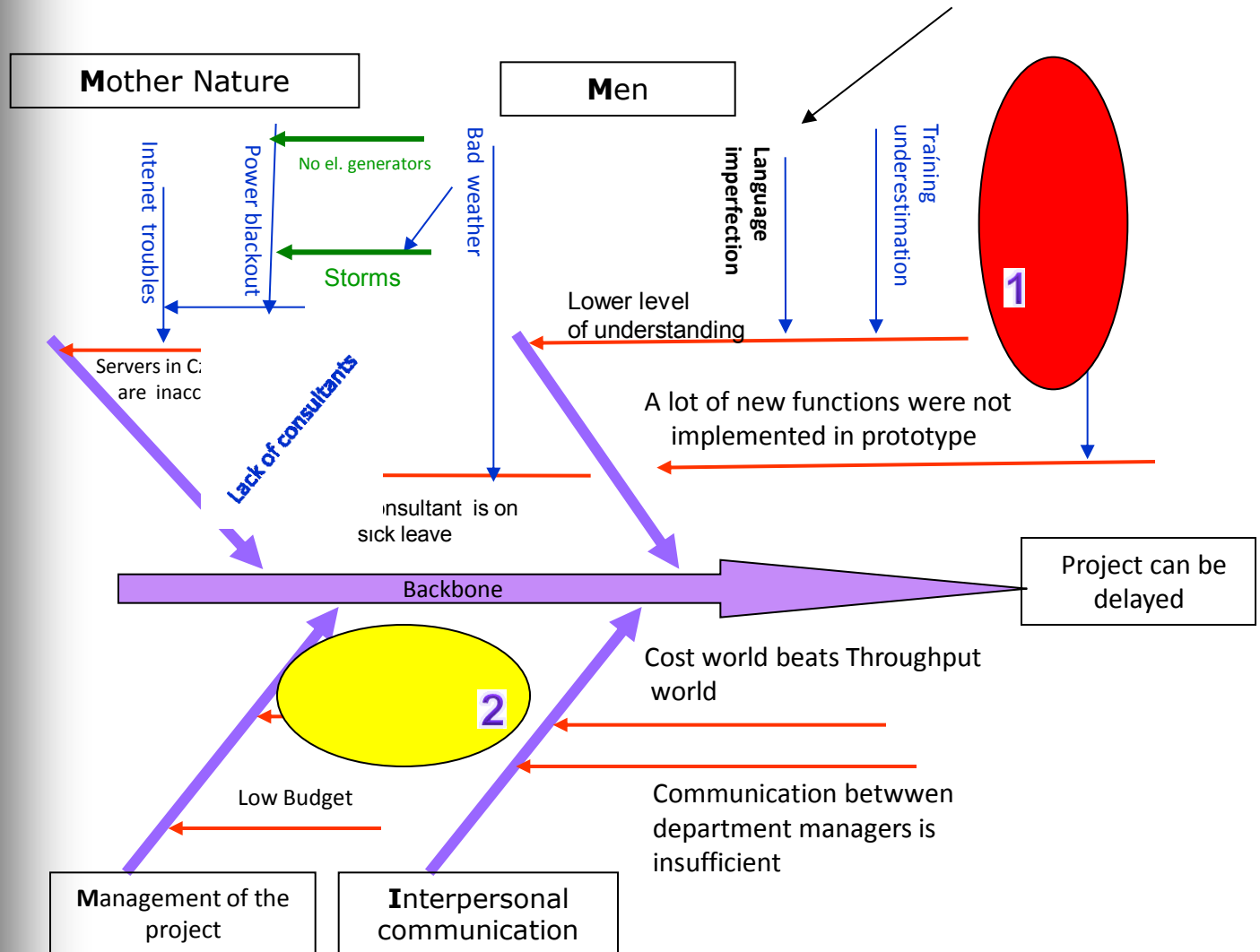
# Fishbone diagram-support

heart of the problem



(Methods, **Material**, Manpower, Measurement, Machines)

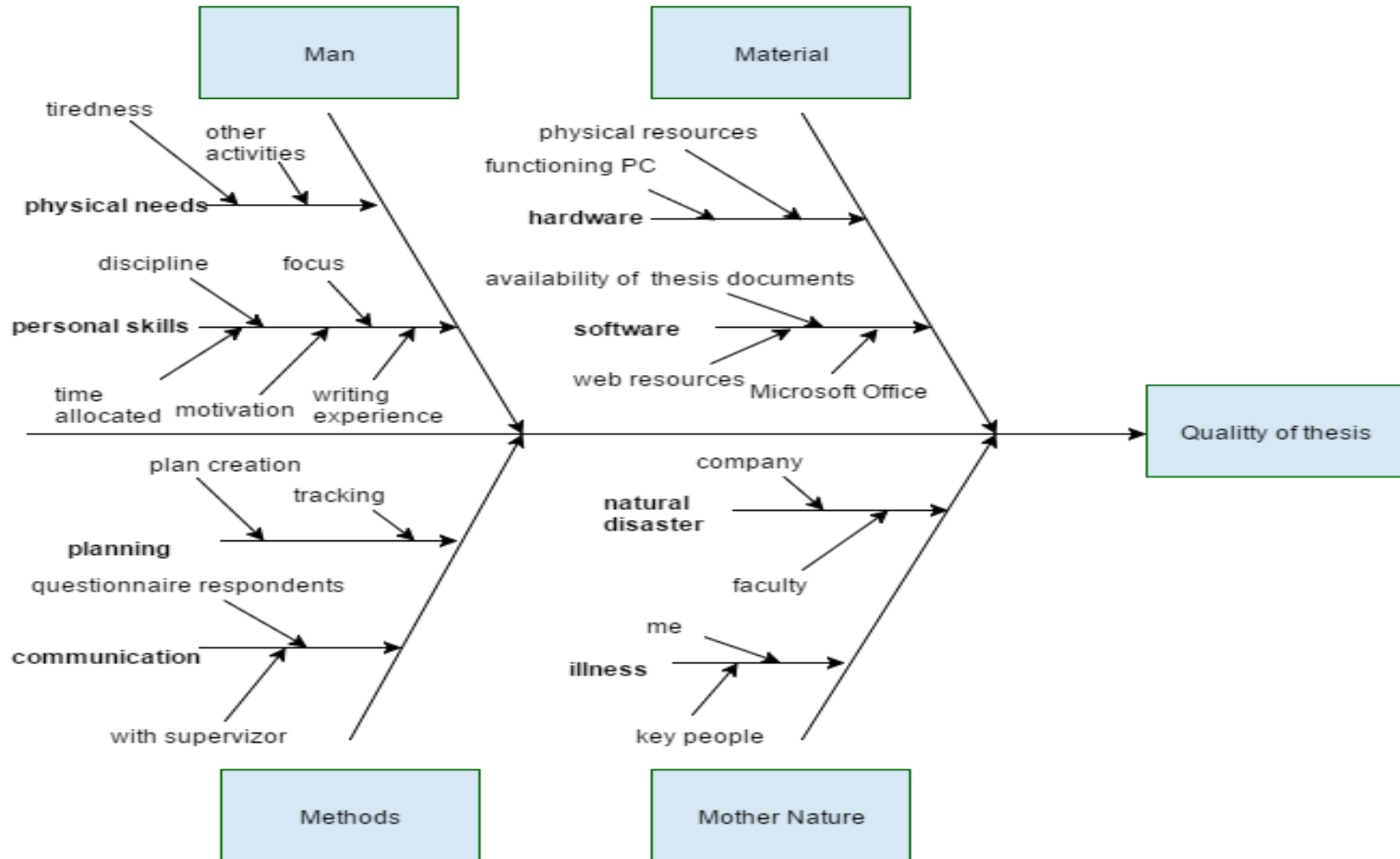
# Fishbone diagram-SA Project



(Methods, **Material**, Manpower, Measurement, Machines)

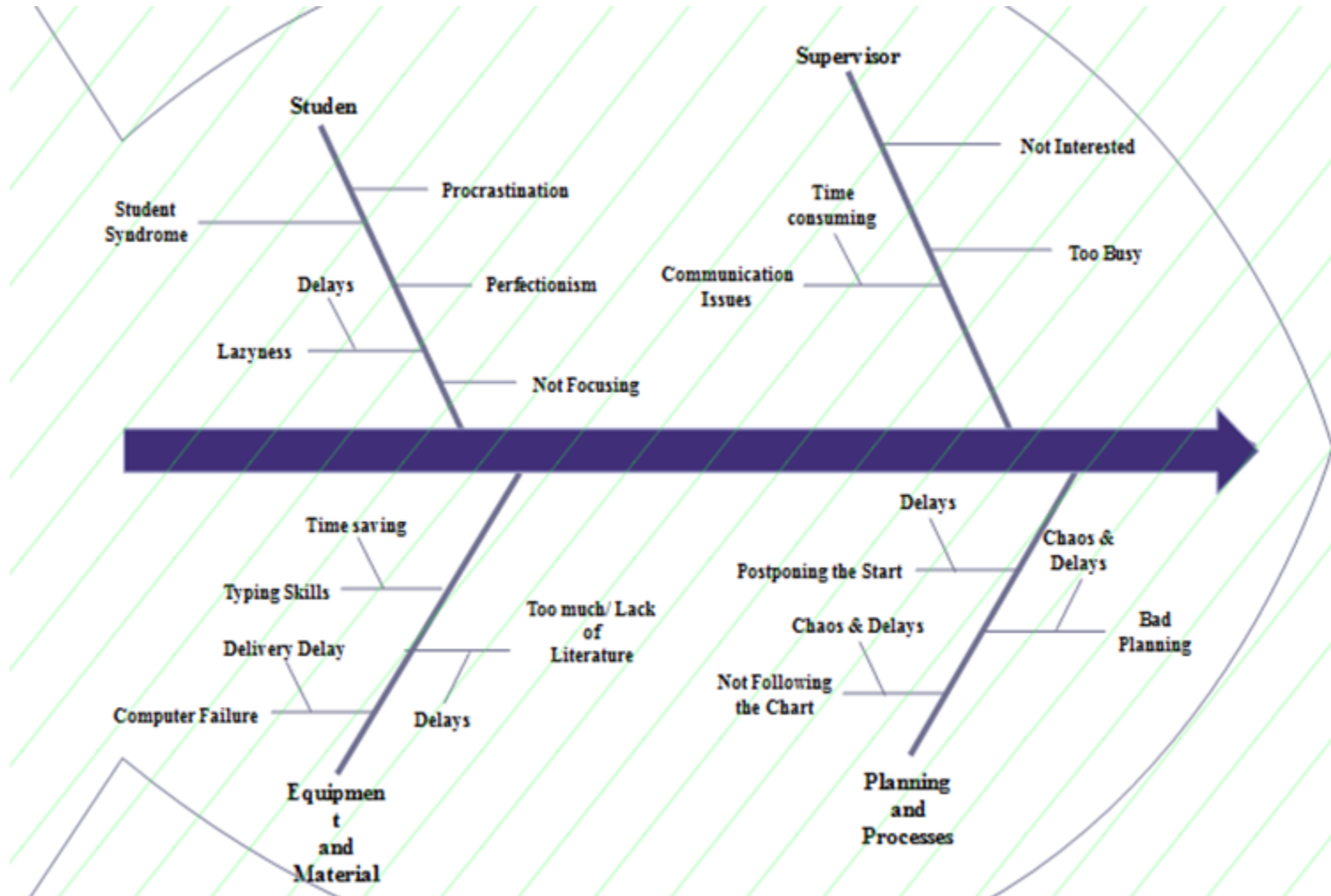


# Another example of Ishikawa I.

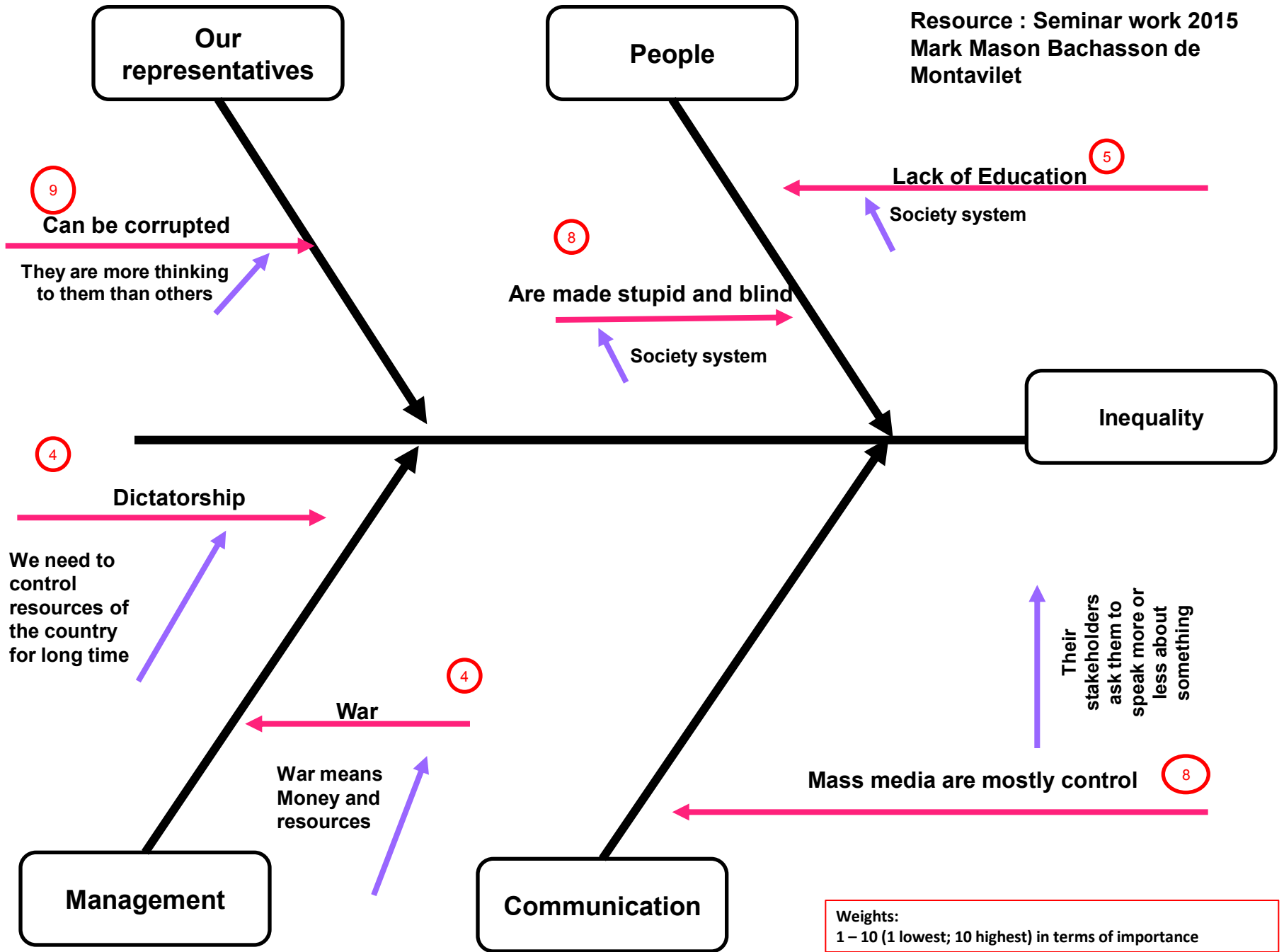


Resource : Seminar work 2015- Ing. Martin Lofaj

# Another example of Ishikawa II.



Resource : Seminar work 2015- Tugulea Lilia

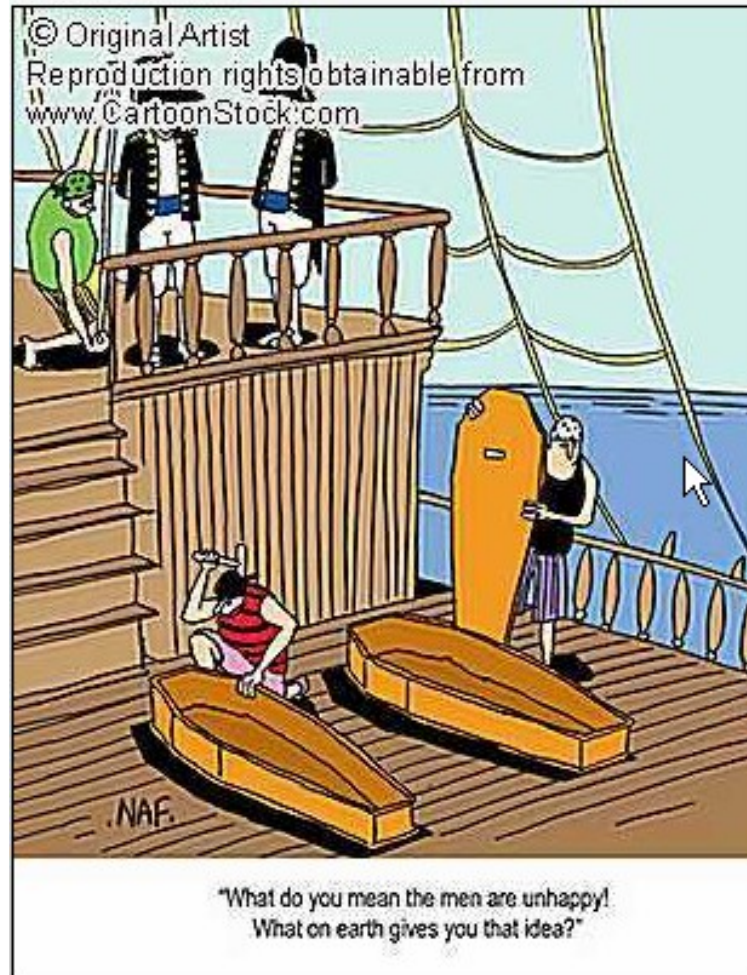


# Dissatisfied employee I



"EVERYTHING OKAY, PHILLIPS?"

# Dissatisfied employee II



# 5WHYs

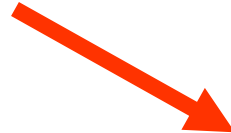
- WHY 1 :Why my car had stopped ?
- No petrol in tank
- WHY 2 :Why i did not have a petrol in my tank ?
- I did not buy in the morning on my way to work
- WHY 3 :Why i did not buy a petrol ?
- No money in my pockets
- WHY 4 : Why no money i my pockets?
- Evening poker
- WHY 5 : Why i did not win a poker game?
- I do not know how to bluff!



# 5WHYs



Cause



Effect



# TQM and Ishikawa FBD and Pareto 80|20

Statistika zmetkovosti **Reject statistics**

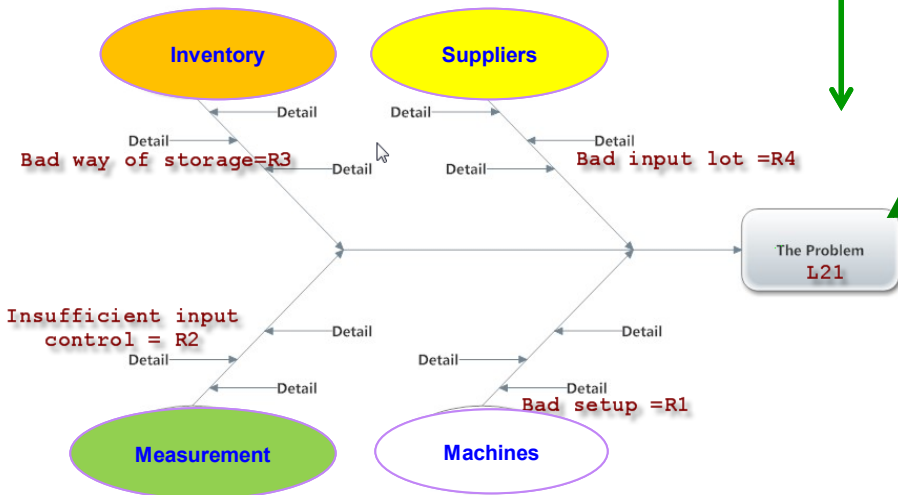
Zmetky celkem . . . . . **9 485 283** Filtr Data . . . . . **Filter date**

**Rejects Total** Filtr čísla zboží. . . . . **Filter Item**

Kód	Popis	Množství zmetků	Poměr zmetkovosti
L14	Seké	116 579	1%
L15	Propadliny-polotovary	94 515	1%
L16	Deformace klipu	48 382	1%
L17	Deformace	61 782	1%
L21	Hrudky	848 556	9%
L23	řleky	195 791	2%
L24	Flek - kráter	4	0%
L30	kropenatě	21 654	0%

Bad size, rusty, overflow, bad colour,...

- Reject statistics
- Final product /Rejects
- MachineCenters/Rejects
- Rejects in time
- Final products/Rejects in time
- Machine centers/Rejects in time



Reject type (effects);	Reason 1 (cause)	Reason 2 (cause)	Reason 3 (cause)	Reason 4 (cause)
L19	8	9	2	4
L20	0	1	4	6
L21	7	2	3	5

Score

Manual for urgent reject cause elimination



(to establish correct priority of remedy actions)

Every reject type -> one Ishikawa diagram (electronic version)

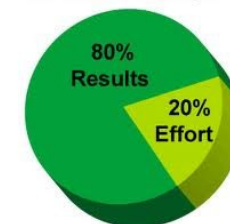


# Pareto tool : What is it ?

- tool to specify priorities
- which job have to be done earlier than the others
- which rejects must be solved firstly
- which product gives us the biggest revenues
- 80|20 rule



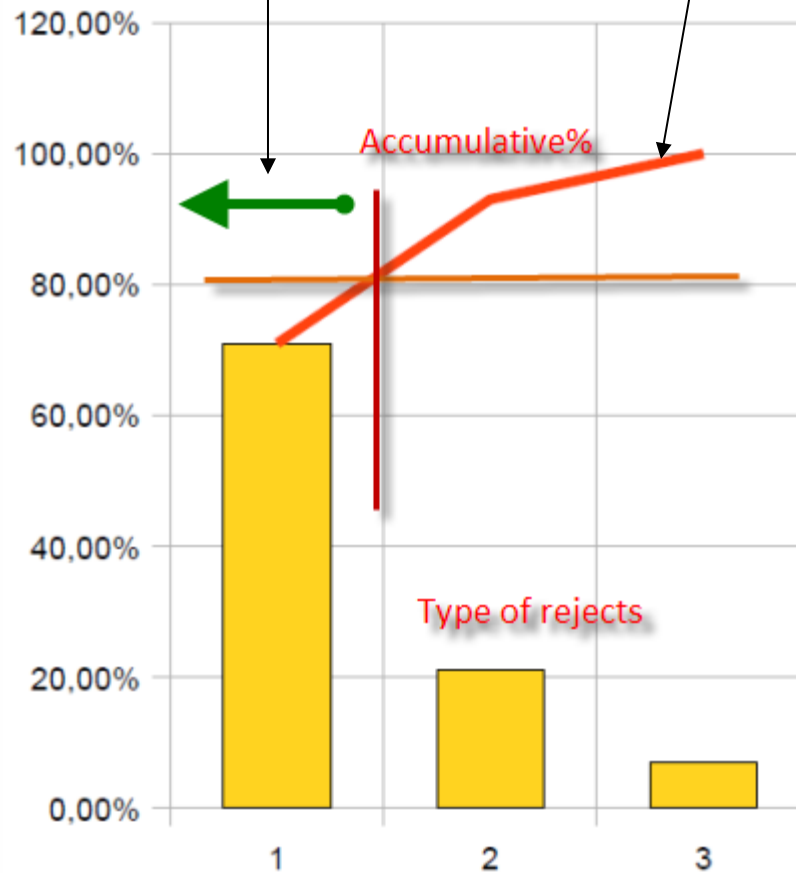
The Pareto Principle



# Pareto chart : possibility to split up reject and setup priorities

High priorities

Lorenz curve



See next slide  
to understand the way  
how to construct Lorenz  
curve

# How to construct Lorenz Curve and Pareto chart

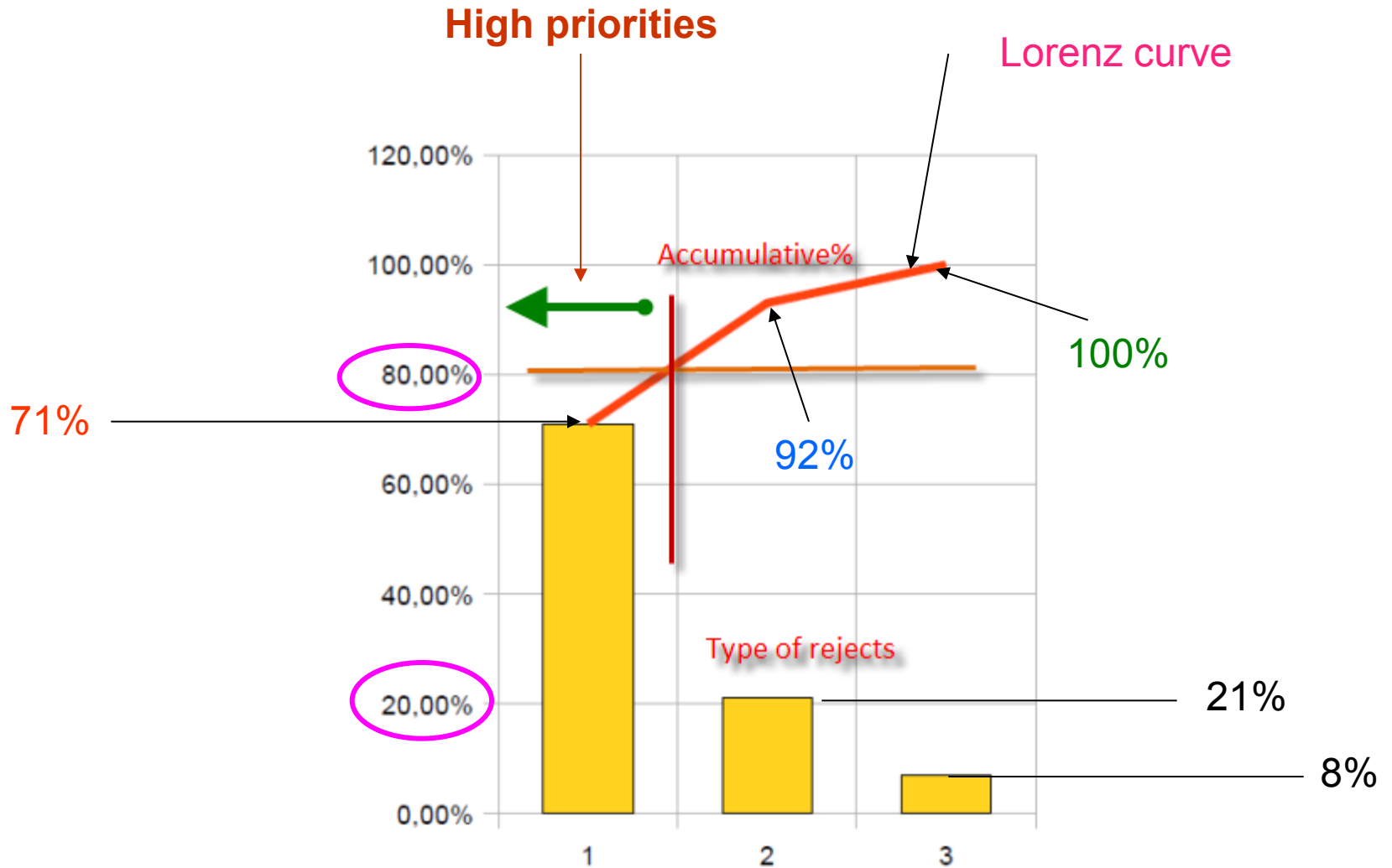
- list of causes (type of rejects) in %
- table where the most frequent cause is always on the left side of the graph

Reject	Type	Importance	Importance (%)	Accumulative (%)
<b>1</b>	Bad size	<b>10</b>	<b>71%</b>	<b>71 %</b> =71%
<b>2</b>	Bad material	<b>3</b>	<b>21 %</b>	<b>92%=71%+21%</b>
<b>3</b>	Rust	<b>1</b>	<b>8%</b>	<b>100 %</b> =92%+8%

**Comment 1** :  $10+3+1=14$

**Comment 2** :  $71 \% = 10/14$ ;  $21\%=3/14$  .....

# Pareto chart- possibility to split up reject and setup priorities



# Pareto analysis per every type of reject – next

step -> practical example of Pareto use in ERP MS Dynamics NAV

Type of reject	Cause 1	Cause 2	Cause 3	Cause 4	Cause 5	Cause 6	Total
<b>L1</b>	<b>7</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>8</b>	<b>0</b>	<b>22</b>
L2	2	4	6	8	0	9	29
L3	4	0	0	5	6	7	22
L4	5	7	2	0	1	3	18
L5	0	2	7	3	0	1	13
L6	9	7	5	2	3	6	32
L7	0	7	0	2	3	4	16
L8	1	8	6	2	4	0	21
L9	2	0	5	7	1	4	19
L10	7	2	8	9	7	5	38
C	C5 %	C1 %	C3 %	C2 %	C4 %	C6%	
<b>L1</b>	<b>36,36</b>	<b>31,82</b>	<b>18,18</b>	9,09	<b>4,55</b>	0,00	100
Lorenz curve	36,36	68,18	86,36	95,45	100,00		

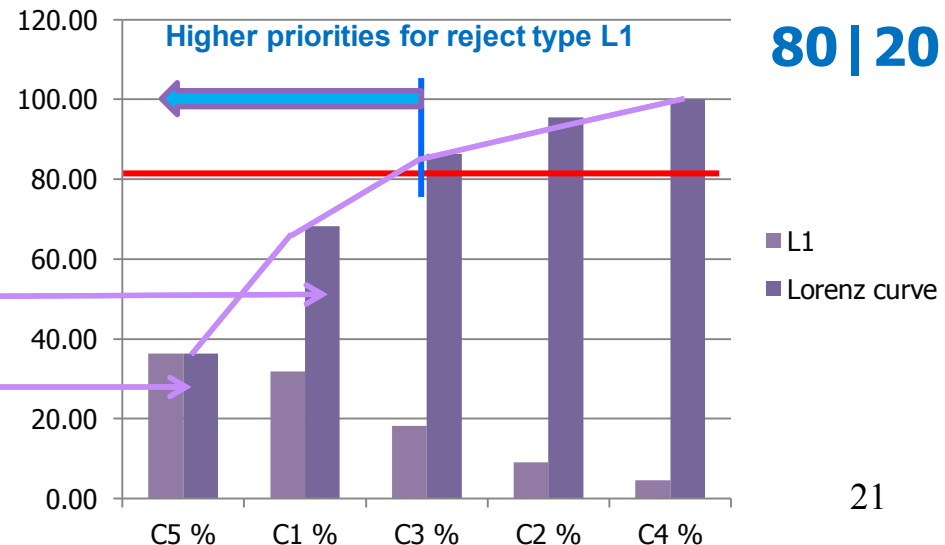
  

<b>C5</b>	<b>8</b>	<b>36,36</b>	= $(8/22)$
<b>C1</b>	<b>7</b>	<b>31,82</b>	= $(7/22)$
<b>C3</b>	<b>4</b>	<b>18,18</b>	= $(4/22)$
<b>C2</b>	<b>2</b>	<b>9,09</b>	= $(2/22)$
<b>C4</b>	<b>2</b>	<b>4,55</b>	= $(2/22)$

**We need to improve (remedy) firstly causes C5 a C1 !!!**

**36,36 + 31,82**

**36,36**

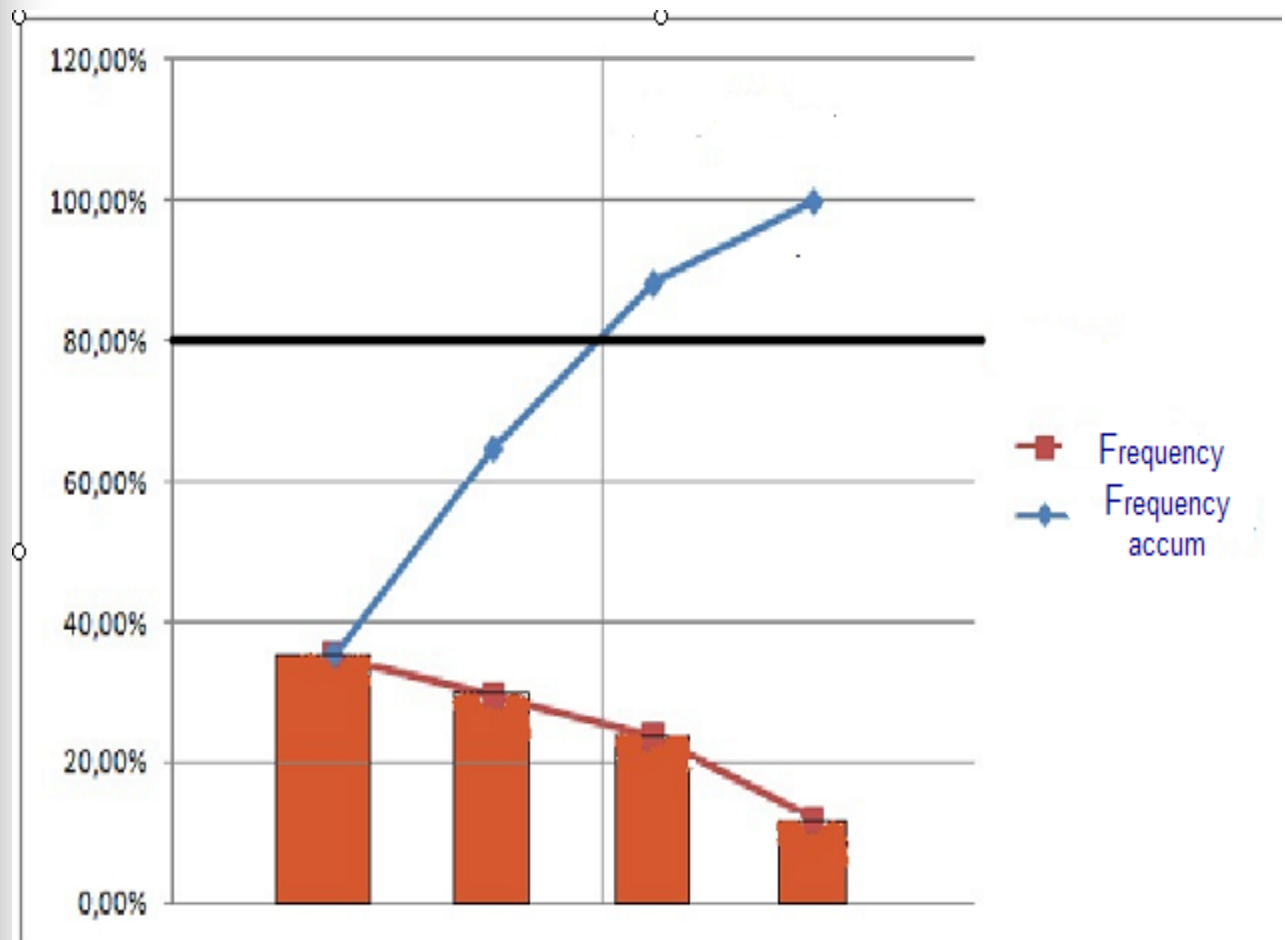


# Pareto analysis II - data

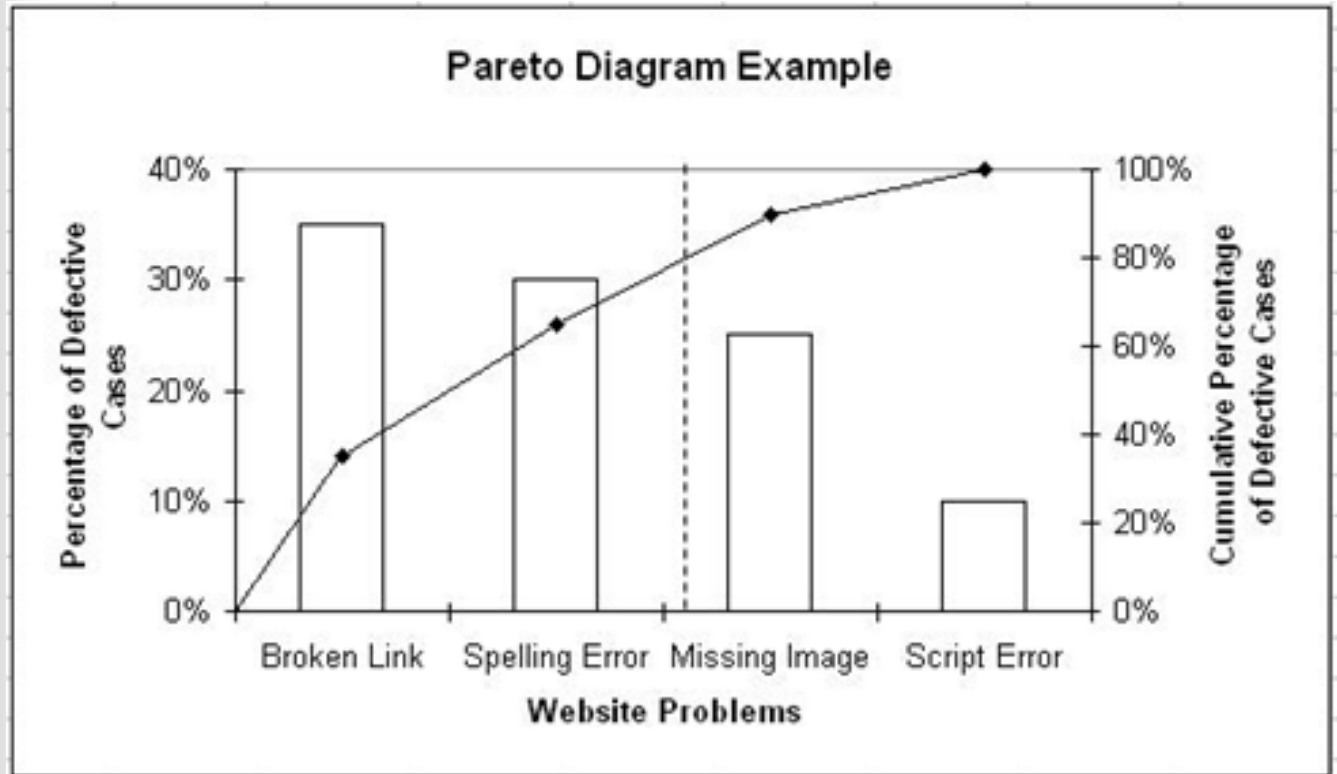
	Frequency	Freq (%)	Freq accum(%)
■ Difficulty	6	(35,29)	(35,29)
■ Resignation	5	(29,41)	(64,71)
■ Underestimation	4	(23,53)	(88,24)
■ Low motivation	2	(11,76)	(100,00)



# Pareto analysis II



# Pareto analysis II



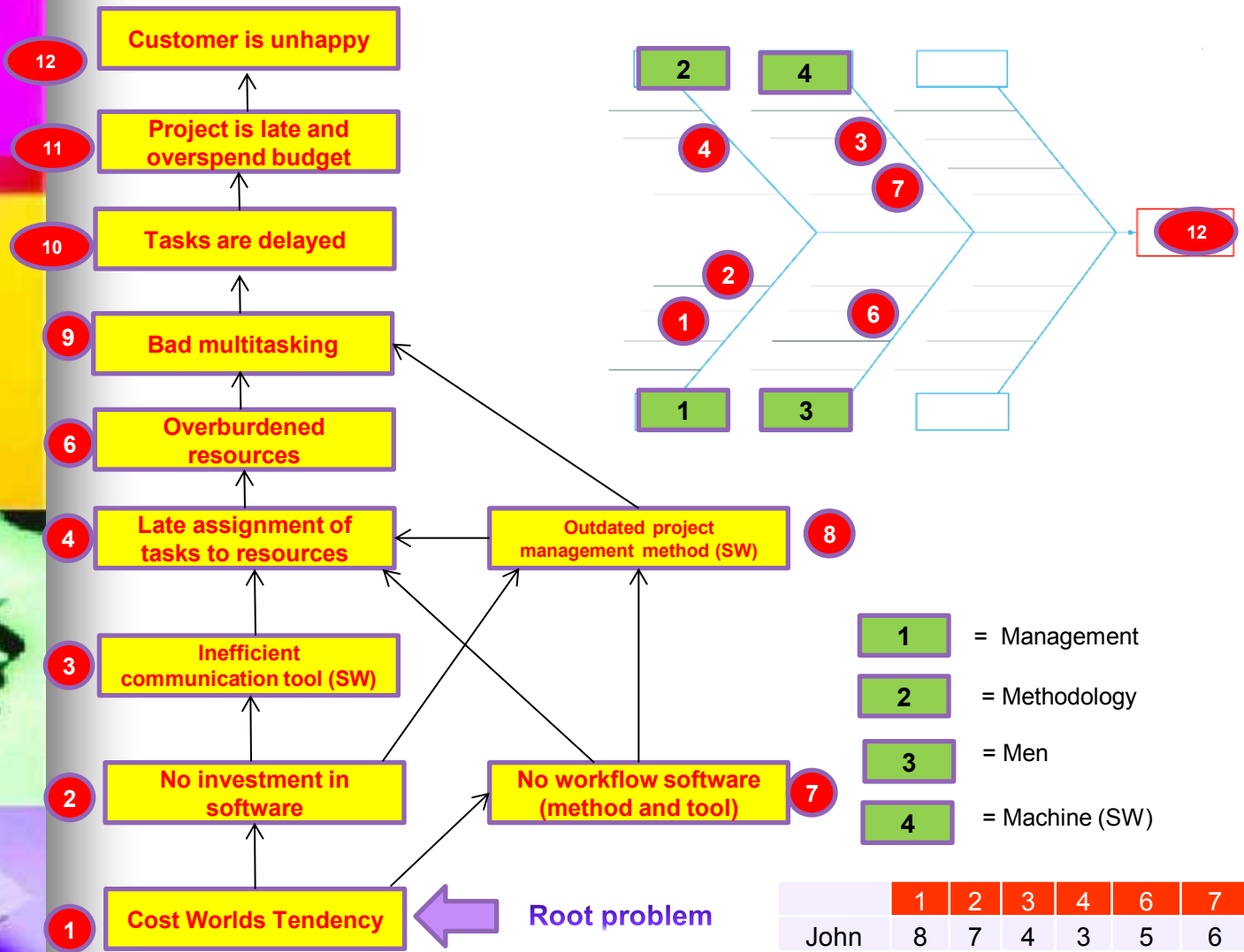


# Evaluation of set of rejects

- Every reject is assigned to one Ishikawa tree
- Every tree with empty table is handed over to chosen company of responsible experts
- All tables are collected and evaluated
- See example with two rejects and two experts

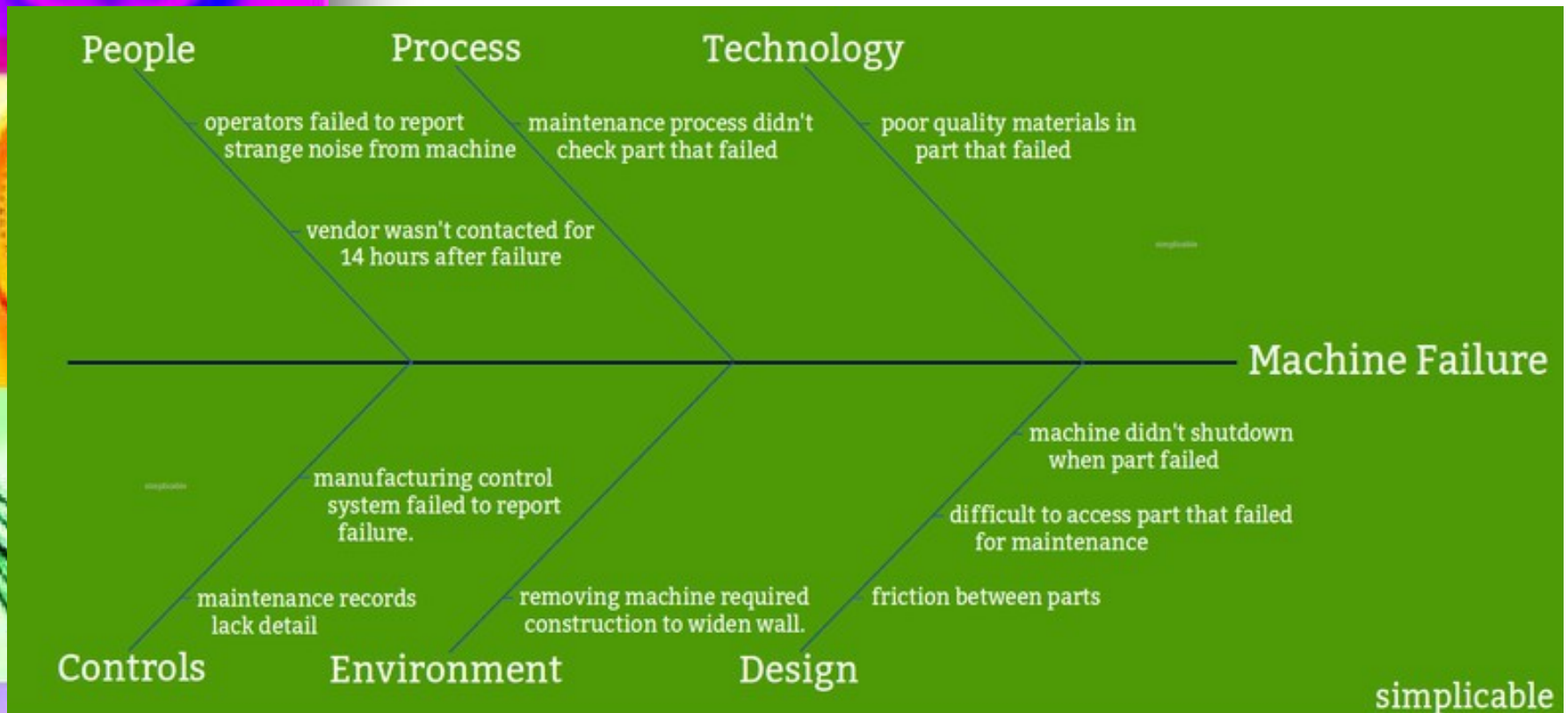
	Domain	Machines	Input control	Setup	Routing	Method	Breakdowns	Workers	Measurment
	Reject code								
	L1	3,5	9	6,5	2	2,5	6	3	1,5
	L2	9,5	2,5	2	5,5	6	8	3,5	2,5
Expert	Reject								
John	L1	3	8	9	3	2	7	2	1
Linda	L1	4	10	4	1	3	5	4	2
Expert	Reject								
John	L2	9	3	3	5	7	8	4	3
Linda	L2	10	2	1	6	5	8	3	2

# Current Reality Tree and Ishikava (Pareto)



SW=software

# Example 1



# Conclusion

Type	<a href="#">Problem Analysis</a>
Definition	A visualization of the causes of a problem.
Also Known As	<a href="#">Ishikawa Diagram</a>
Invented By	Kaoru Ishikawa
Related Concepts	<a href="#">Problem Analysis</a> » <a href="#">Root Cause</a> » <a href="#">Human Error</a> » <a href="#">Internal Controls</a> » <a href="#">Production Line</a> » <a href="#">Root Cause Analysis</a> »





Vilfredo Pareto in person...



Akira Ishikawa in person...