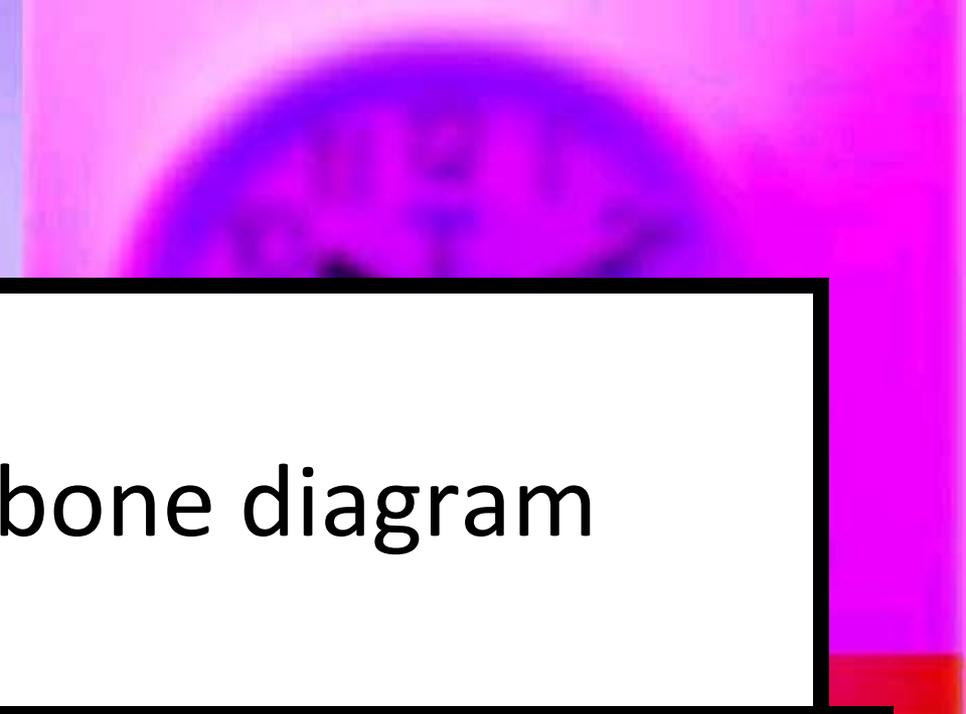
A stack of white papers with blue lines, slightly blurred, set against a light blue background.A blurred image of a clock face with numbers, set against a pink and purple background.

Ishikawa fishbone diagram

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

Skorkovský ESF MU KPH

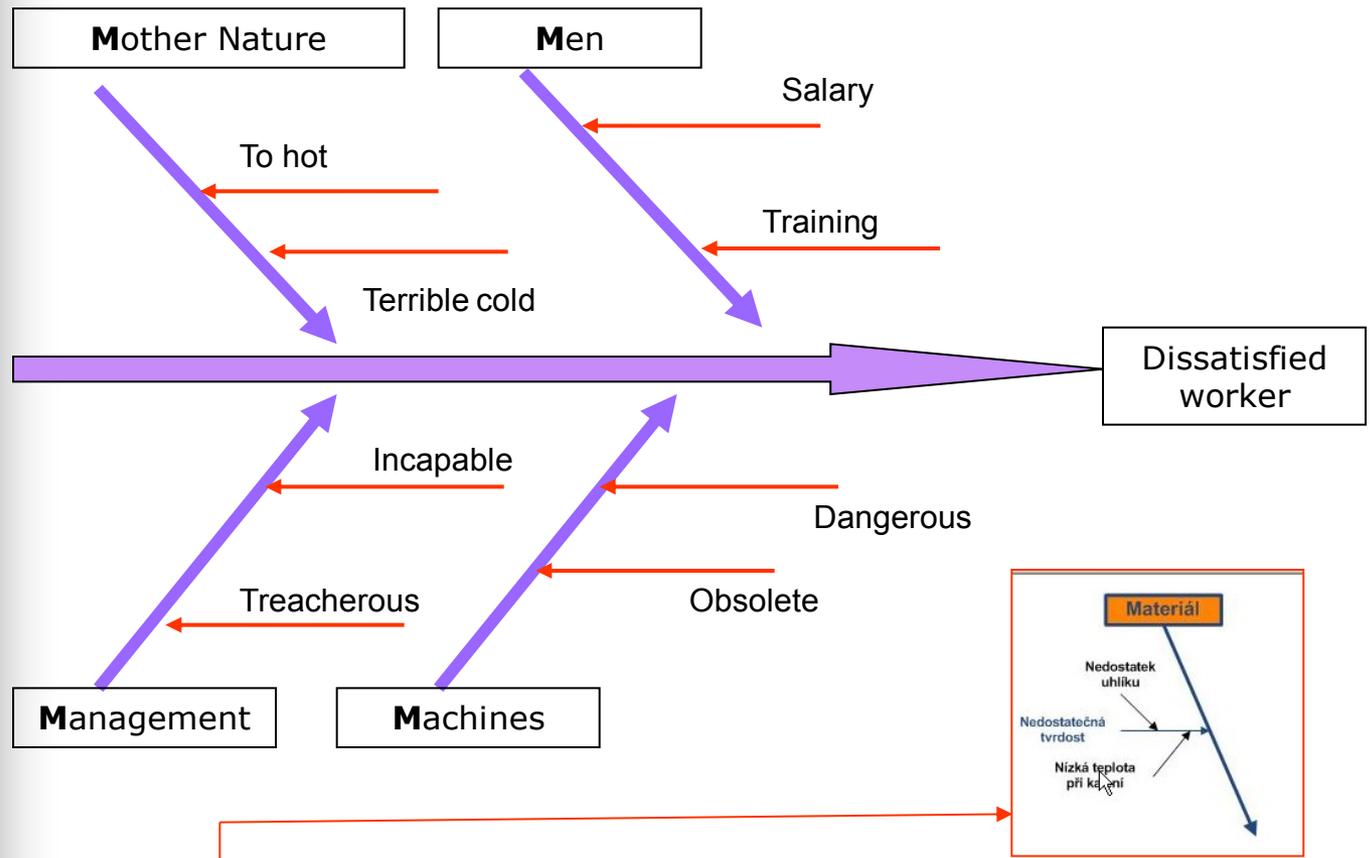
Introduction (FBD= fishbone diagram)

- 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

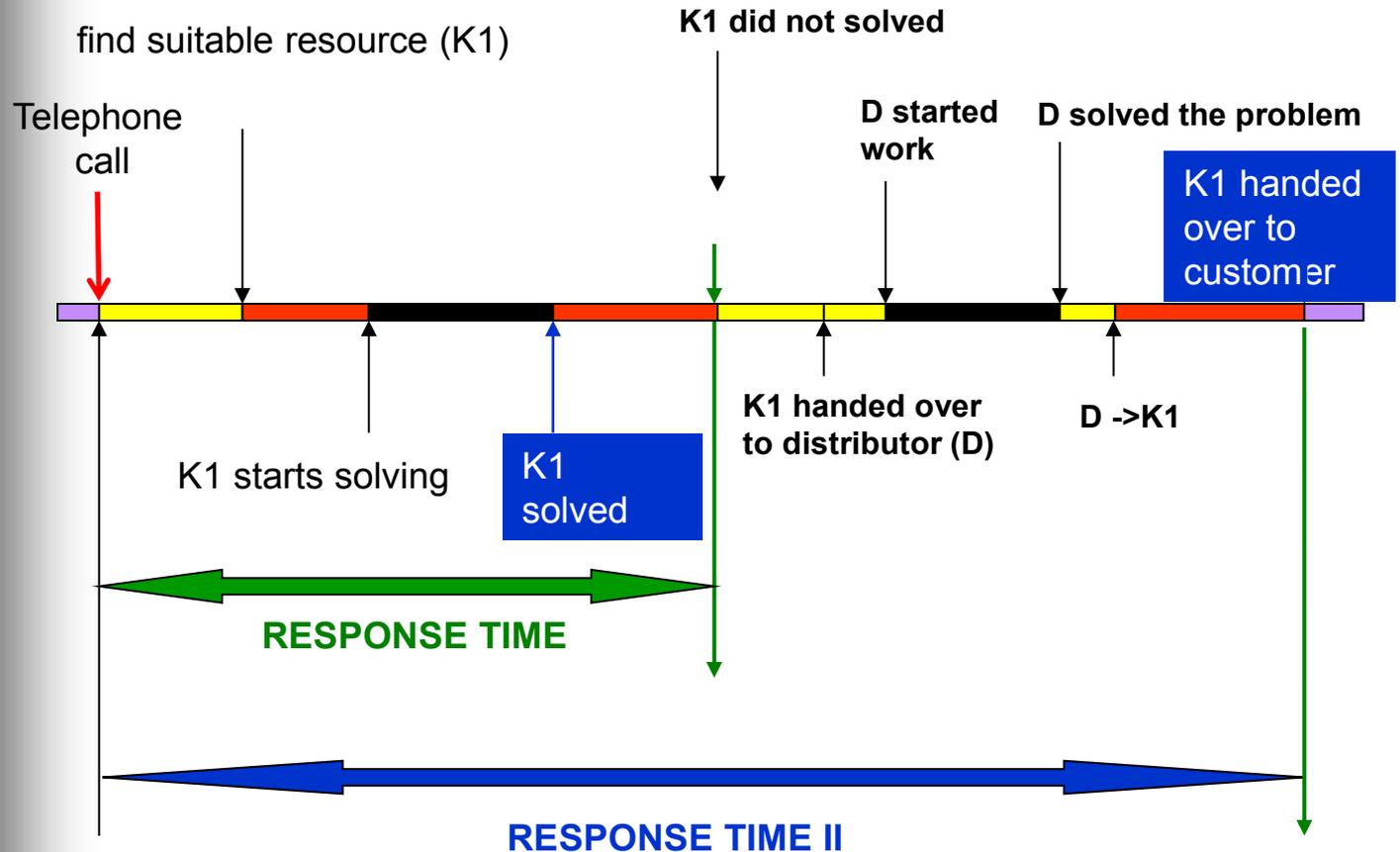


Some chosen problems which could be find out during ERP support process II

- 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



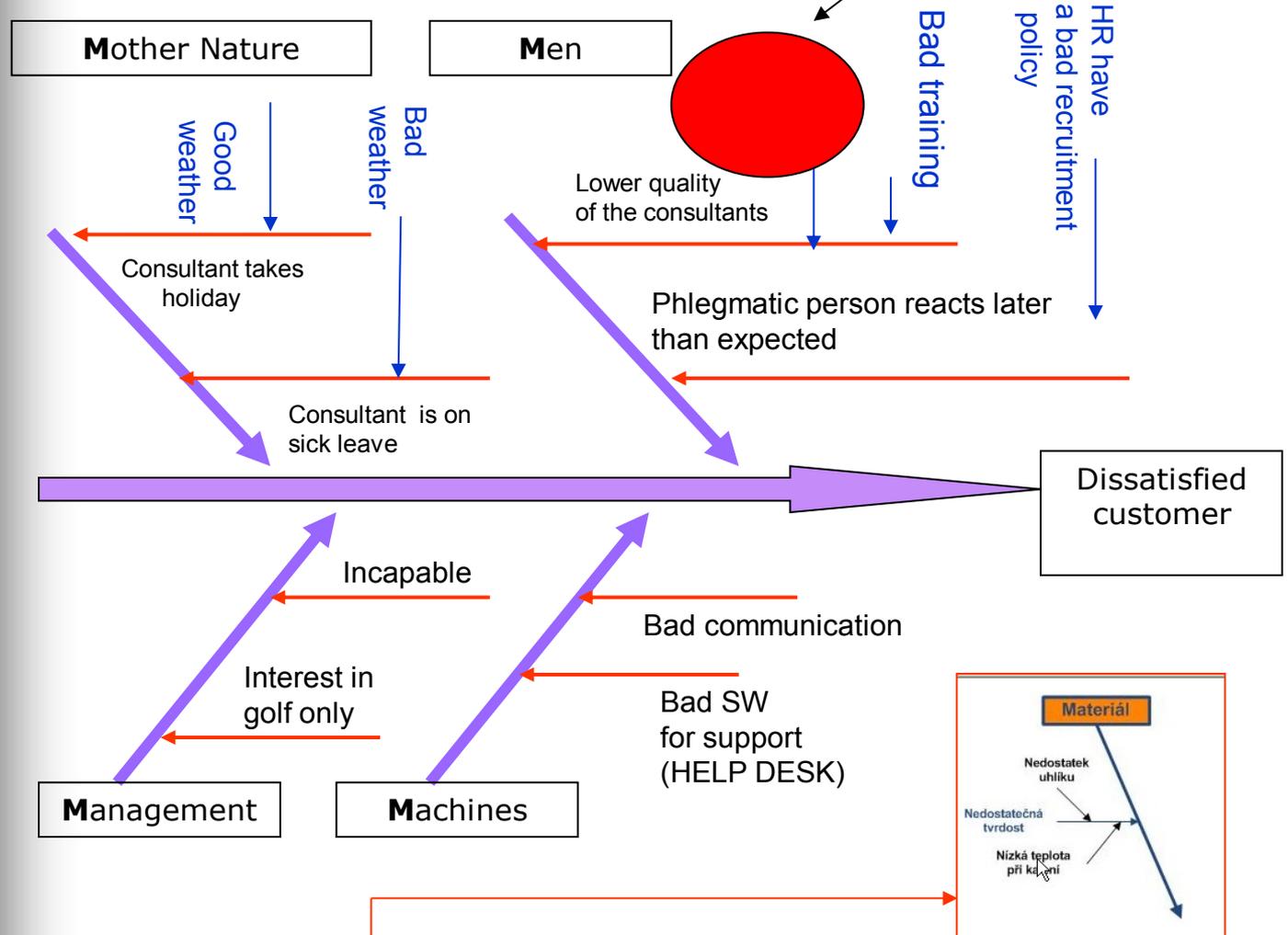
handed over requirement

— = active work

— = idle time

Fishbone diagram-support

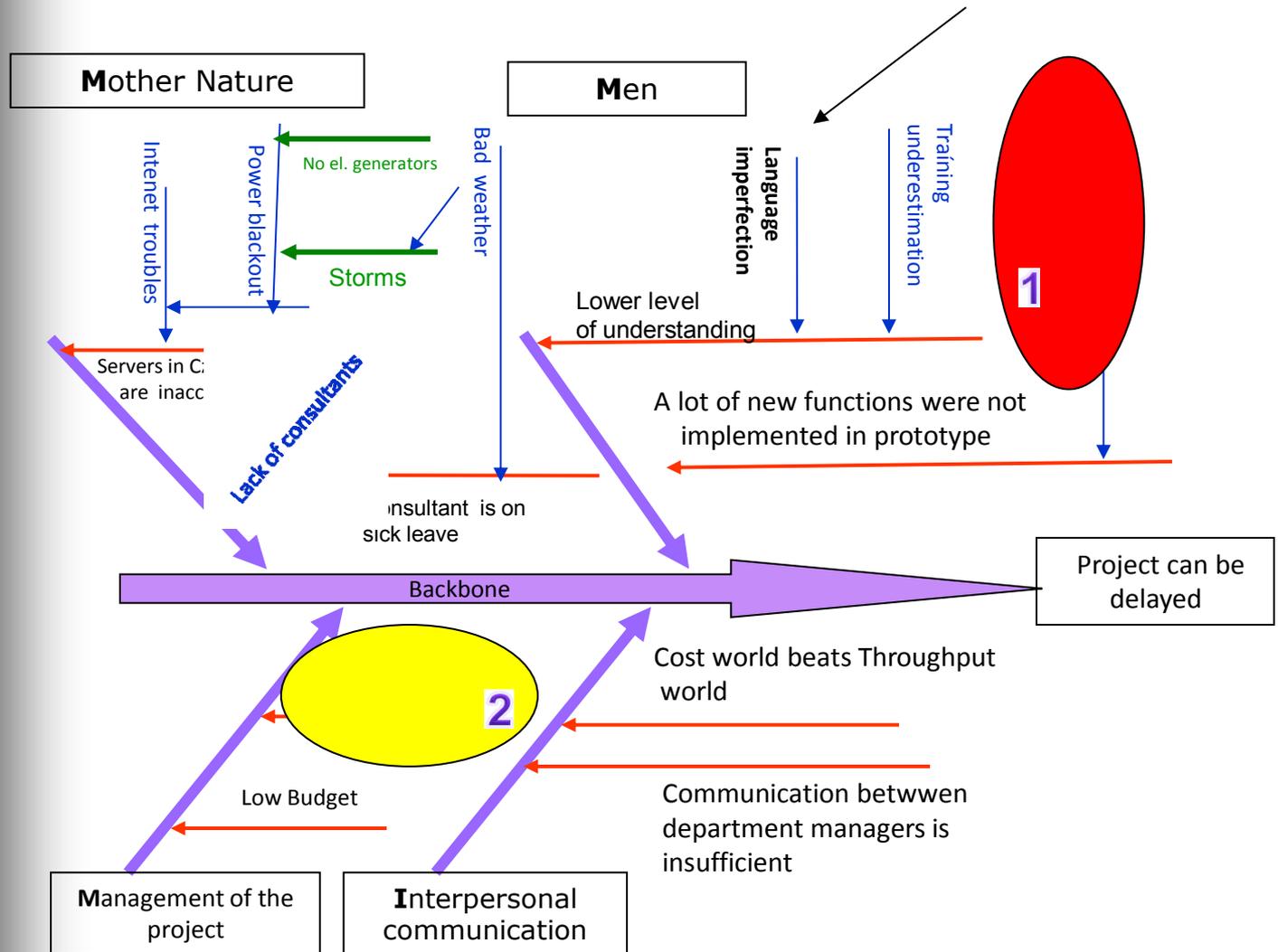
heart of the problem



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

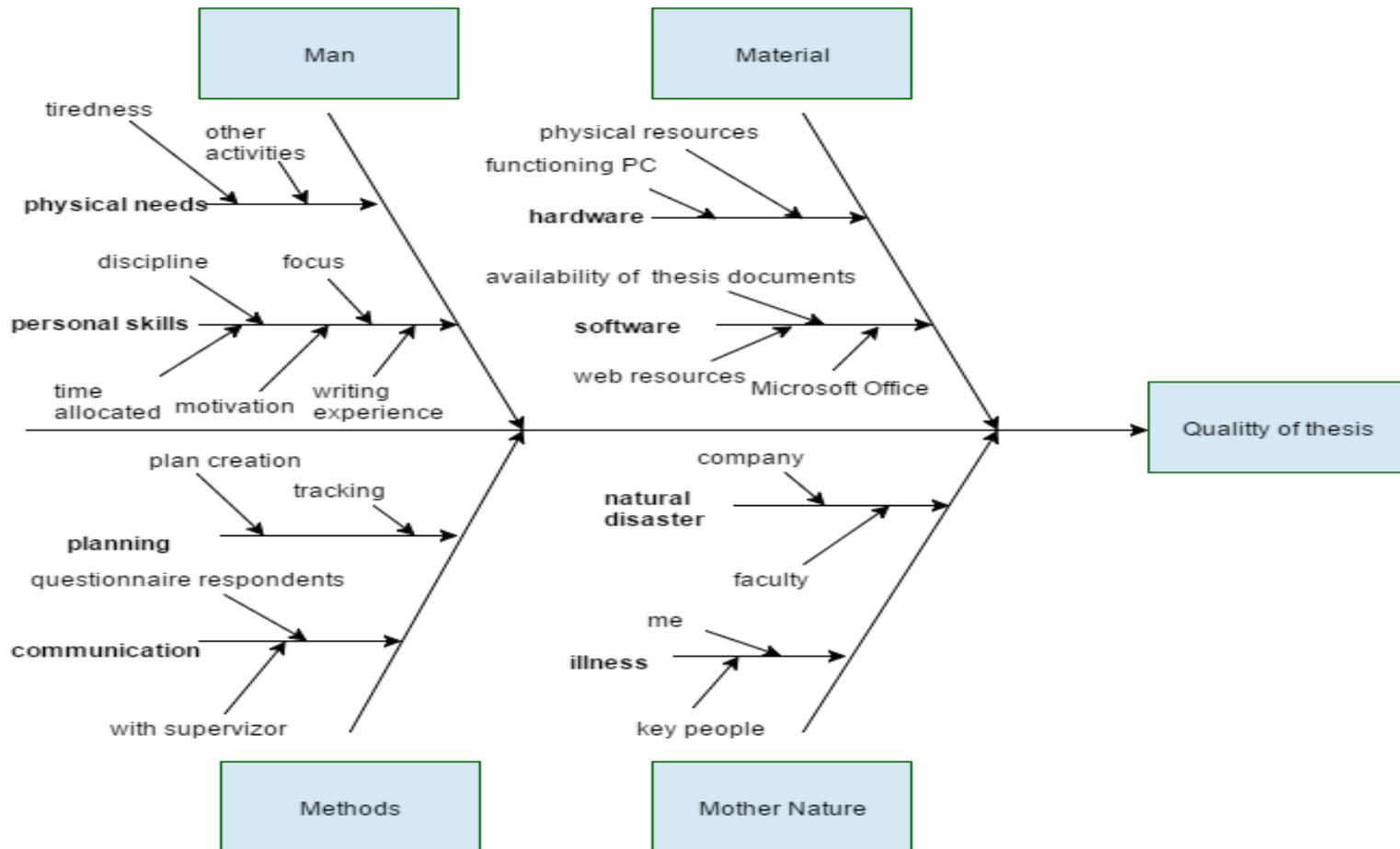


Fishbone diagram-SA Project



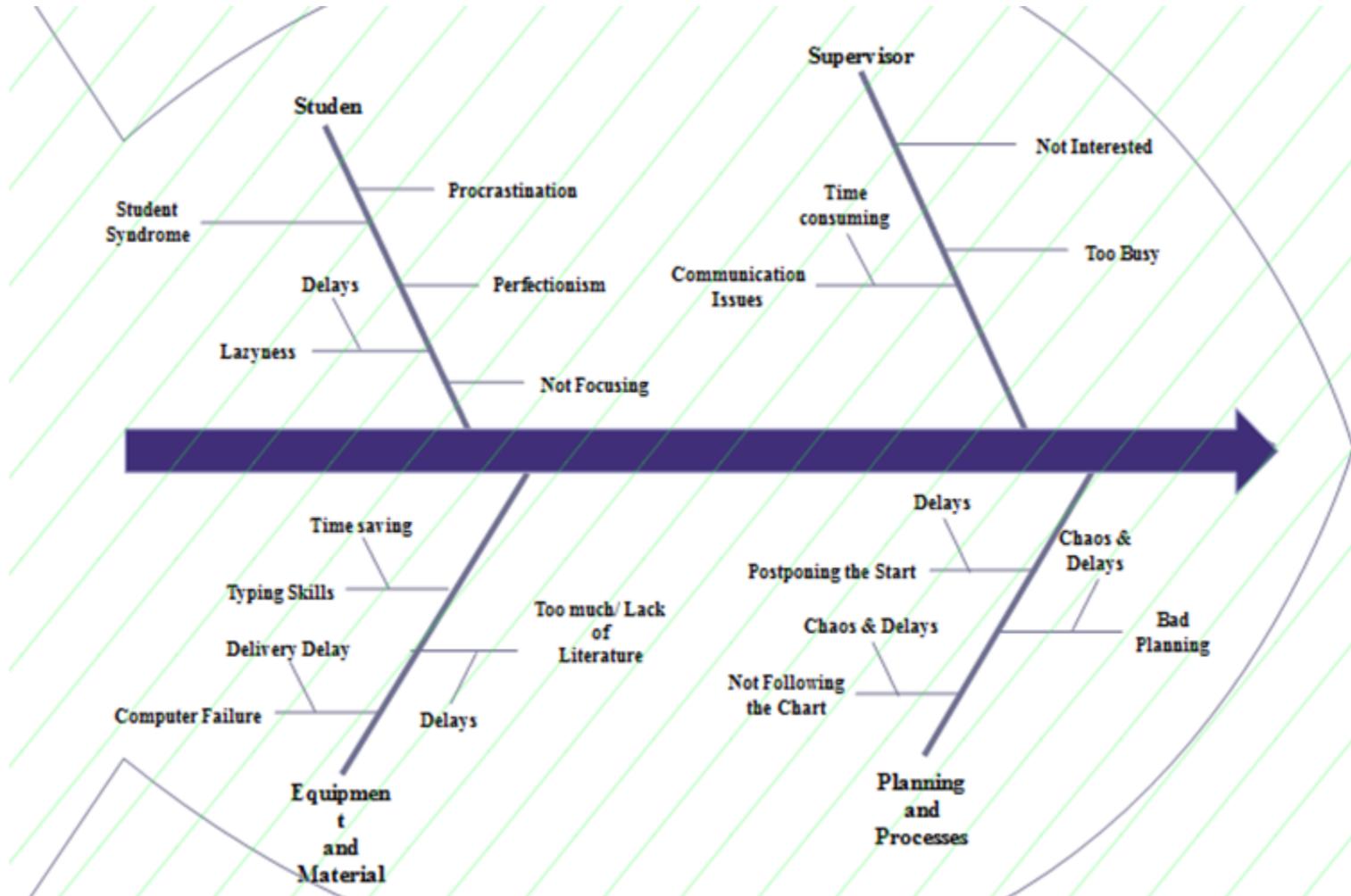
(Methods, **Material**, Manpower, Measurement, Machines)

Another example of Ishikawa I.

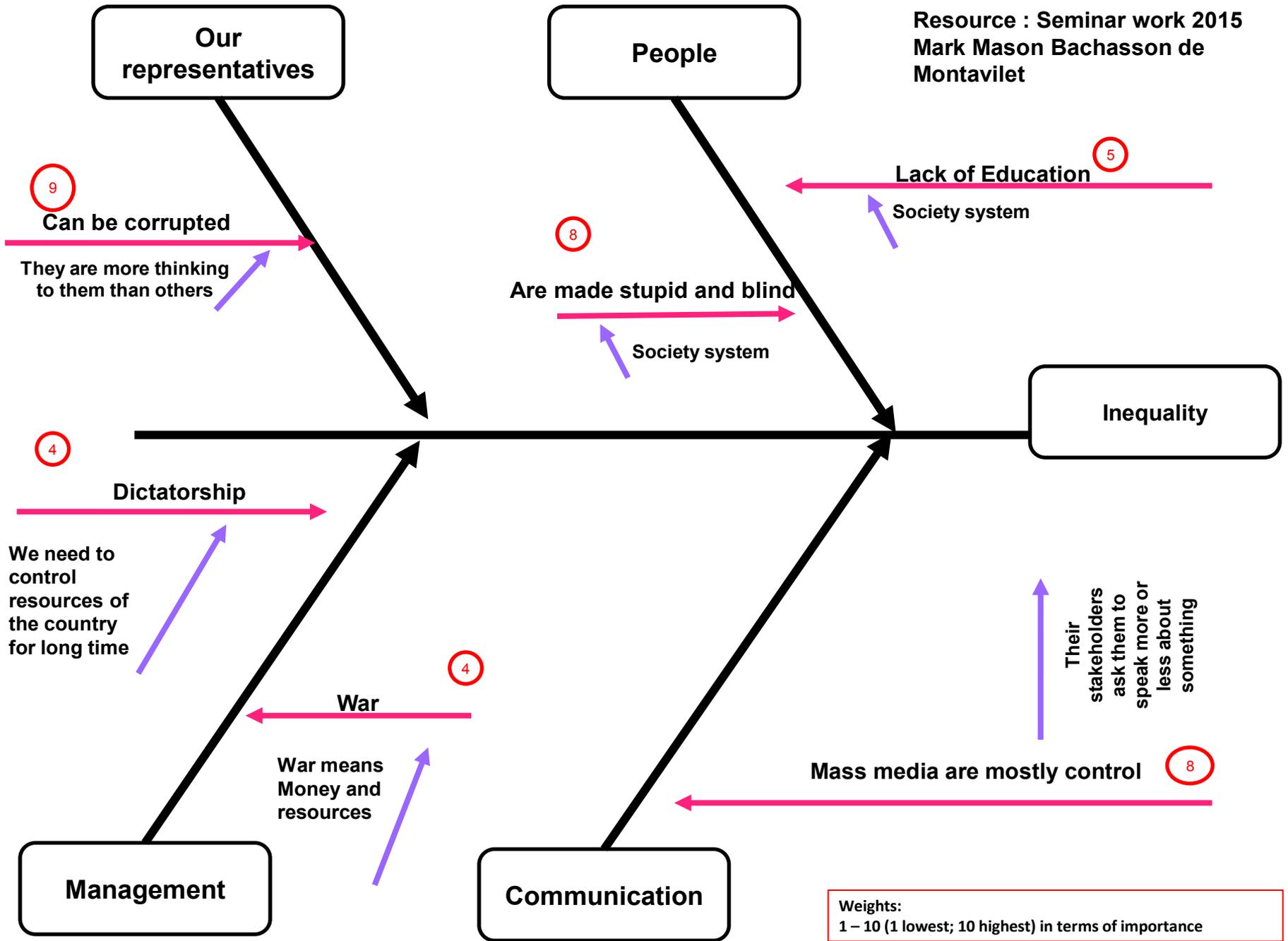


Resource : Seminar work 2015- Ing. Martin Lofaj

Another example of Ishikawa II.



Resource : Seminar work 2015- Tugulea Lilia

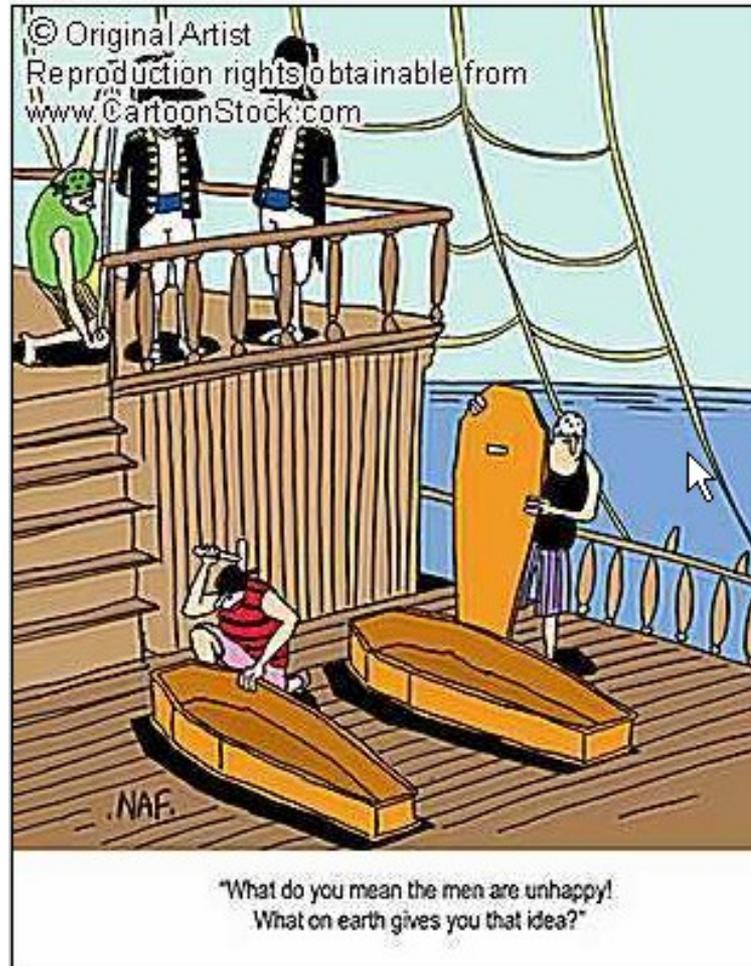


Dissatisfied employee I



"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**

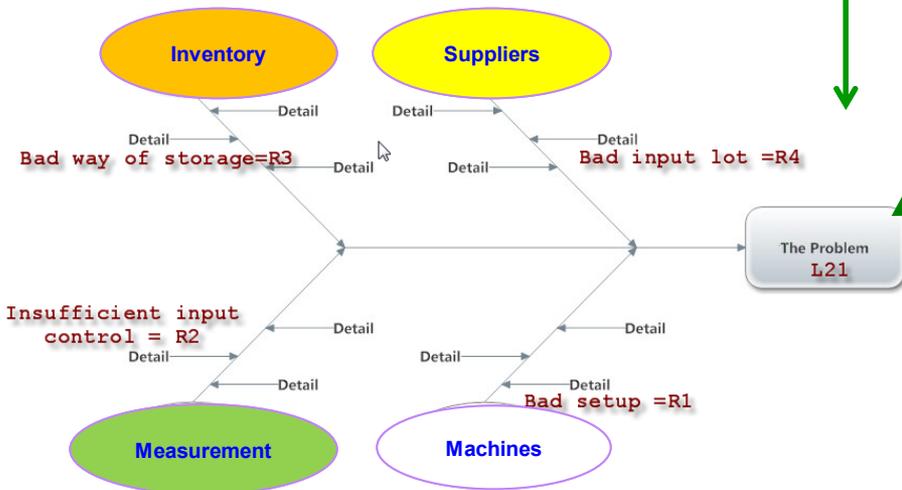
Zmetky celkem **9 485 283** Filtr Data **Filter date**

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



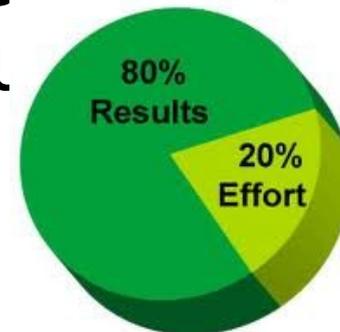
(to establish correct priority of remedy actions)

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 revenue
- 80|20 rule

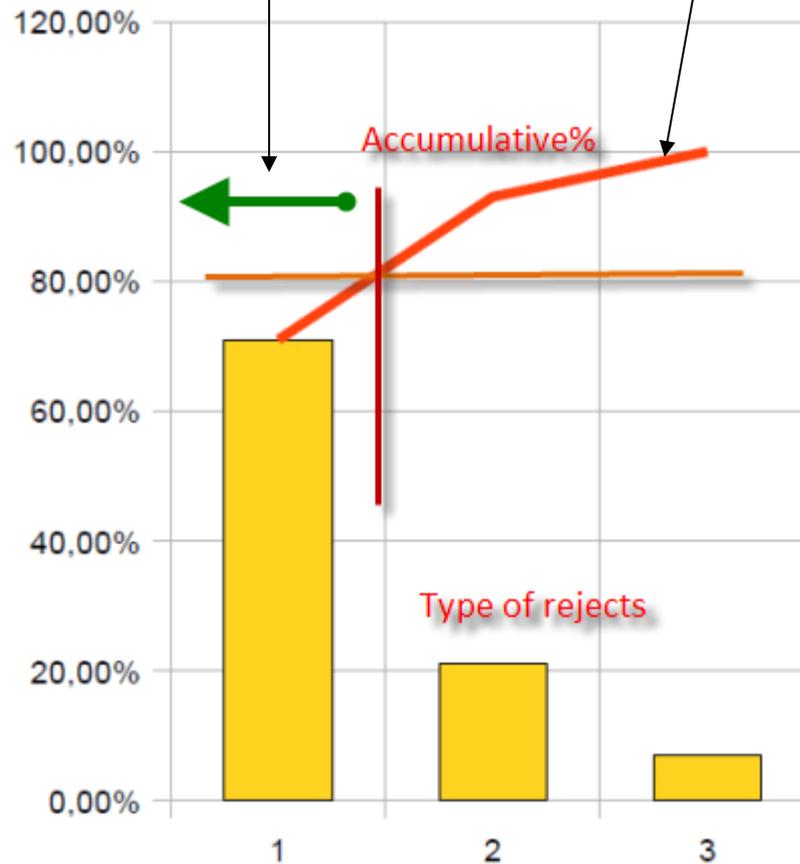
The Pareto Principle



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

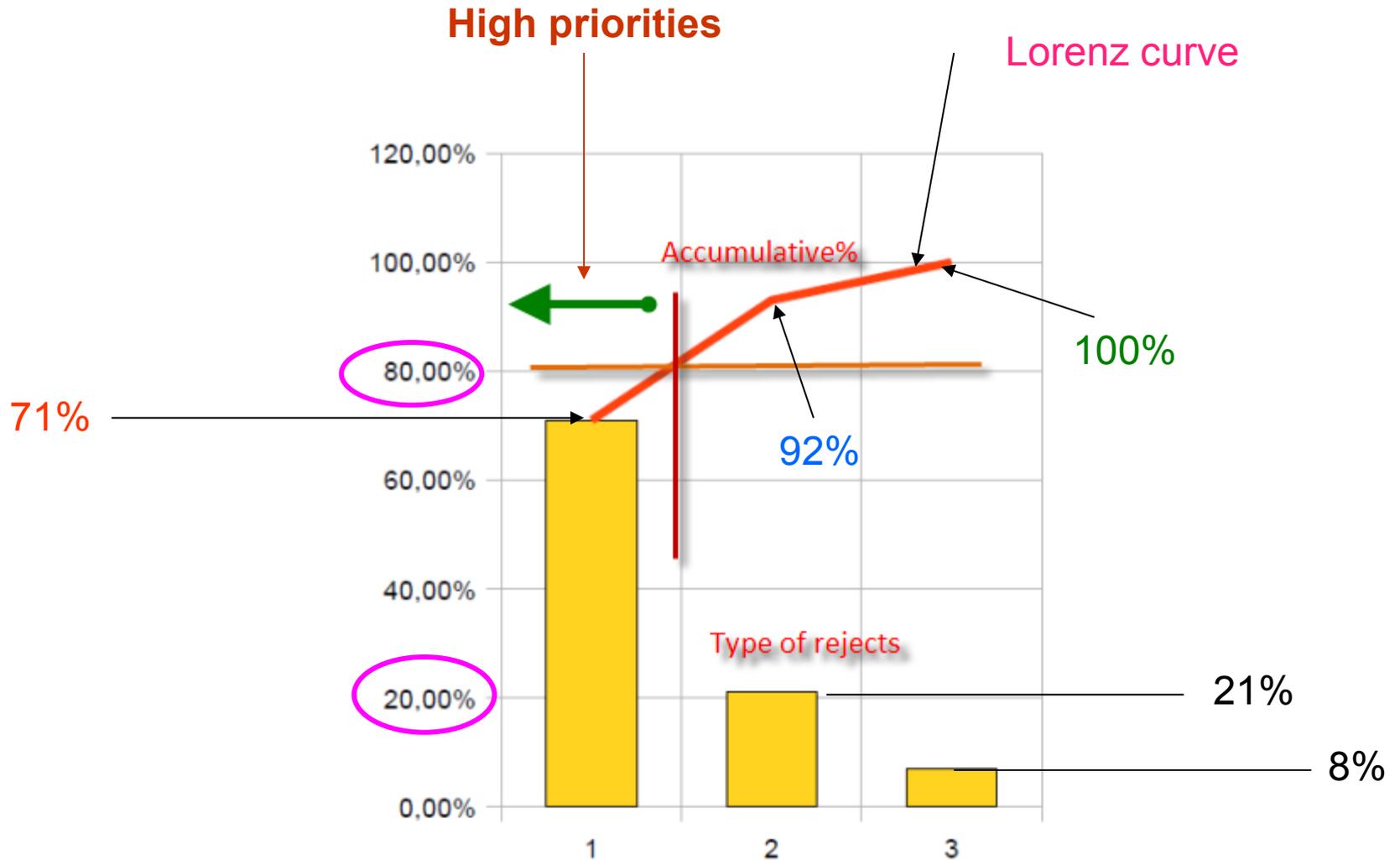
- list of causes (type of rejects) in %
- table where the most frequent cause is always on the left side of the graph

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

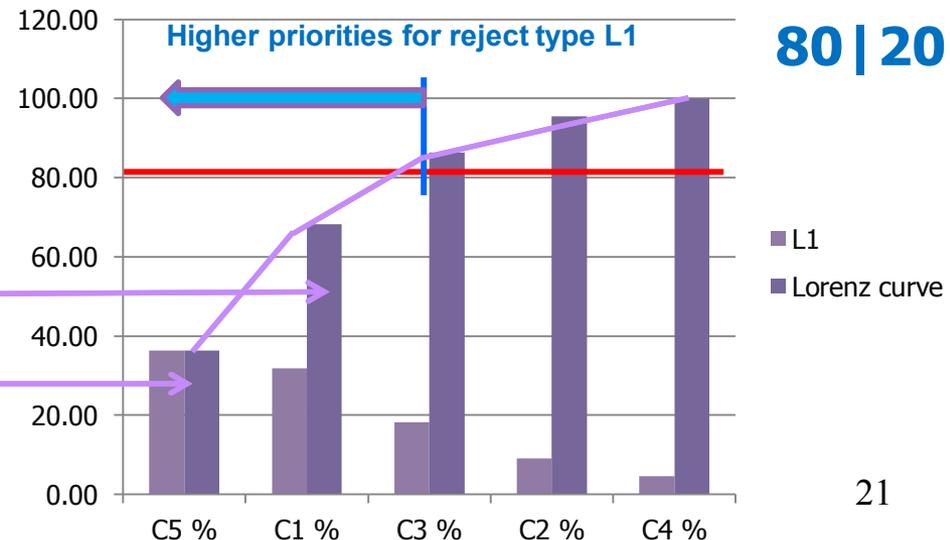
Type of reject	Cause 1	Cause 2	Cause 3	Cause 4	Cause 5	Cause 6	Total
L1	7	2	4	1	8	0	22
L2	2	4	6	8	0	9	29
L3	4	0	0	5	6	7	22
L4	5	7	2	0	1	3	18
L5	0	2	7	3	0	1	13
L6	9	7	5	2	3	6	32
L7	0	7	0	2	3	4	16
L8	1	8	6	2	4	0	21
L9	2	0	5	7	1	4	19
L10	7	2	8	9	7	5	38
C	C5 %	C1 %	C3 %	C2 %	C4 %	C6%	
L1	36,36	31,82	18,18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

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

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

36,36 + 31,82

36,36

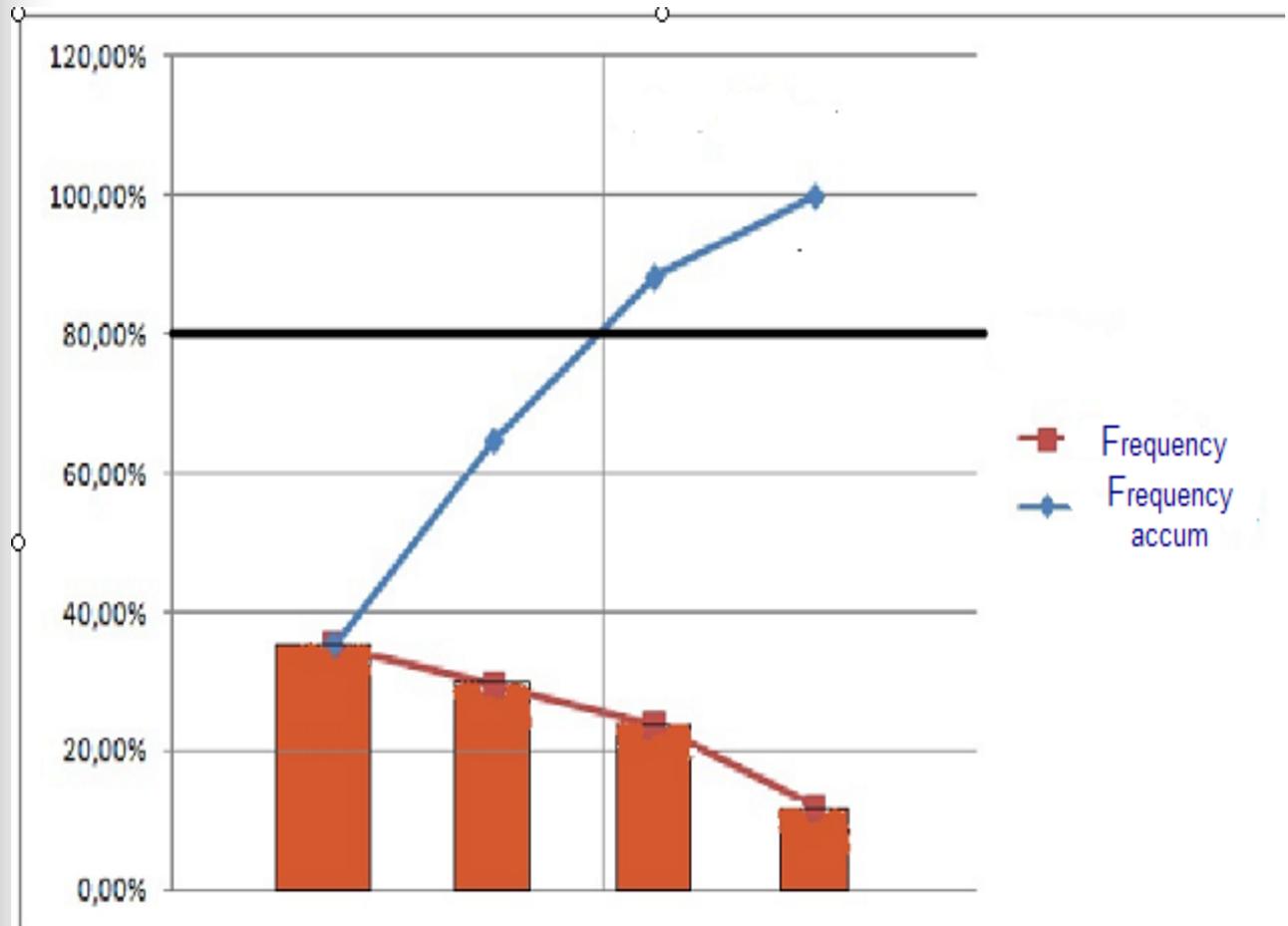


Pareto analysis II - data

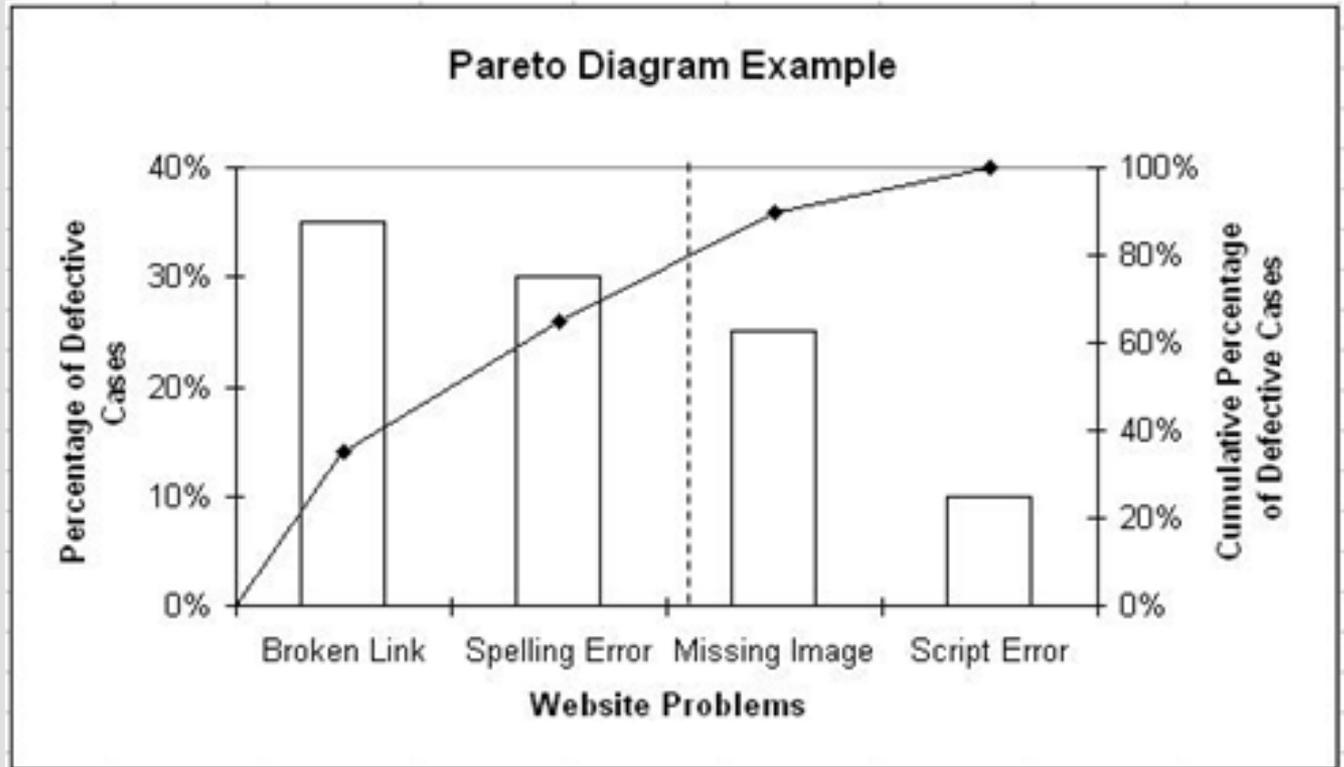
	Frequency	Freq (%)	Freq accum(%)
■ Difficulty	6	(35,29)	(35,29)
■ Resignation	5	(29,41)	(64,71)
■ Underestimation	4	(23,53)	(88,24)
■ Low motivation	2	(11,76)	(100,00)



Pareto analysis II



Pareto analysis II

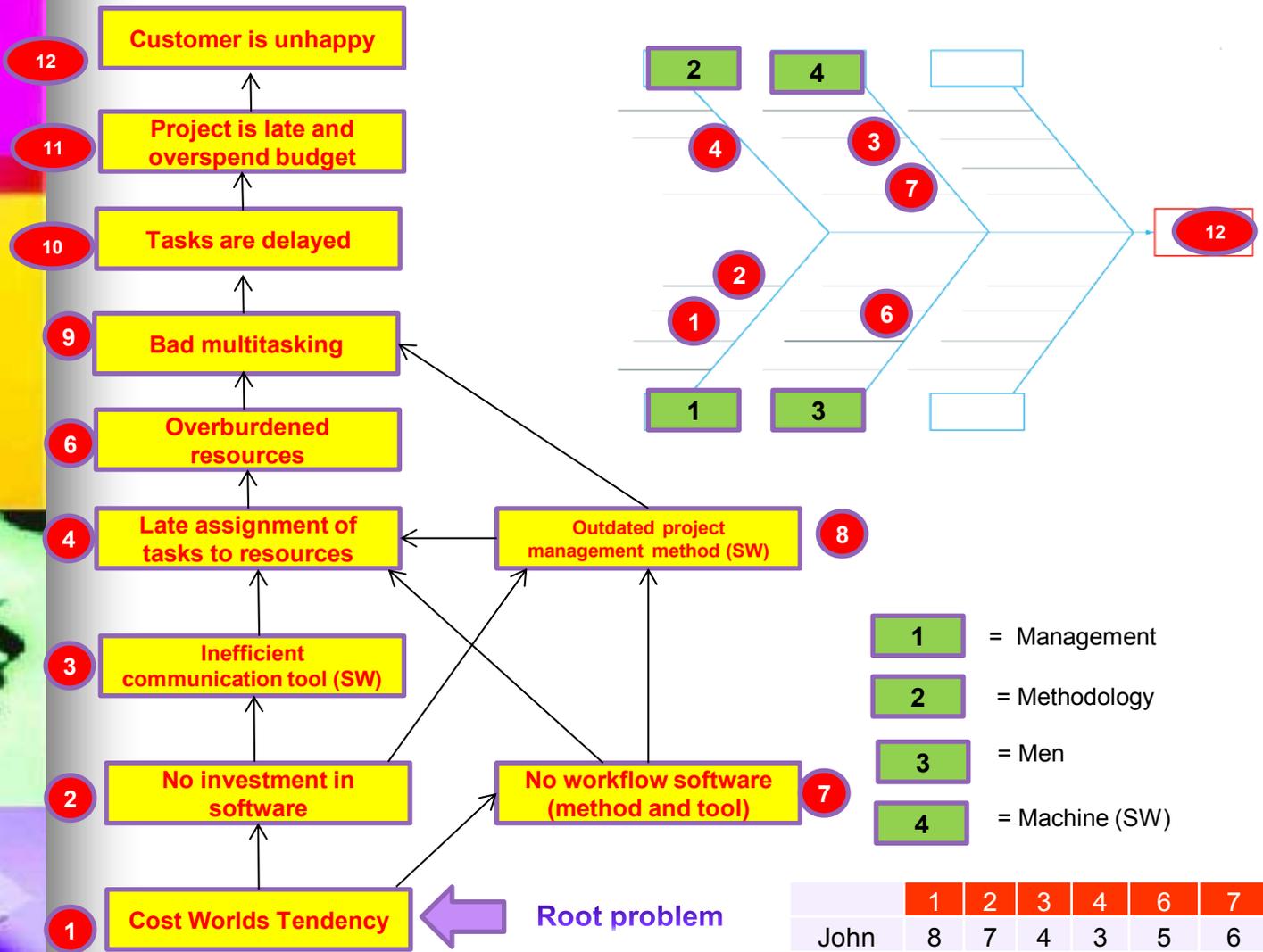


Evaluation of set of rejects

- 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



Vilfredo Pareto in person...



Akira Ishikawa in person...