ASIFOOD

Co-funded by the
Erasmus+ Programme
of the European Union

Short Term Training Course (STTC)
"Safety and Quality in Innovative Food Production Systems"

20-26 May, 2018

Asian Institute of Technology, Thailand

Lecture 3 and 4:

Food Quality and Safety Management Systems – (Part I and II)

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department
of food science
and technology

Food Quality and Food Safety Management Systems

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DFST

ISEKI - Food Association

Universität für Bodenkultur Wien
University of Natural Resources
and Life Sciences, Vienna

Muthgasse:
VIBT (Vienna Institute of Biotechnology)

Other BOKU Departments/Institutions

- *Management of natural resources and environment*
- *Securing nutrition and health*

Department of Food Science and Technology

Institute of Food Sciences

Food Quality Assurance
Sensory Science
Food Chemistry
Food Physics
Food Authenticity
Food Microbiology

Institute of Food Technologies

Food Technology
Food Biotechnology
Process Engineering

BOKU VIBT Vienna Institute of BioTechnology

Thematical strength:

- Technology, Biotechnology, Process Engineering
- Quality and Safety of Food
- Interactions „Food – Consumer“

- - ~ 60 scientists, 20 technicians, secretaries
- ~ 6.500 m^2 pilot plant, laboratories and office rooms
- Annually ~300 students Bachelor Food & Bio Technology
  - ~ 60 MSc Food Science&Technology
  - ~ 20 MSc Safty in the Food Chain

European Association for

Integrating
Food Science
and Engineering
Knowledge
Into the
Food Chain

is an independent European non-profit organisation, established in 2005 by universities, research institutes, companies and associations related to food as an outcome of 10 years of Thematic Network activities.

http://iseki-food.net

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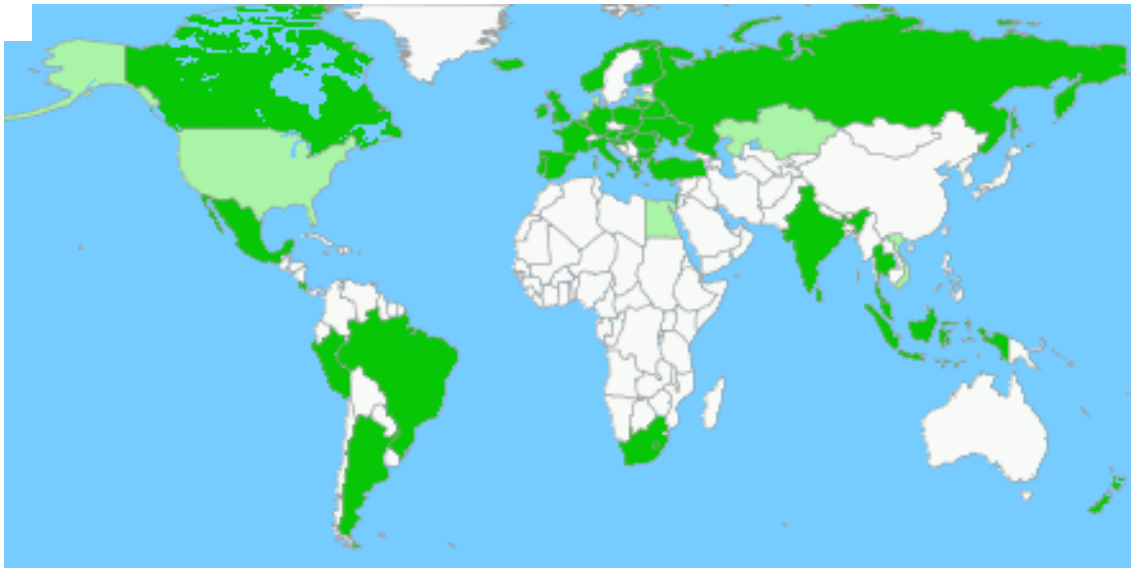
ISEKI Food Association

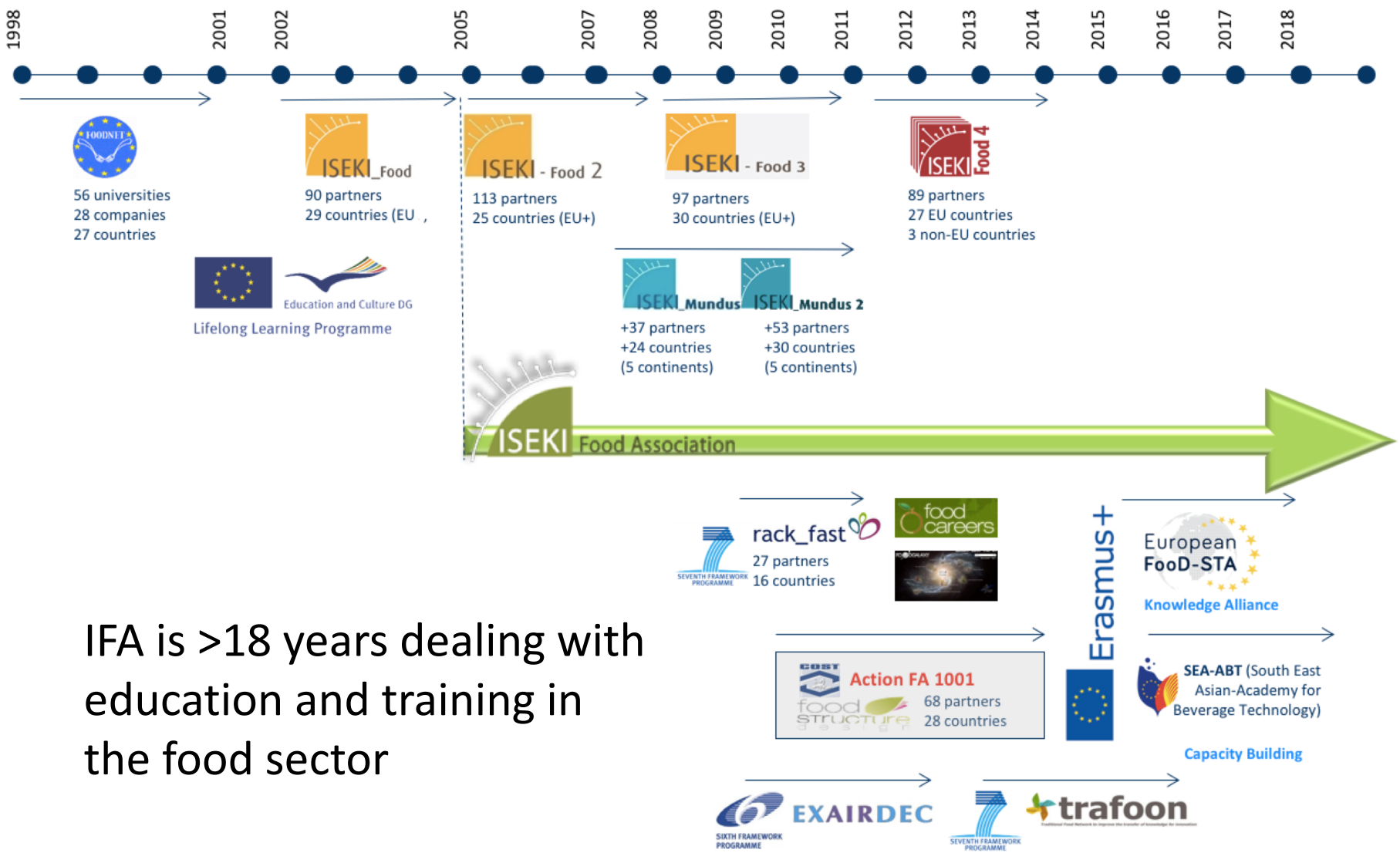
IFA has members in 52 countries



countries with Nat.Representatives

countries without Nat.Representatives

ISEKI-Food Association (IFA) and Projects



IFA is >18 years dealing with education and training in the food sector

ISEKI Food Association

is a platform for:

Promoting synergies between

Research - Education - industry

International, SUBJECT SPECIFIC ACCREDITATION of FOOD STUDY PROGRAMMES

ISEKI - Food Association

EQAS-Food Award

EUROPEAN QUALITY ASSURANCE FOR STUDY PROGRAMMES IN FOOD SCIENCE AND TECHNOLOGY

https://www.iseki-food.net/accredidation

CERTIFICATION OF DEGREE PROGRAMMES

	STANDARD ROUTE	EXTENDED ROUTE
	DOCUMENTATION FROM PRIOR REVIEW	SELF-ASSESSMENT REPORT (SAR)
	SAR and audit reports must be included. Additional information on the alignment to the EQAS learning outcomes must be provided. Can include a single programme or group of programmes.	Framework supporting documentation provided by EQAS. Can include a single programme or group of programmes.
	ASSESSOR REVIEW	
	Documentation shared with assessors. No audit. Team composed of teachers, industry specialists.	Documentation shared with assessors. Two days audit for a single programme. Team composed of teachers, industry specialists and senior student.
	DECISION ON THE AWARD	
	Based on information provided in the documentation. Decision by IFA Accreditation Commission.	Based on self-assessment and audit reports. Decision by IFA Accreditation Commission.

CERTIFICATION of SHORT COURSES

The workshop is certified by IFA according the EQAS scheme.

ISEKI - Food Association
EQAS-Food Award
Certified Course

Participants will get a certificate of attending a certified course, or, if wanted, a certificate for successful completion by IFA after an optional voluntary assessment at the end of the workshop for possible CPD recognition.

ISEKI_Food 2018

5th International ISEKI_Food Conference

3-5 July 2018, Stuttgart

University of Hohenheim, Germany

Bridging Training and Research for Industry and the Wider Community

ISEKI Food Association

https://www.isekiconferences.com

UNIVERSITÄT HOHENHEIM 1818

SEA-ABT
South East Asia Academy for Beverage Technology

The South East Asia Academy for Beverage Technology

Co-funded by the Erasmus+ Programme of the European Union

The Project no. 561515-EPP-1-2015-1-AT-EPPKA2-CBHE-JP

ERASMUS+ Capacity building for HE

Oct. 2015 – Oct.2018 1 Mio € 9 partners

BACKGROUND

- Thai Beverage Industry requires highly skilled staff
- No adequate education available in Thailand and SEA
- Selected trainees are sent over to Europe, US, Ausralia

AIMS

1. **Support Thai Universities** to improve the higher education of technicians and engineers by establishing an education concept for Beverage technicians and engineers (alcoholic and non alcoholic)
2. Improve **trainings equipment**
3. **Support Thai companies and stakeholders** in the beverage area to find qualified personnel
4. Establish an organisational frame - Academy

PROJECT PARTNERS

	Thailand	EU
Universities	**KU** (Kasetsart University)	**BOKU** (Universität für Bodenkultur Wien), AT
	CU (Chulalongkorn University)	**HGU** (University of Geisenheim), DE
	KMITL (King Mongkut's Inst.of Techn.)	**UNITE** (University of Teramo), IT
Industry	**PATKOL** (food equipment supplier)	**Habla Chemie (**Cleaning Agents**)**, DE
Associations		**IFA** (ISEKI-Food Association), AT
		EHEDG (Europ. Hygienic Equipment Design Group), DE
		EUCEN (EU university continuing education network), BE
		.....

OUTCOMES

Higher Education (HE)
International Accreditation by IFA

a) Postgraduate Diploma (1y)
KU (+CU+KMITL)

b) tune existing food study programmes

c) Double degree
CU – UNITE

CPD training
International Certification by IFA

"Joint EU-SEA Beverage Academy"

EU-Bev. Academy

SEA-Bev. Academy

a) development/provision of certified trainings

b) certification schemes for selected profiles

- Certified Hygiene Officer/Manager
- Certified Quality Officer/Manager
- …….

c) Certify trainers

d) Provision of trainings facilities

Oct 15----------Oct 16----------Oct 17----------Apr 18----------Oct18

selection & specification

Train the trainer in EU

development

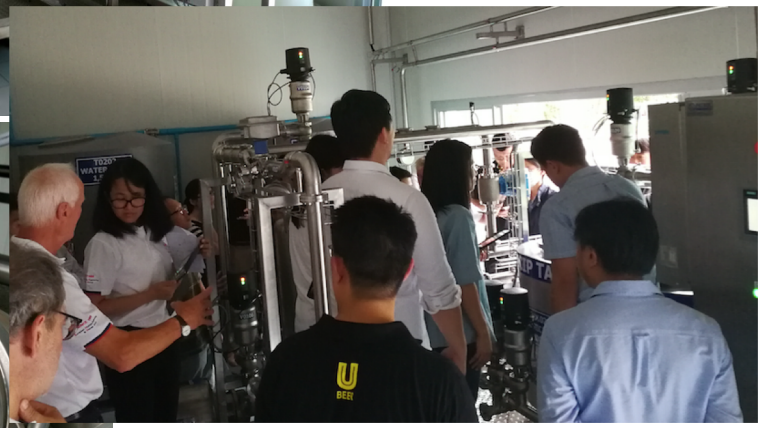
test

improvement

certification

Co-funded by the Erasmus+ Programme of the European Union
The Project no. 561515-EPP-1-2015-1-AT-EPPKA2-CBHE-JP

Training Equipment



SEA-ABT
South East Asia Academy for Beverage Technology

"Joint EU-SEA Beverage Academy"
training center with mainly independently working local hubs in Bangkok and Vienna

EU Beverage Academy
at BOKU using the infrastructure of IFA

SEA Beverage Academy
at KU using the infrastructure of KU-FIRST

"Joint EU-SEA Beverage Academy"

maintained by ISEKI-Food Association (IFA)

- Administration of members: European and Thai Universities and companies (food processors, equipment supplier, training provider)
- Accreditation of food study programmes (formal process)
- Certification of training activities (formal process)
- Qualification of persons
- Host and maintain a **Web platform** with:
  - E-learning system
  - Webinar & Teleconference system
  - Digital library of educational products and teaching tools
  - Information collection system: Database on needs and available modules, courses and educational products, facilities and resources
  - brokerage system for jobs, internships

EU Beverage Academy

SEA Beverage Academy

"Joint EU-SEA Beverage Academy"

EU Beverage Academy

- keep contact with EU stakeholders (needs collection)
- train the trainers
- transfer knowledge and support co-operations
- provide experts for accreditation of food study programmes and certification of training activities

SEA Beverage Academy

- keep contact with Thai stakeholders (needs collection)
- deliver training activities
- transfer knowledge and support co-operations
- provide experts for accreditation of food study programmes and certification of training activities

SEA-ABT members

Expected contribution

- help identify needs
- accept diploma thesis work
- accept internship
- giving lectures at the university

benefits

- tailor made high quality, certified training
- get support in business development
  - find experts and partners
  - access to equipment and new technologies
  - …….

EHEDG ADVANCED COURSE ON HYGIENIC ENGINEERING

The course provides knowledge and insight into the hygienic design of equipment and processes for the food, feed and pharmaceutical industry, to better fulfil the wishes of purchasers and retailers. These include minimising down time, maintenance, cleaning costs and environmental impact, but also efficient cleaning, optimal product safety and constant product quality. The design should comply with present legislation and standards, but can also anticipate future changes.

Trainers

Mr.Knuth Lorenzen
President of the EHEDG since 2007, Member of the 3-A, Steering Committee and Expert in Hygienic Design Enquiries.

Mr.Andy Timperley
Chairman of the EHEDG Test Methods Sub-group, CCE for the P3--A group of Standards for Pharmaceutical equipment.

Prof. Dr.Gerhard Schleining
Chairman of EHEDG Austria Regional Section

Assoc. Prof. Dr.Navaphattra Nunak
Chairman of EHEDG Thailand Regional Section

18-20 JULY

EHEDG Thailand, KMITL, Bangkok

https://www.sea-abt.eu/events/upcoming

https://ififs2018.meetinghand.com

IFIFS 2018

1st Int. Conference on Innovations in Food Ingredients & Food Safety

AIT Asian Institute of Technology

ISEKI Food Association

ASIFOOD

SEA-ABT South East Asia Academy for Beverage Technology

Co-funded by the Erasmus+ Programme of the European Union

- Innovative Food Ingredients and Food Quality
- Traditional Foods and Beverage
- Functional Foods, Functional Beverages and Neutraceuticals
- Food Safety and Risk Assessment Analysis in Food Production and Food Supply Chain Systems
- Emerging Trends in Traceability Techniques in Food Systems
- Emerging Trends and Public Health Concerns of Use of Chemicals
- Medical Foods
- Food Process Engineering and Non-thermal food processing technologies
- Reduce Food Loss and Postharvest Technology and Management
- Smart Food and Beverage Packaging Systems

department
of food science
and technology

Content

Food Quality

"degree to which a set of inherent characteristics fulfills requirements" (ISO)

"Meeting or exceeeding customer and consumer expectations" (Luning & Marcellis 2011)

Food Safety

"ensuring, that food consumption (according to its intended use) does not cause harm and/or foodborne illness to the consumer. … the term food safety includes the absence of harmful substances such as environmental contaminants or residues of veterinary medical products" (BfR 2011)

Food Quality Management

Food Safety Management

FQ&FS Management Systems

ISO 9000
FSCC 22000
IFS, BRC

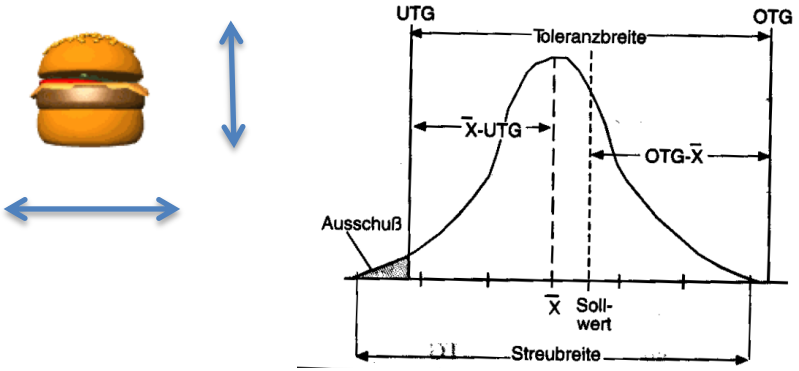
TQM and cont. improvement

Conclusion

Food Quality

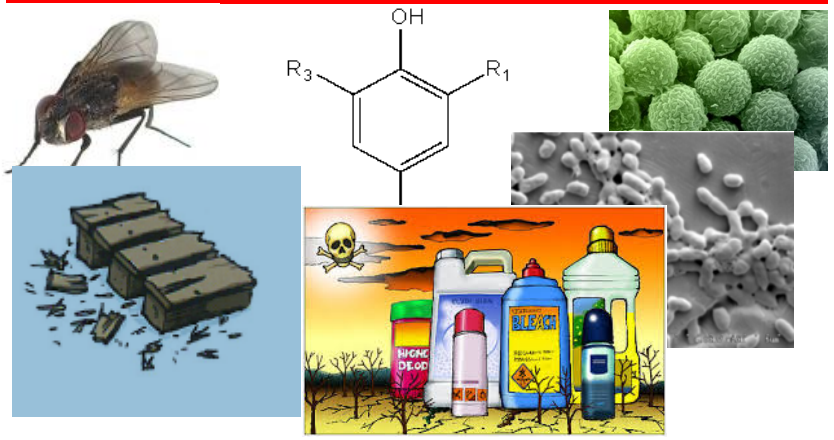
Consumer requirements (dynamic)

PROCESS
Process capability



Food Safety

Hazards

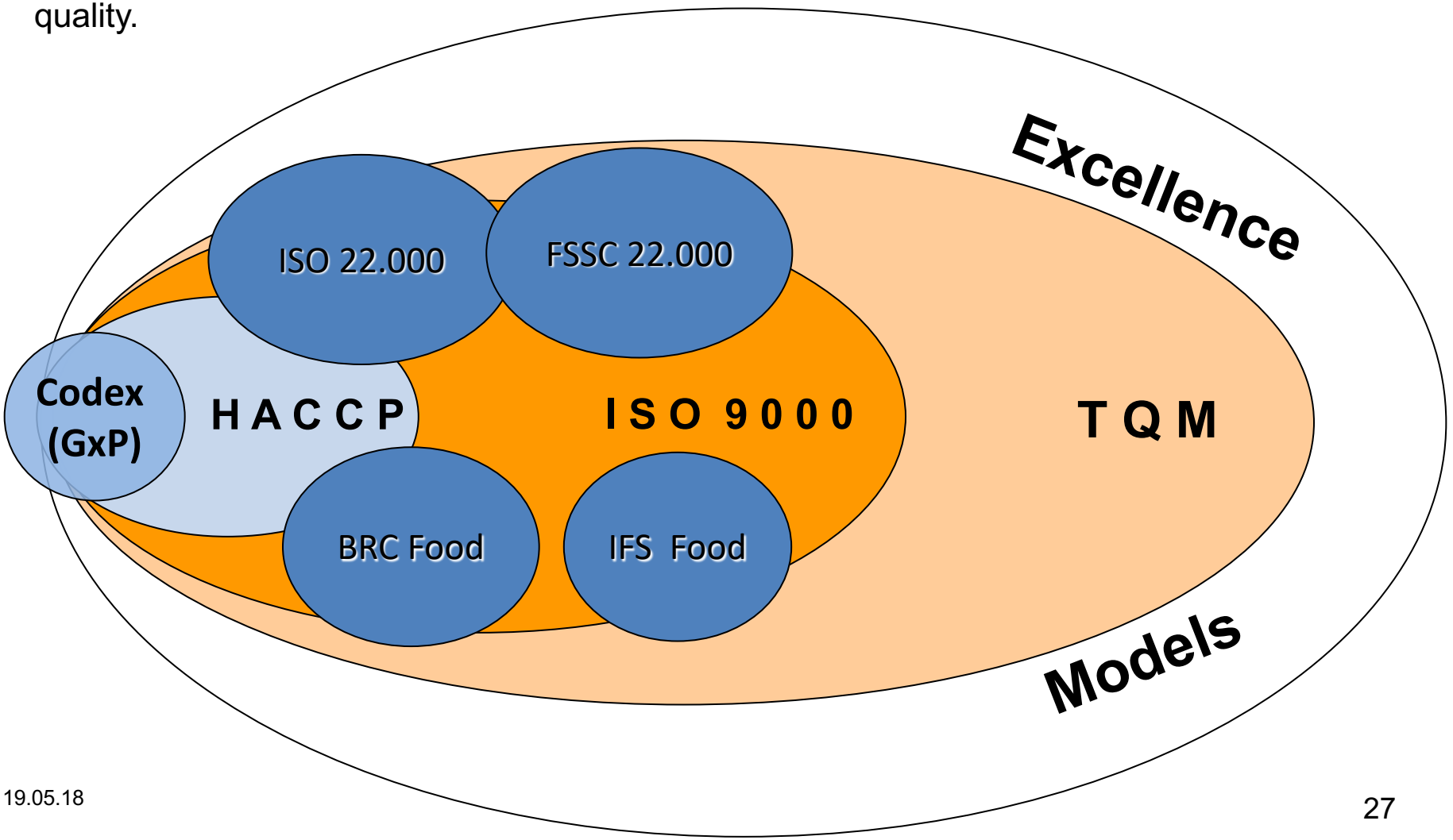


Based on prerequisite programmes:
GMP,
HACCP

- Identify hazard
- Implement control and monitoring systems to prevent their occurrence
- Specify CCP, limits
- Self assessment

Food Quality (FQ) and Food Safety (FS) Management Systems (MS)

Offer a **structured framework** around which companies can define and implement measures to enable consistent manufacture of products of the required safety and quality.



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and technology

Food Quality Management

- Food Quality
- Process, machine and process capability
- Q7: control charts, pareto diagram, fishbone diagram
- House of Quality
- Failure Mode And Effects Analysis (FMEA)

Food Quality Management

Food Safety Management

FQ&FS Management Systems

ISO 9000
FSCC 22000
IFS, BRC

TQM and cont. improvement

Conclusion

QUALITY - MANAGEMENT

- latin “qualis” (“how it is made, of which, what of”)

- ***„to manage“***
  Latin: „*manus*“…….the hand
  Italian: „maneggiare“…..to handle sth.

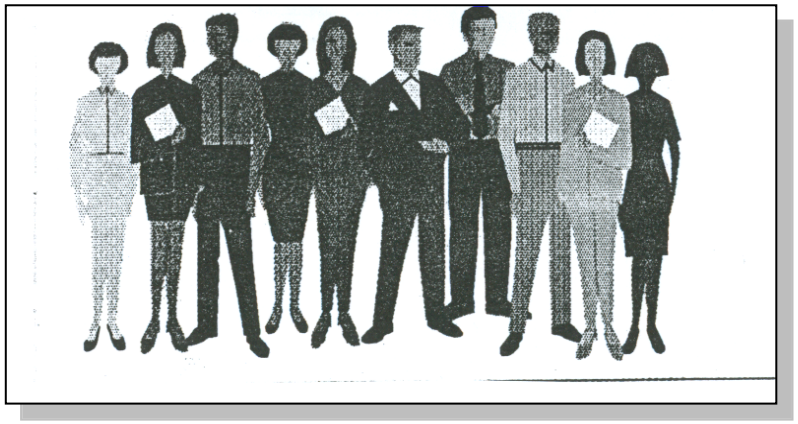
Meaning (in english):

…..to lead, supervise, execute, operate

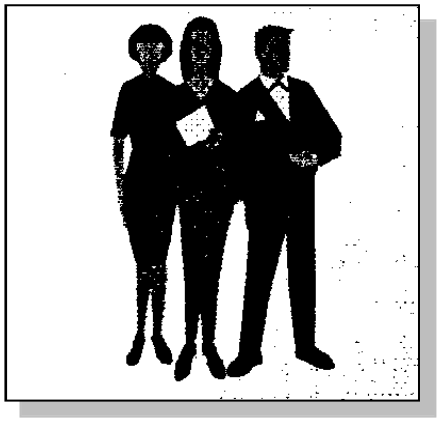
WHY IS QUALITY IMPORTANT ?

- **Irritation about bad quality has stronger impact than pleasure about low price**
- Disappointment about a lack of quality stays longer with the customer, than the joy of paying less

unsatisfied consumers tell about bad experiences to 10 other persons

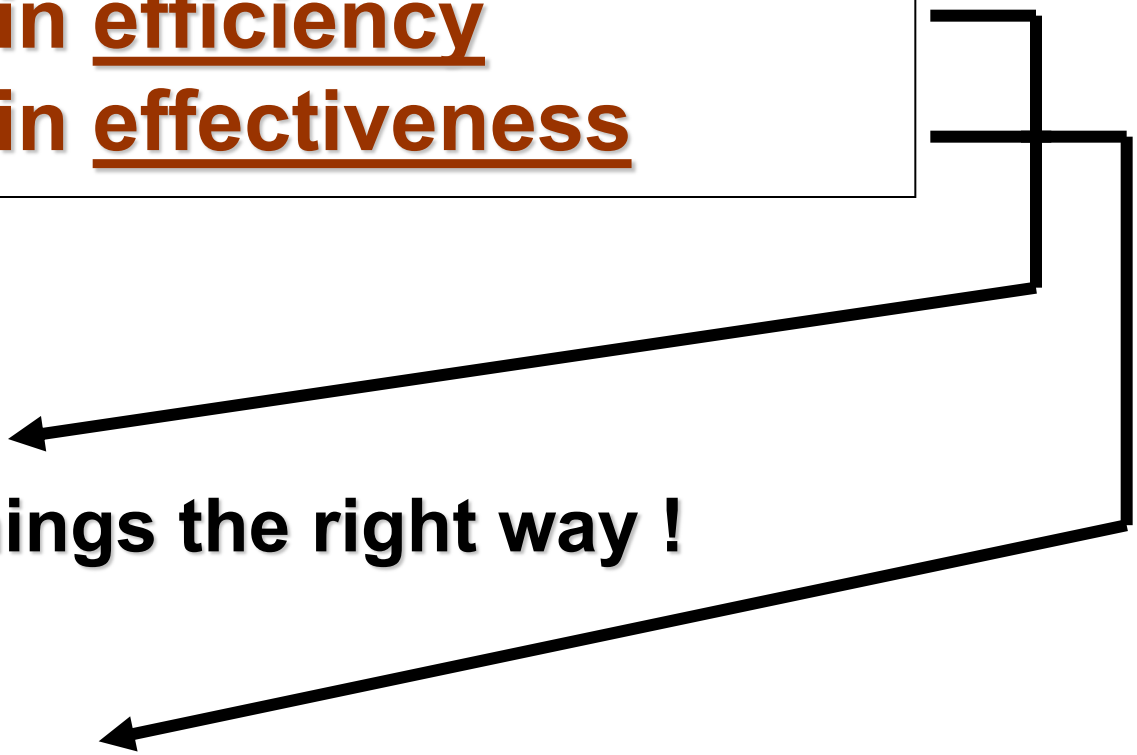


satisfied consumers tell about good experiences only to 3 other persons



QM-Systems – what for ?

1. Increase in efficiency
2. Increase in effectiveness



…doing things the right way !

…doing the right things !

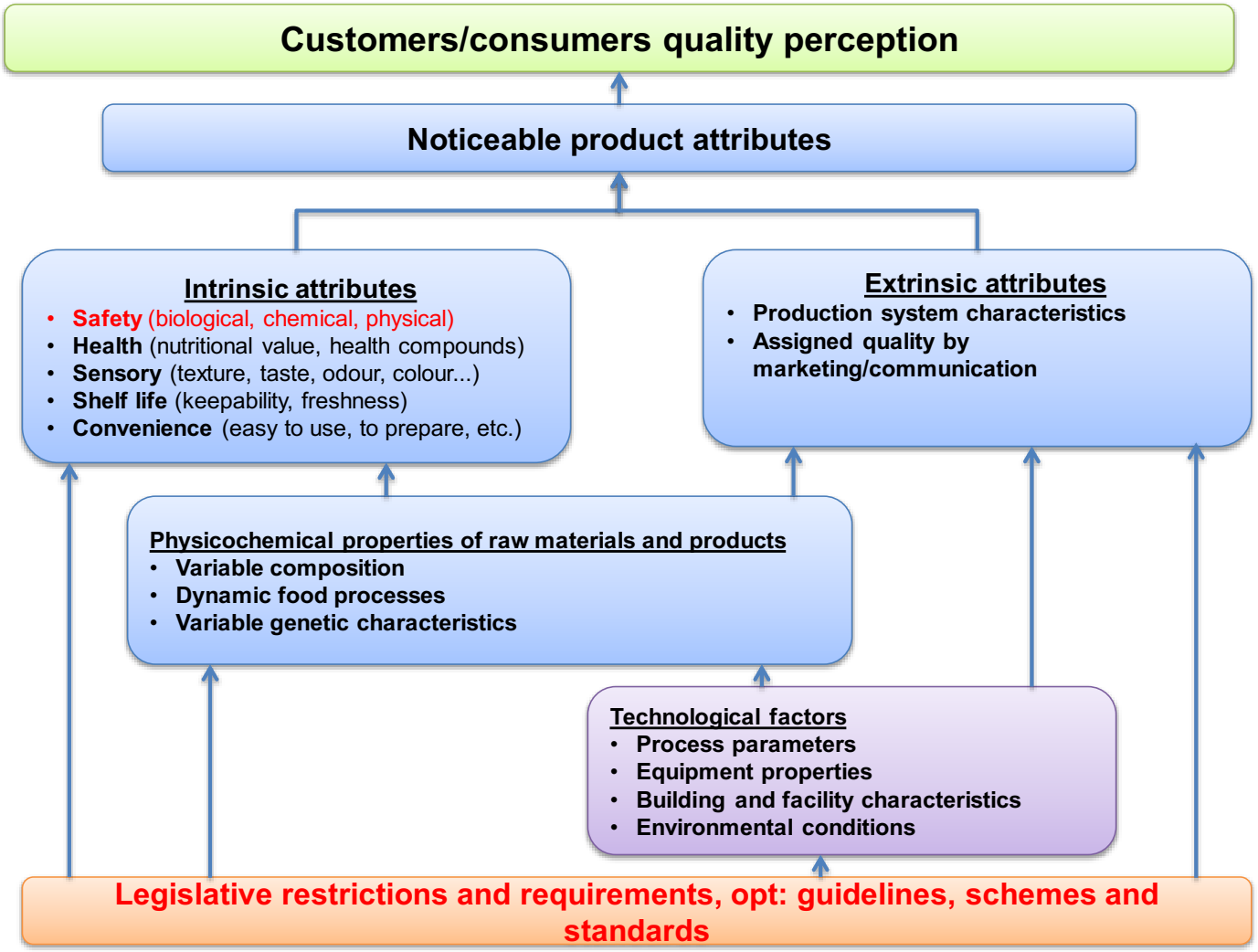
AIMS OF DIFFERENT STAKEHOLDERS

owner, shareholder	**Financial success, sustainability of company, etc.**
management	**Legal compliance, liability, etc.**
employees	**Economic stability, recognition, carreer, etc.**
customers	**optimum delivery o**f all services**, loyality to contract, fullfillment of expectations, etc.**
supplier	optimum relation to customer, loyality to contract, **economic cooperation**
authorities	**compliance to law**
environment	**low impact on environment, etc.**

PERCEIVED QUALITY

- is a **value judgement** of the consumer regarding the fit to his expectations
- is based on conscious and unconscious processing of **intrinsic** attributes (eg. flavor, texture, etc.) and **extrinsic** attributes (eg. price, brand, etc.)
- judgement depends on **previous experiences**, **personal** and **environmental** variables
- quality attributes can be perceived **directly** (eg. appearance, flavor, texture, freshness, convenience, etc.) or be **based on confidence** (eg. safety, naturalness, health benefits, exclusiveness, ecological aspects,…)

Food Quality attributes

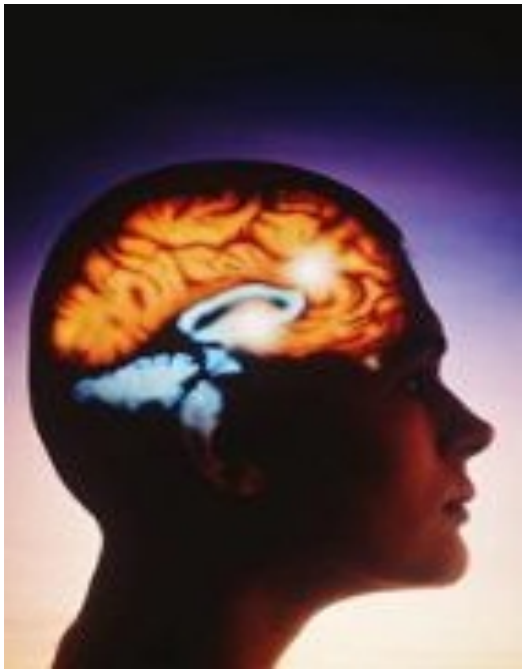


Luning, Marcellis 2007

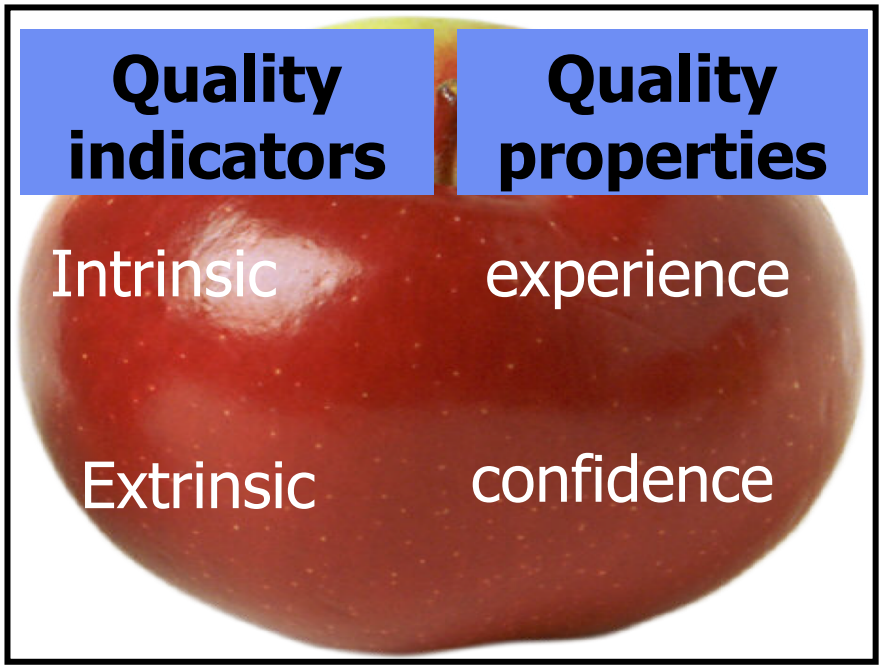
COGNITIVE MODEL TO PERCEIVE QUALITY OF FOOD

Steenkamp et al.

consumer



product



quality properties are perceived via quality indicators

QUALITY ATTRIBUTES

- Are quality properties which the consumers want to achieve
- Are perceived via quality indicators

based on

experience

flavour

texture

appearance

freshness

convenience

confidence

safety

health benefits

fit for special use

naturalness

exclusiveness

ecological

QUALITY INDICATORS

- Are perceived during consumption

intrinsic	extrinsic
colour	packaging
crispness	brand
gloss	price
	origin

EXAMPLE FOR COGNITIVE MODEL

Quality indicators	Quality properties
intrinsic clear liquid, visual flavour	**experience** sweet, strawberry flavour, satisfies thurst, convenience
extrinsic female, light fruits, healthy, mid price, low calories	**confidence** wellnes and fitness, enhance beautiness and attractiveness, loose weight, positive mood

CONSUMER ASPECTS

importance depend on age, situation, …

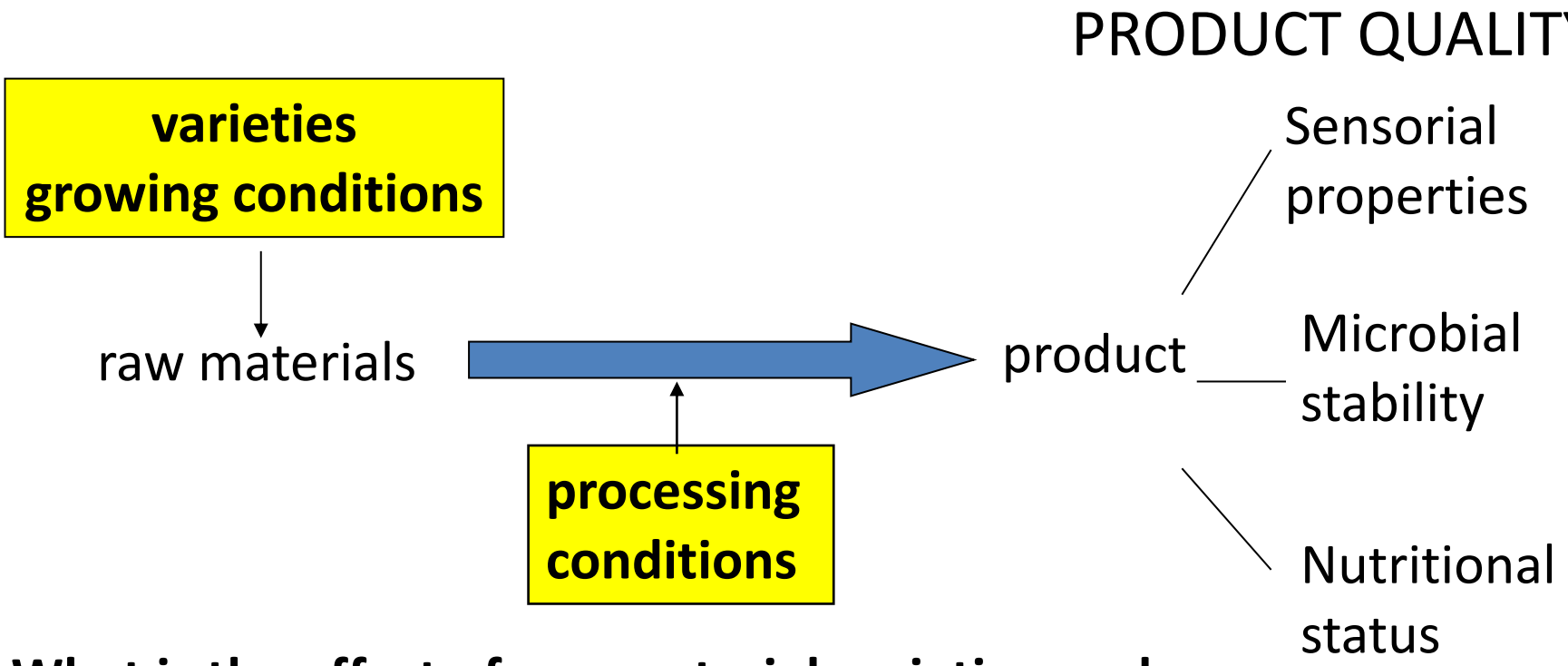
material aspects

- **nutritional** value: energy intake, vitamins, freshness, ..
- **sensorial** aspects: taste, pleasure, …
- **health** aspects (preventiv): strengthen immune system, …..

immaterial aspects

- **communication** value: Semiotic quality
- **entertainment**
- **convenience**

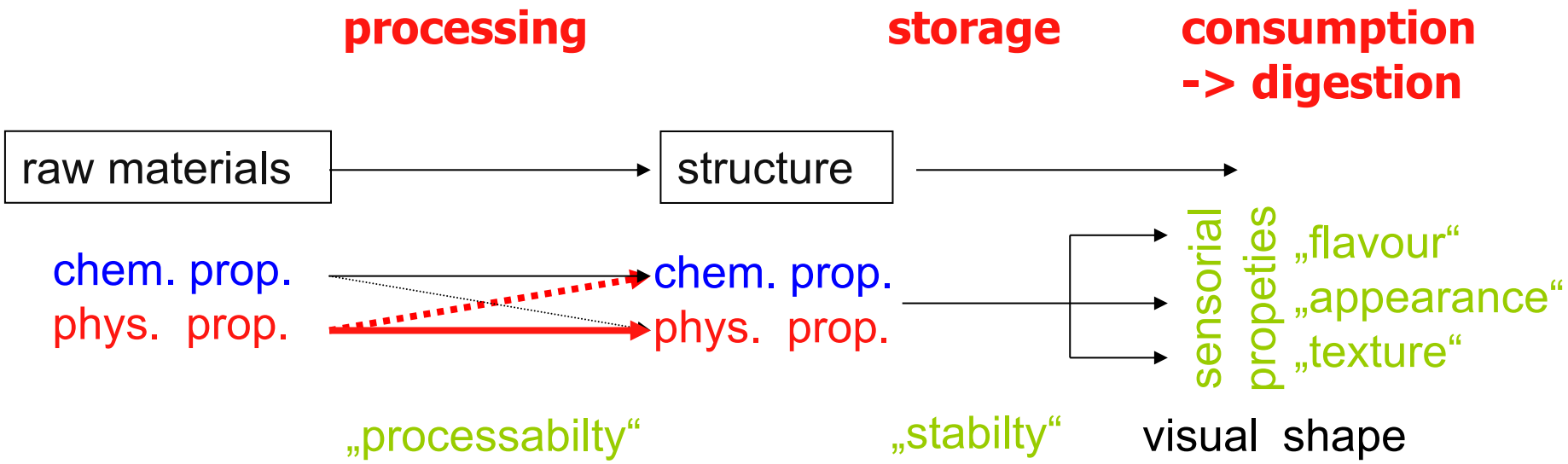
Technological Aspects



What is the effect of raw material variation and processing conditions on product quality?

How can we modulate raw materials and processing operations to get a desired product quality?

Technological Aspects



Food is stressed during **processing** and **consumption** in various ways: mechanical load, temperature,...

Knowledge about the behaviour of food is important for **processing** (optimum product and process design) and for the **quality**

visual	shape gloss, colour consistence
auditive	crispiness brittleness
haptic	firmness elasticity

Sensorial Quality

Appearance

- colour: degree of ripeness d of fruits and vegetables, apperant crispiness of pommes frittes, maturation of peace of meat
- gloss: freshness of confectionary
- distribution of structure elements on pizza -> “home made“
- form and distribution of wholes in cheese

Flavour

- taste, smell

Texture

During consumption a destruction of the structure takes place by knife, fork, fingers, teeths and/or tonge structure properties are perveived:

- Restistance against mechanical stress during disintegration, chewing and swallowing (hardness, firmness, stiffness, crispness, crunchiness, creamines, roughness, juiciness, crumbleness, etc.)
- Distribution of particle size, etc

If only 1 of these properties does not meet the expectations, the product is not accepted

HOW TO MEASURE SENSORIAL QUALITY

subjective

preference

>80 untrained representatives

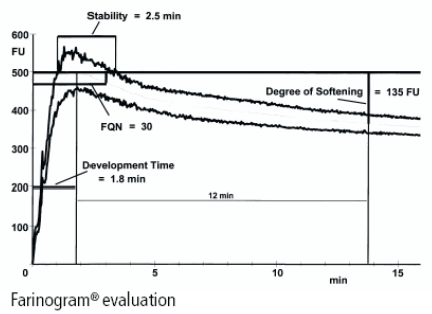
descriptive

8-12 trained panel

objective (instrumental)

imitative

Farinograph, ..



Farinogram® evaluation

empiric

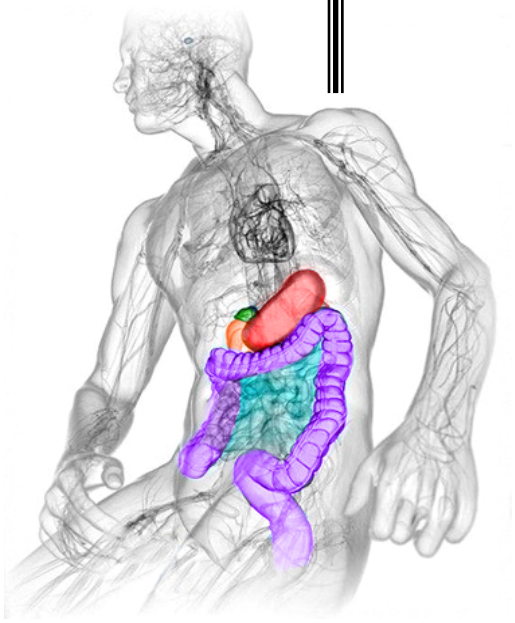
Penetrometer, ..

fundamental

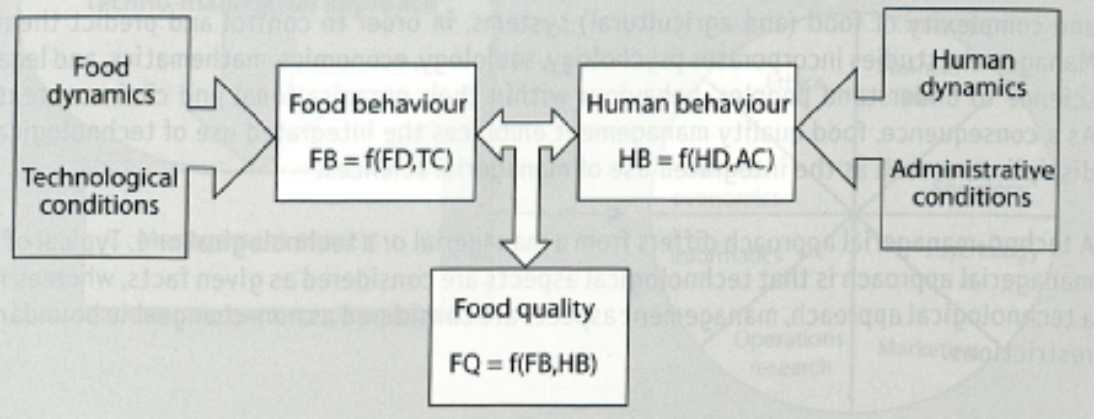
Rheometer,...

HEALTH ASPECTS

- Making food that works for us: **bioactivity**
- Link between physical properties of foods and nutrient release in the GI tract?
- Future of **food design**: Naturally improving food for health & well-being



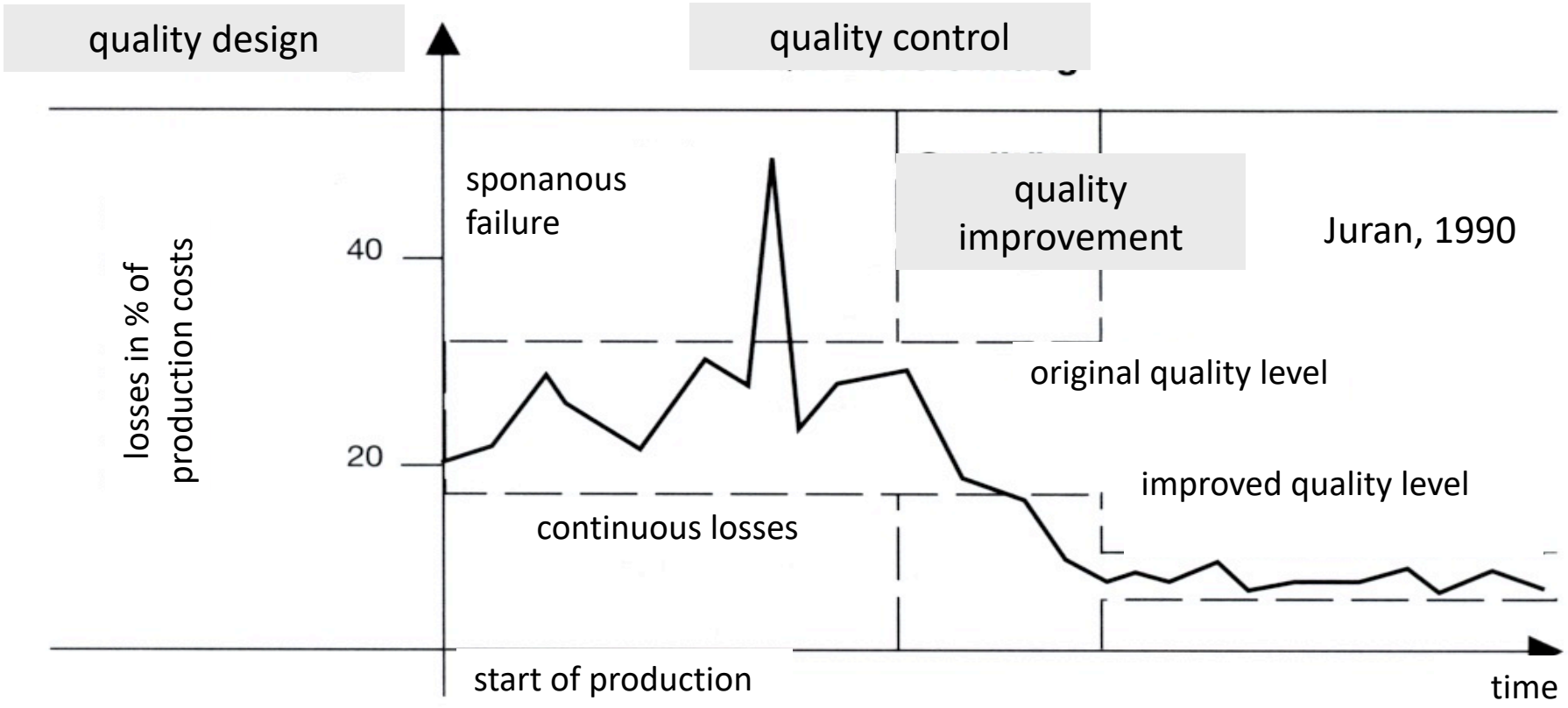
Food Quality Relationship



Element FQ relationship model	Examples
Food dynamics	Inherent variability in product composition (i.e. concentrations of macro and micro ingredients, pH, a_w) Dynamic food processes in time, like enzyme activities, growth rates of micro-organisms, and respiration rates
Technological conditions	Process conditions (process parameters, type of process), equipment (design, lay-out, type), and buildings (infrastructure) as applied in production and distribution
Human dynamics	Inherent variability in people with respect to their quality perceptions, attitudes, interests, and other personal factors influencing decision-making on food quality
Administrative conditions	Procedures and rules, responsibilities and tasks, and information systems to support the decision-making behaviour of people on quality

Luning, Marcellis 2007

How can quality be DESIGNED, CONTROLLED and IMPROVED



systematic approach: Quality Management

Food Quality Management

is a <u>systematic approach to avoid mistakes</u>

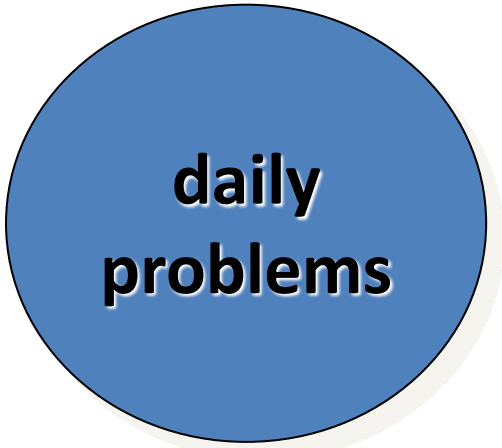
objectives of QM:

Prevention is better than taking corrective actions **!**

- each possible failure will happen once !
- who has never time to do things right, must take the time later to do it again
- each recognized mistake is a chance to learn and do it better in future
- QM eliminates causes of mistakes systematically by improvement and <u>corrective actions</u>

Food Quality Management

usual:



QM works on prevention instead on solving daily problems

ideal:

Food Quality Management

An overal quality concept is:

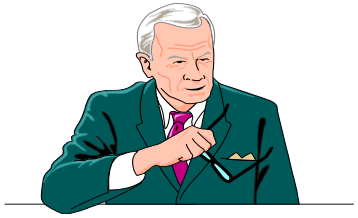
holistic ⇨
- compulsory for Management, all employess and all business process

preventive ⇨
- by systematic quality design
- by avoiding of mistakes
- by continuous improvement

process oriented ⇨
- by slim, controlled processes
- by teamwork with self responsibility
- by principle of internal customers

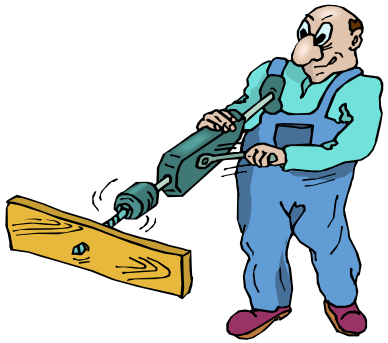
customer related ⇨
- by fulfilment of all customer requirements
- by product support
- by consideration of environmental requirements

Procedure of implemetation of a QMS



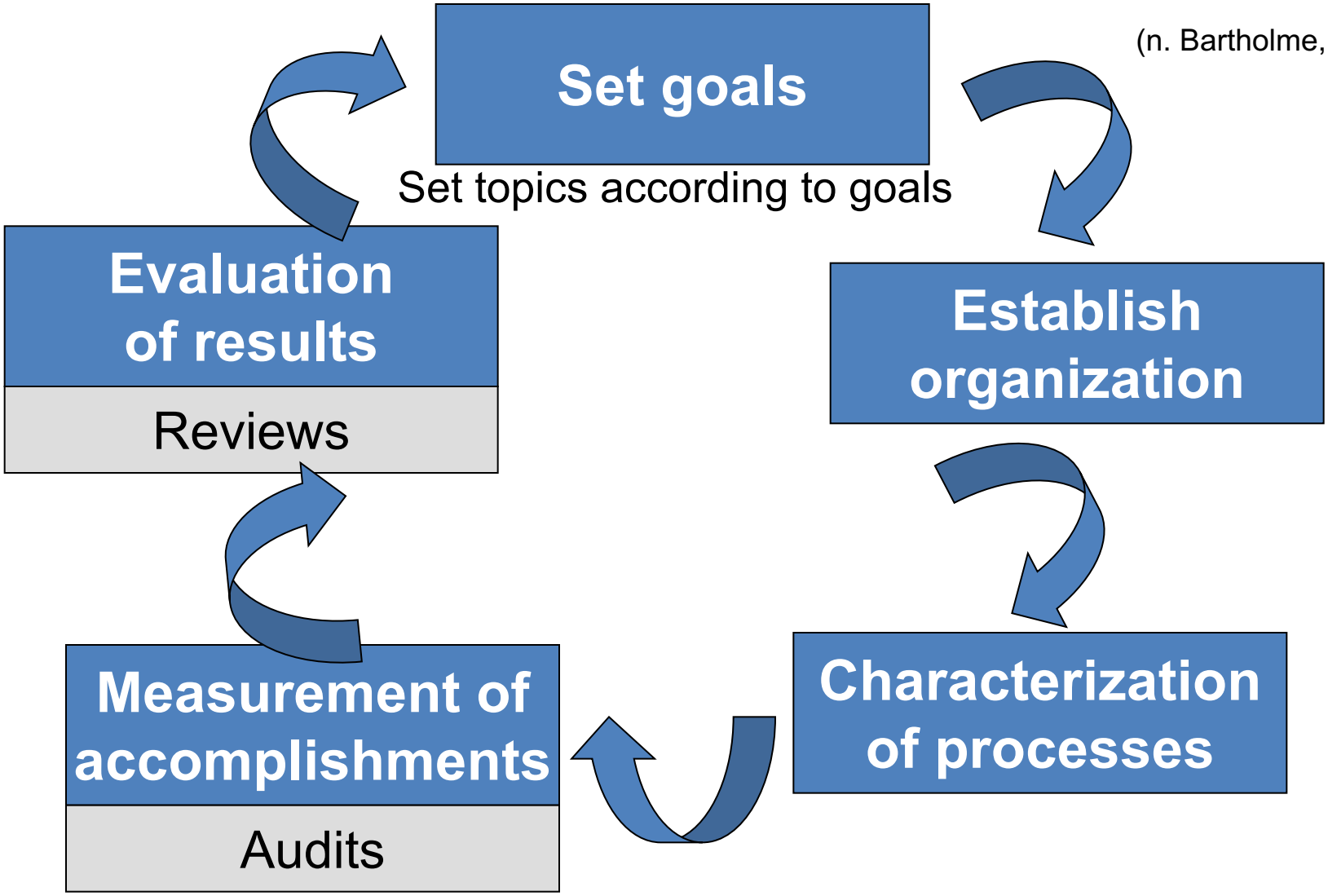
Decision to implement
a QM-system

Appointment of a
QM-representative
(…Management-level)



Involvement of all
employees according to
the principle of consensus

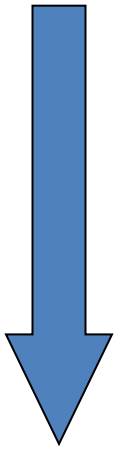
The management-circle



(n. Bartholme, 2001)

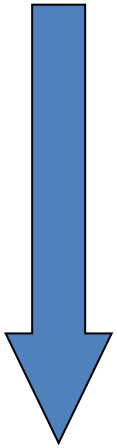
The term „Management-system“

MANAGEMENT



Leadership,
Guidance,
Organization,
….

SYSTEM



…natural or artificial construct,
Order,
an „orderly/structured“ whole

Management-system

Definitions acc. to DIN EN ISO 9000: 2000

Management:

Refers to all activities that are used to coordinate, direct and control an organization.

Managementsystem:

System that serves the establishment of politics and goals as well as the achievement of said goals.

Direction and control comprise:

(1) Quality policy
(2) Quality goals
(3) Quality planning
(4) Quality control
(5) Quality assurance
(6) Quality improvement

Management-system

People as the center of a company

Motivation

Experience

Openness

Communication

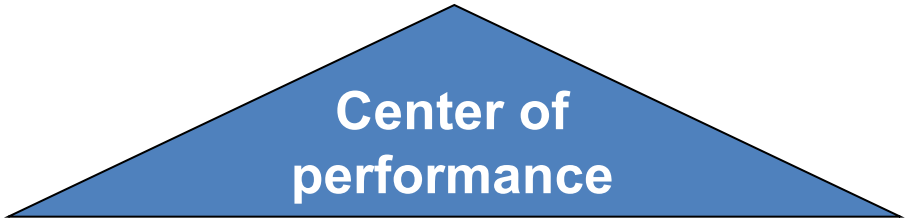
Responsibility

Trust

Employees, a companies biggest asset

How do you motivate employees?

Quality management concept



Motivate people	Process-optimization
Leadership-behaviour	Self-organization

QFD, System-analysis/FMEA, DoE, SPC, Quality audit, Teamwork, CIP, Workshop circles

Leadership

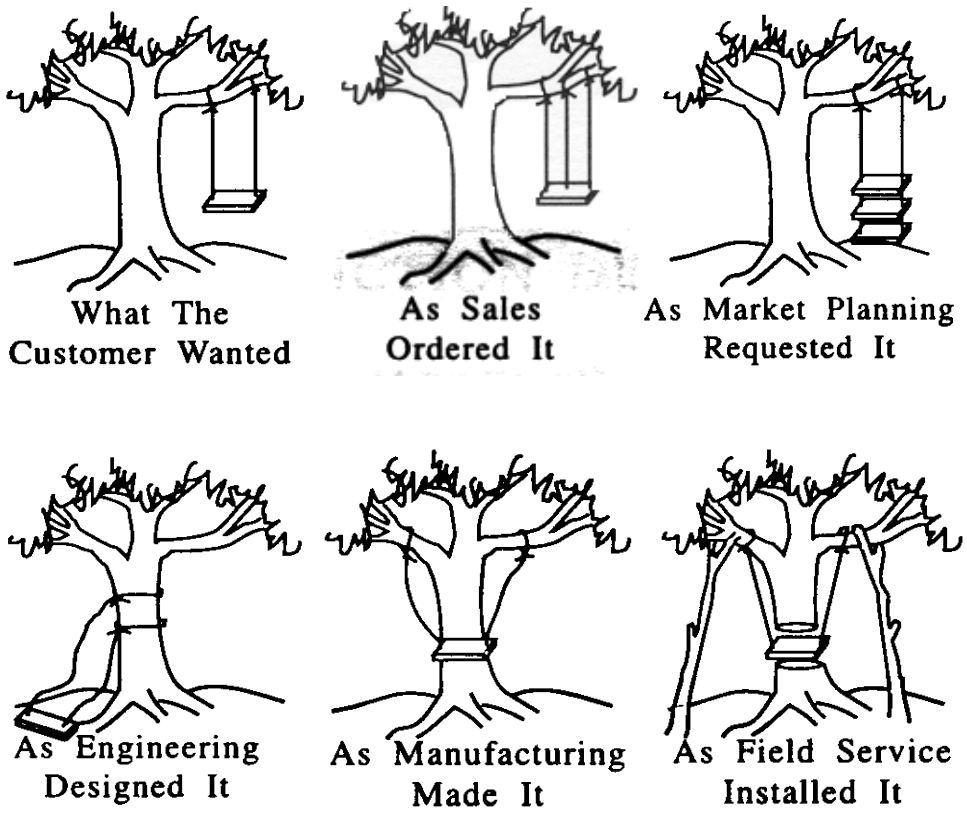
- visionary Leader

Implementation

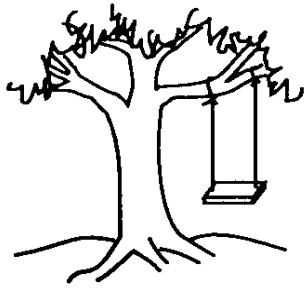
- Coaching of management-/ executive staff
- Employee training
- Functional analysis
- Process analysis

Tools

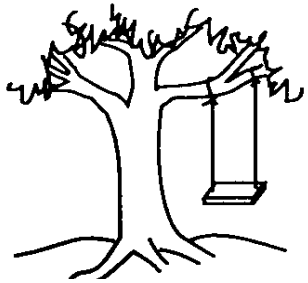
Traditional Design Prozess



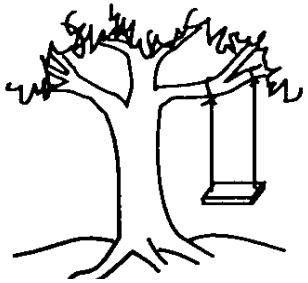
QUALITY FUNCTION DEPLOYMENT (QFD)



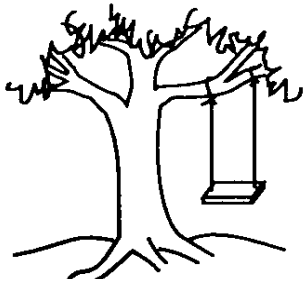
What The Customer Wanted



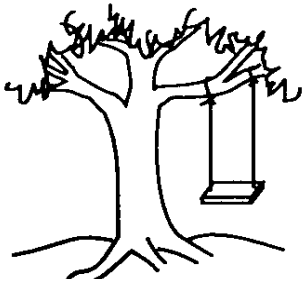
As Sales Ordered it



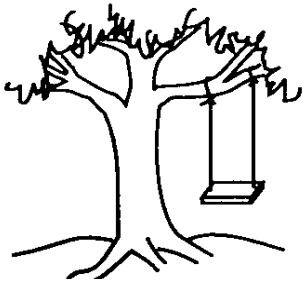
As Market Planning requested it



As Engineering Designed it



As Manufacturing Made it

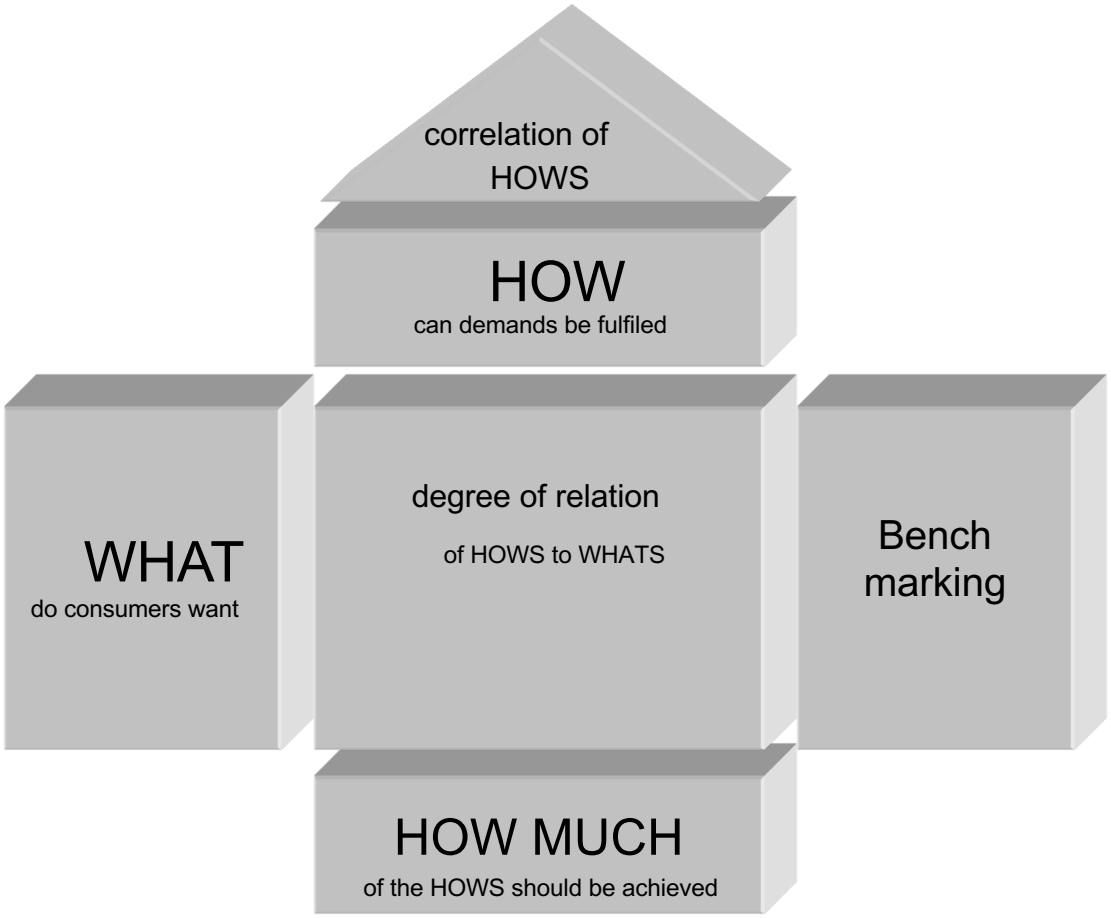


As Field Service Installed it

QFD is a technique to translate consumer requirements into appropriate product properties

The House of Quality

documentation of results of planning processes



Example of the House

1 ~20 consumer demands are

2 weighted (1..unimportant….10).

3 product properties (technical, measurable)

4 direction of optimisation

5 Relation 1-3: weak:1, strong: 3

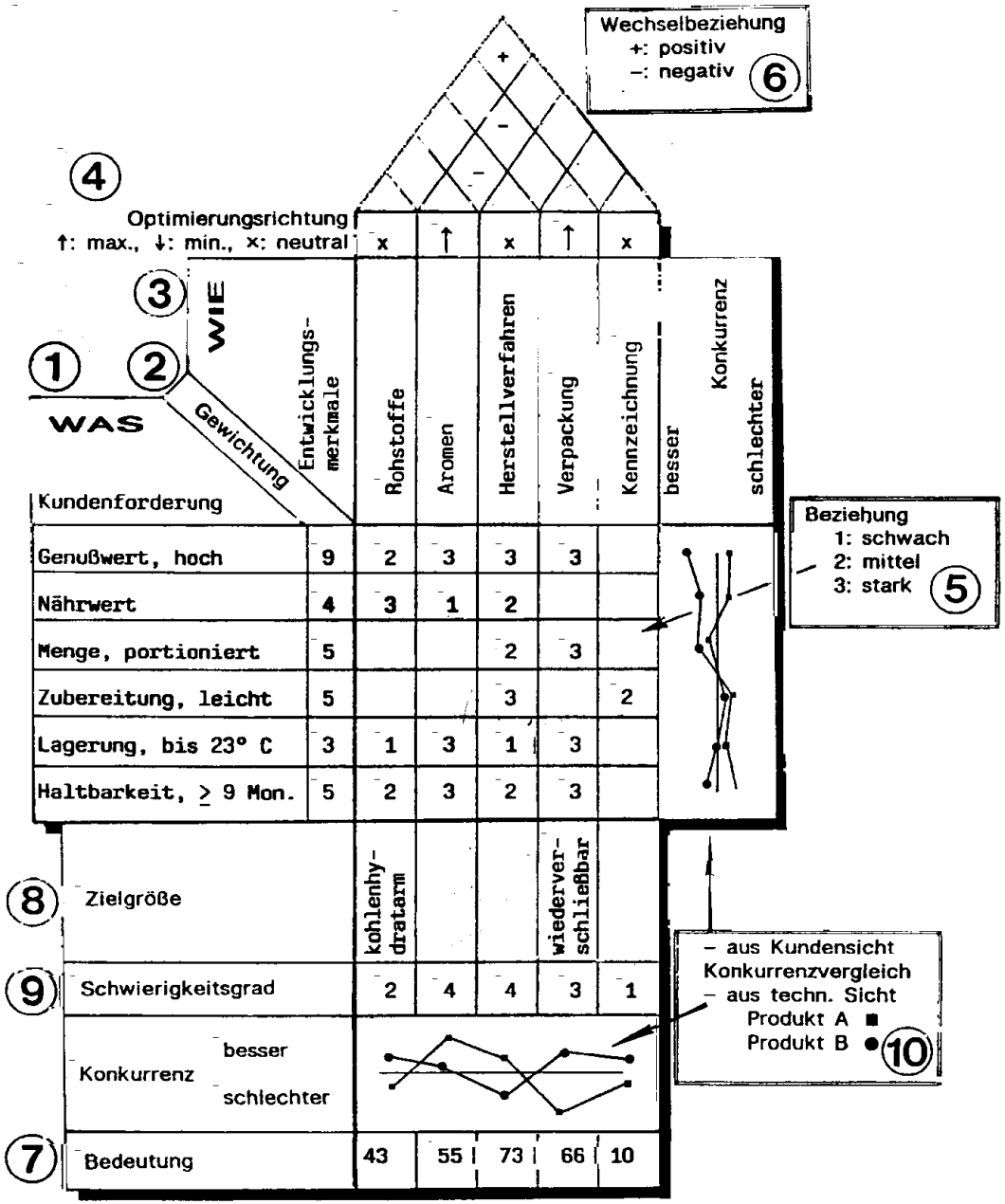
6 Correlation of 3: ++…-

7 Technical importance: ∑(2*5), the higher the critical

8 Set target value for product propert and method for measurement

9 technical efforts to achieve product requirements (easy: 1..10)

10 benchmarking with other products



FAILURE MODE AND EFFECTS ANALYSIS (FMEA)

Is central method of preventive QM

is a tool to analyse potential failures and their causes and to assess associated risks considering occurance, impact and discovery

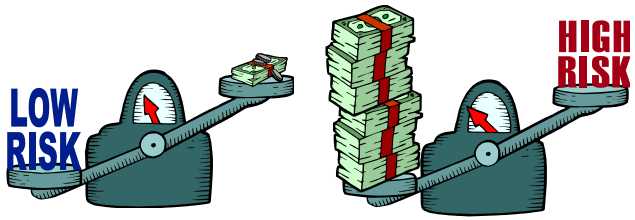
The earlier a failure can be eliminated, the cheaper it is

Lists all possible failures

Assess **occurance** (O: 10-1), **impact** on consumer (I: 10-1) and **discovery** (D: 1-10)

Calculate risk priority number **RPN = O * I * D**

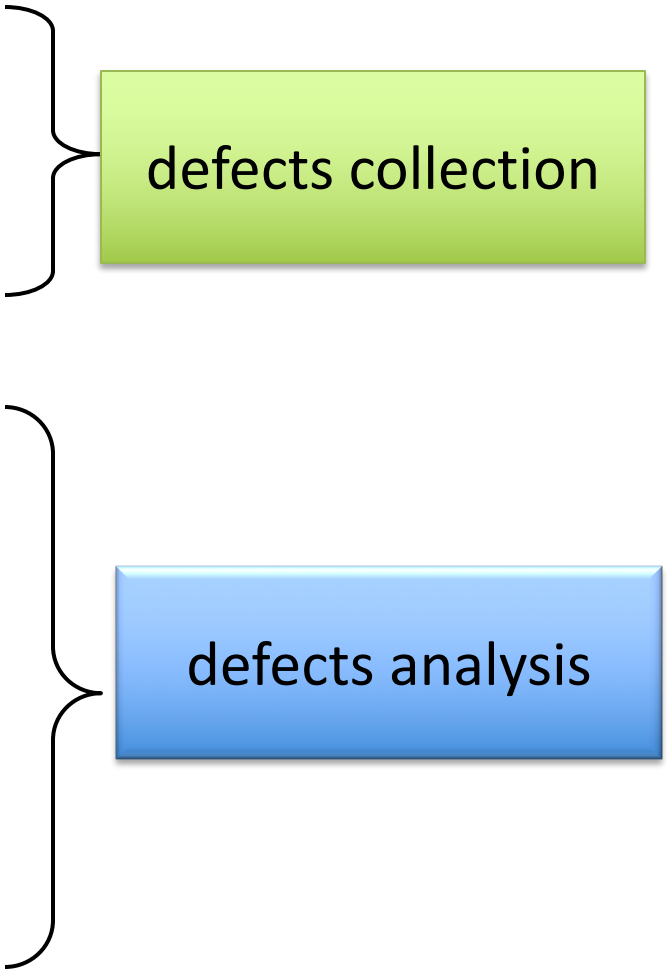
Specify **corrective actions** to reduce RPN



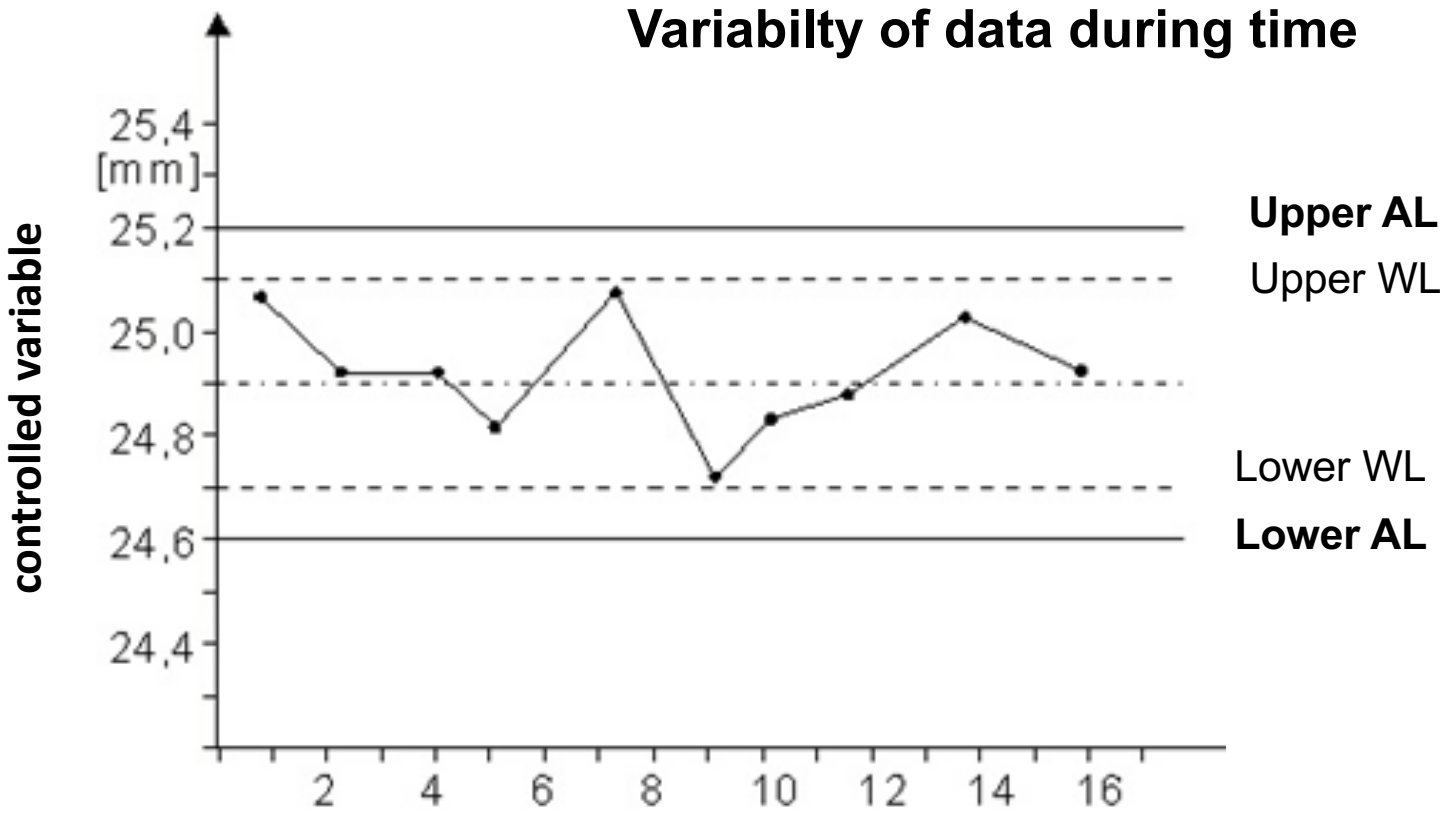
Quality tools (Q7)

1. Defect list
2. Histogram
3. **Quality Control Charts**

4. **Pareto diagram**
5. Correlation diagram
6. Brainstorming
7. **Cause – Effect - Diagram**



Quality control charts



Shewart chart for variable data

AL (Action limit): ~3σ
Warning limit ~2σ, 2/3EG

TYPES OF CONTROL CHARTS

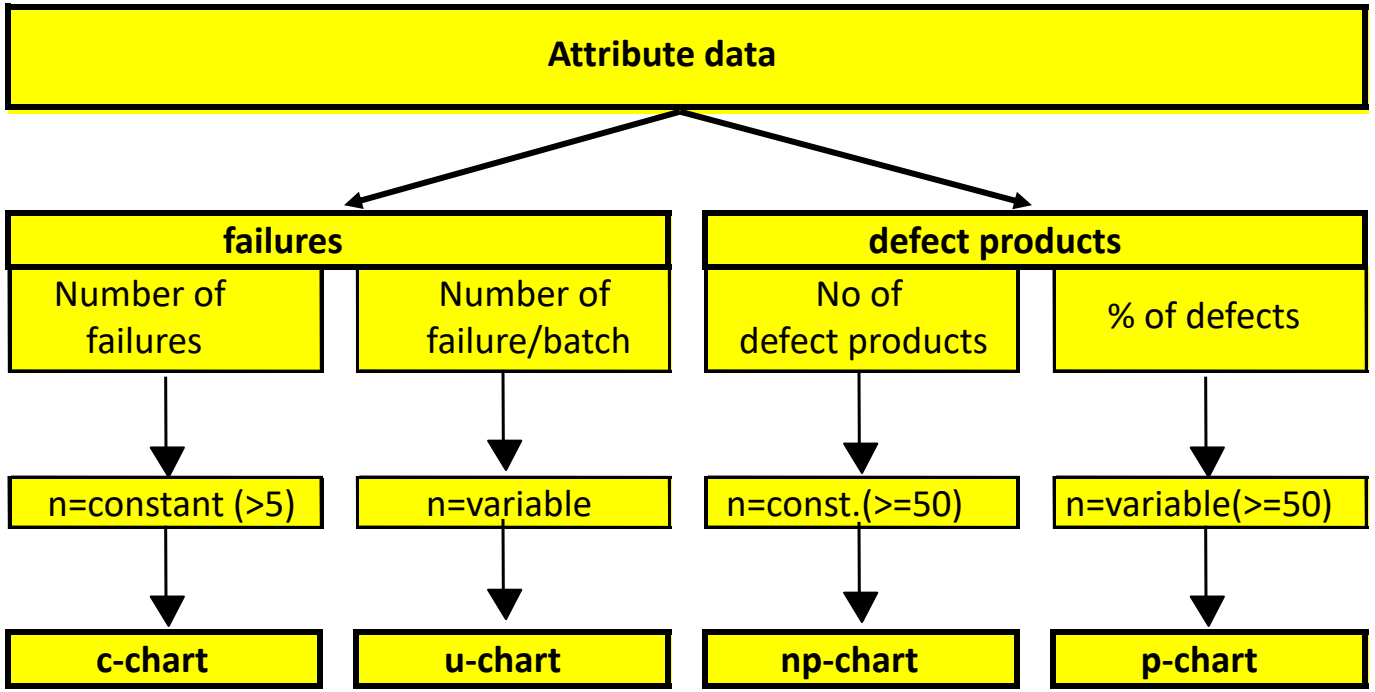
depend on: type of data
sample size

Attribute data

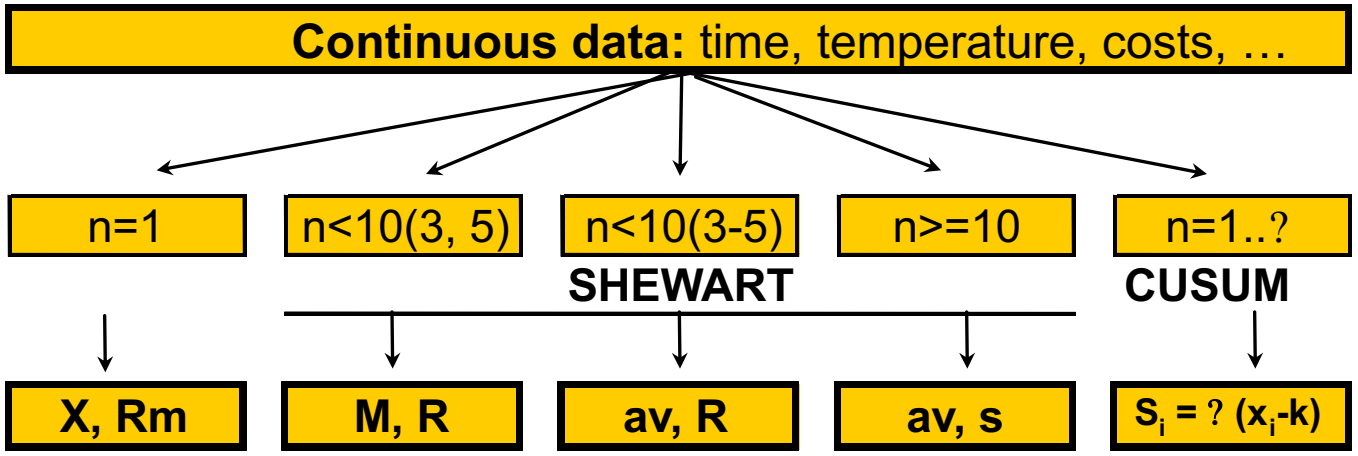
counts: failures, defect products

Continuous data

time, temperature, costs, …



TYPES OF CONTROL CHARTS



ATTRIBUTIVE DATA

Art der Regelkarte	Stichpr. umfang	Mittelline	Kontrollgrenzen
Fehler-anteil p-Karte	Variabel norm. ≥50	Für jede Untergruppe $p = np/n$ Für alle Untergruppen $\bar{p} = np/n$	$*UCL_p = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$ $*LCL_p = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$
Anzahl fehlerhaft np Chart	Konstant normalerw ≥50	Für jede Untergruppe np = # Fehler Für alle Untergruppen $n\bar{p} = np/k$	$UCL_{np} = n\bar{p} + 3\sqrt{n\bar{p}(1-\bar{p})}$ $LCL_{np} = n\bar{p} - 3\sqrt{n\bar{p}(1-\bar{p})}$
Anzahl Fehler c-Karte	Konstant, $\bar{c} > 5$	Für jede Untergruppe $\bar{c}$ = # Fehler Für alle Untergruppen $\bar{c} = c/k$	$UCL_c = \bar{c} + 3\sqrt{\bar{c}}$ $LCL_c = \bar{c} - 3\sqrt{\bar{c}}$
Anzahl Fehler pro Einheit u-Karte	Variabel	Für jede Untergruppe $u = c/n$ Für alle Untergruppen $\bar{u} = c/n$	$*UCL_u = \bar{u} + 3\sqrt{\frac{\bar{u}}{n}}$ $*LCL_u = \bar{u} - 3\sqrt{\frac{\bar{u}}{n}}$

aus: Memory Jogger™ II, GOAL/QPC, Methuen, MA, USA (1994)

np..Anzahl fehlerhafter Teile
c....Anzahl Fehler
n....Stichprobenumfang/Untergruppe
k....Anzahl Untergruppen

CONTINOUS DATA

Art der Regelkarte	Stichpr. umfang n	Mittellinie*	Kontrollgrenzen
Durchschnitt & Spannweite	<10, normaler weise 3 to 5	$\bar{\bar{X}} = \frac{(\bar{X}_1+\bar{X}_2+\ldots\bar{X}_k)}{k}$	$UCL_{\bar{x}} = \bar{\bar{X}} + A_2\bar{R}$ $LCL_{\bar{x}} = \bar{\bar{X}} - A_2\bar{R}$
$\bar{X}$ and R		$\bar{R} = \frac{(R_1+R_2+\ldots R_k)}{k}$	$UCL_R = D_4\bar{R}$ $LCL_R = D_3\bar{R}$
Durchschnitt & Stand. abweichung	Norma-lerweise ≥10	$\bar{\bar{X}} = \frac{(\bar{X}_1+\bar{X}_2+\ldots\bar{X}_k)}{k}$	$UCL_{\bar{x}} = \bar{\bar{X}} + A_3\bar{s}$ $LCL_{\bar{x}} = \bar{\bar{X}} - A_3\bar{s}$
$\bar{X}$ and s		$\bar{s} = \frac{(s_1+s_2+\ldots s_k)}{k}$	$UCL_s = B_4\bar{s}$ $LCL_s = B_3\bar{s}$
Zentralwert & Spannweite	<10, normaler weise 3 or 5	$\bar{\tilde{X}} = \frac{(\tilde{X}_1+\tilde{X}_2+\ldots\tilde{X}_k)}{k}$	$UCL_{\tilde{x}} = \bar{\tilde{X}} + A_2\bar{R}$ $LCL_{\tilde{x}} = \bar{\tilde{X}} - A_2\bar{R}$
$\tilde{X}$ and R		$\bar{R} = \frac{(R_1+R_2+\ldots R_k)}{k}$	$UCL_R = D_4\bar{R}$ $LCL_R = D_3\bar{R}$
Einzelw. & veränderl. Spannweite	1	$\bar{X} = \frac{(X_1+X_2+\ldots X_k)}{k}$	$UCL_X = \bar{X} + E_2\bar{R}_m$ $LCL_X = \bar{X} - E_2\bar{R}_m$
X and R_m		$R_m = \lvert(X_{i+1} - X_i)\rvert$ $\bar{R}_m = \frac{(R_1 + R_2 + \ldots R_{k-1})}{k-1}$	$UCL_{Rm} = D_4\bar{R}_m$ $LCL_{Rm} = D_3\bar{R}_m$

k....Anzahl Untergruppen

$\bar{X} = (\Sigma X_i)/n$

aus: Memory Jogger™ II, GOAL/QPC, Methuen, MA, USA (1994)

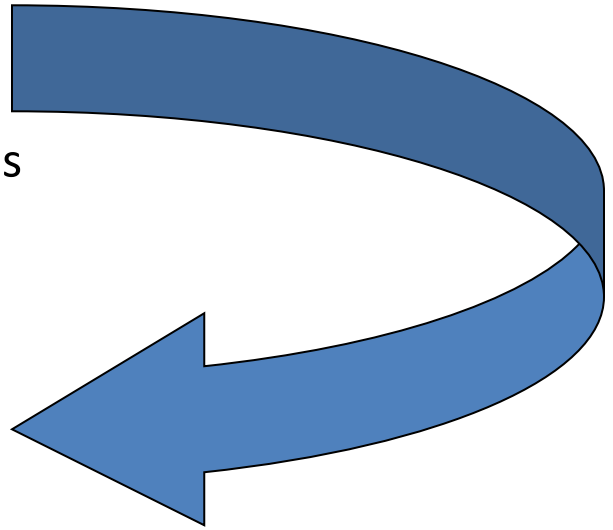
Stichpr.-umfang n	$\bar{X}$ und R-Karte			$\bar{X}$ und s-Karte				$\tilde{X}$ und R-Karte			X und R_m-Karte			
	A_2	D_3	D_4	A_3	B_3	B_4	c_4*	$\tilde{A}_2$	D_3	D_4	E_2	D_3	D_4	d_2*
2	1.880	0	3.267	2.659	0	3.267	.7979	- - - -	0	3.267	2.659	0	3.267	1.128
3	1.023	0	2.574	1.954	0	2.568	.8862	1.187	0	2.574	1.772	0	2.574	1.693
4	0.729	0	2.282	1.628	0	2.266	.9213	- - - -	0	2.282	1.457	0	2.282	2.059
5	0.577	0	2.114	1.427	0	2.089	.9400	0.691	0	2.114	1.290	0	2.114	2.326
6	0.483	0	2.004	1.287	0.030	1.970	.9515	- - - -	0	2.004	1.184	0	2.004	2.534
7	0.419	0.076	1.924	1.182	0.118	1.882	.9594	0.509	0.076	1.924	1.109	0.076	1.924	2.704
8	0.373	0.136	1.864	1.099	0.185	1.815	.9650	- - - -	0.136	1.864	1.054	0.136	1.864	2.847
9	0.337	0.184	1.816	1.032	0.239	1.761	.9693	0.412	0.184	1.816	1.010	0.184	1.816	2.970
10	0.308	0.223	1.777	0.975	0.284	1.716	.9727	- - - -	0.223	1.777	0.975	0.223	1.777	3.078

aus: Memory Jogger™ II, GOAL/QPC, Methuen, MA, USA (1994)

INTERPRETATION OF CONTROL CHARTS

Is the process **under control**?

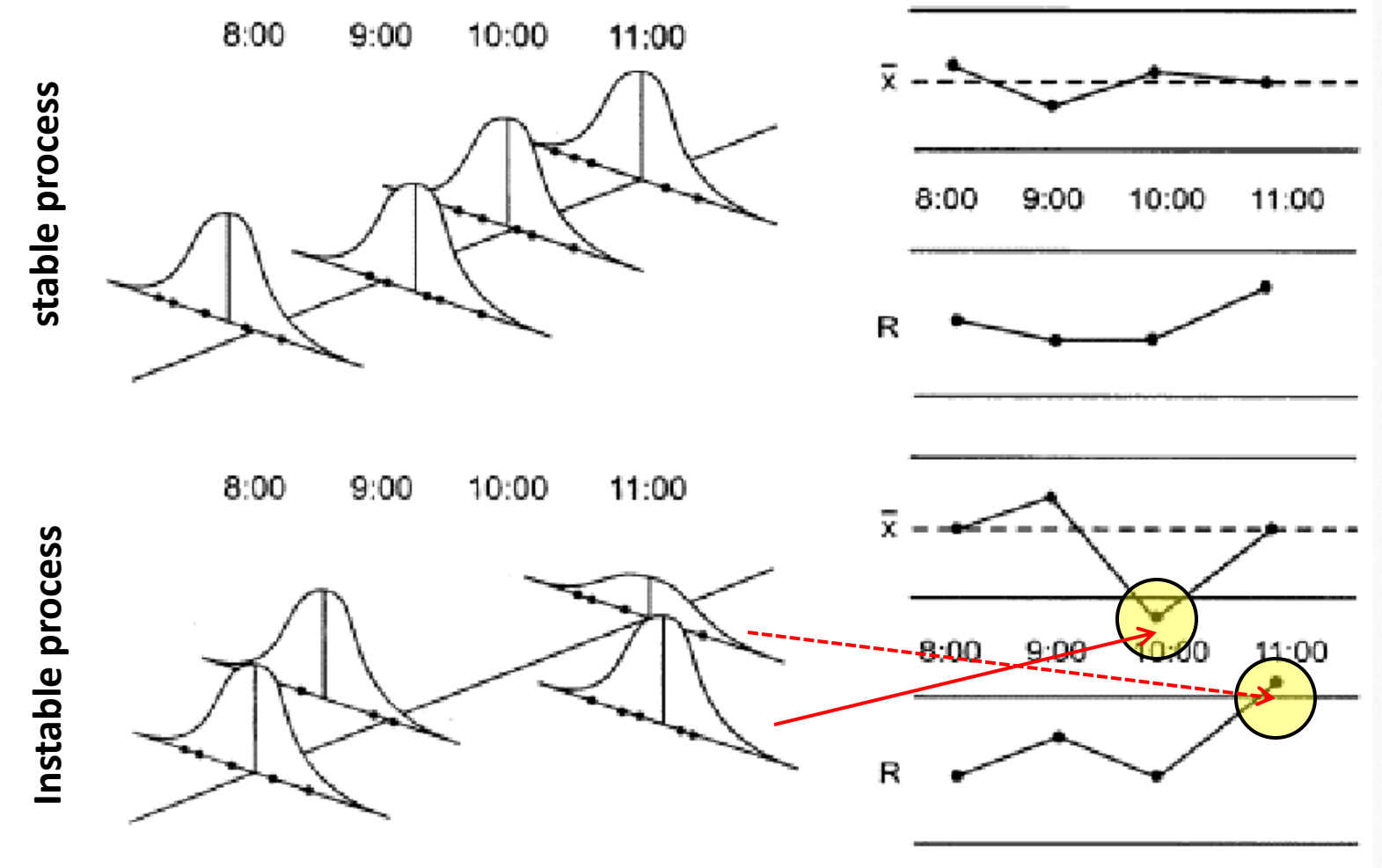
- Is center line equal to target value ?
- Variability: systematic deviations?
  Results out of limits?
  If yes then find reasons and eliminate causes
- Recalculation only if process has changed



Process is not under control if e.g.:

- =>1 results are out of limits
- 9 subsequent measurements are on the same side of the center line (RUN)
- 6 subsequent measurements show in/de-creasing TREND
- **……**

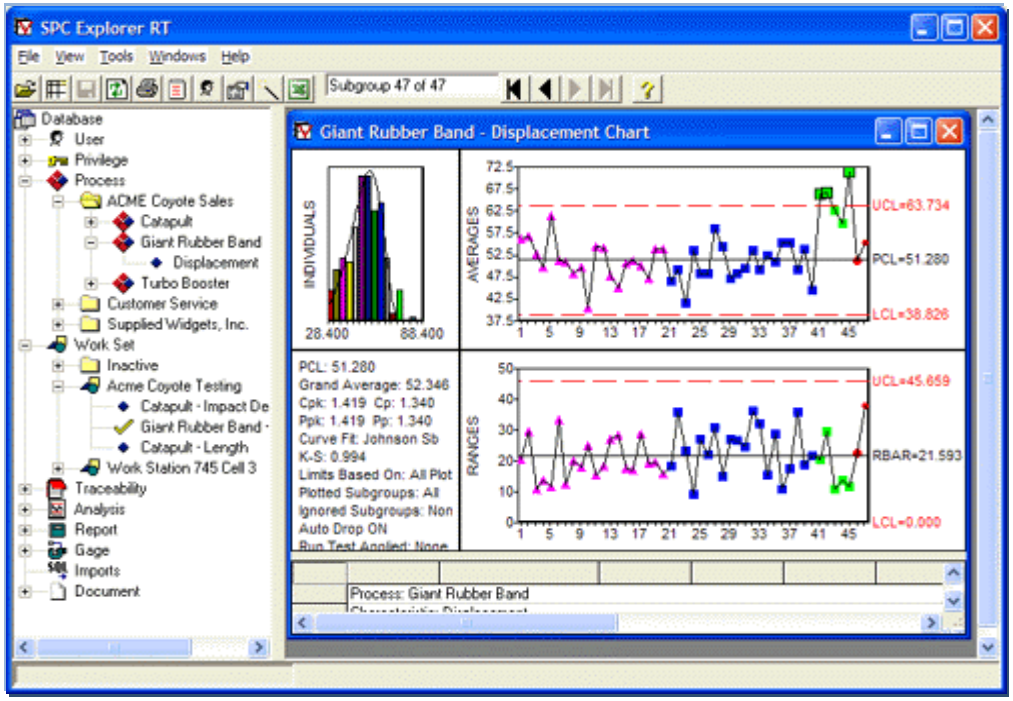
Example: x, R chart



Analysis of an INstable process

- Have different methods been used for measurement or evaluations
- Did the environment change (Temperature, Humidity)
- Were there unforseen influences like degradation of tools and sensors, etc.
- Was the personell stressed
- Were came the samples from: different batches, shifts, persons, …..
- Has the process been re-adjusted frequently
- Were untrained persons involved
- Did the Input (raw materials, …) change
- Have methods (cleaning, maintenance) been changed
- ……

STATISTICAL PROCESS CONTROL (SPC)



Objectives: to keep a capable process under control, based on statistics, by continuously monitoring and small corrections, if necessary

- **not for process improvement**
- **Characteristics: permanent comparison of measured values with predefined specifications: e.g. x,s (Control Charts)**

PATHWAY TO SPC

Process Definition

Identification of relevant characteristics and control mechanisms

Flow diagrammes, **Pareto analysis**, FMEA, HACCP → **Critical measuring variables**

Process Analysis

Identification of sources of the variability

Collection of data statistical evaluation → **Distribution of measured values**

Process Evaluation

Quantification of variability in relation to specifications

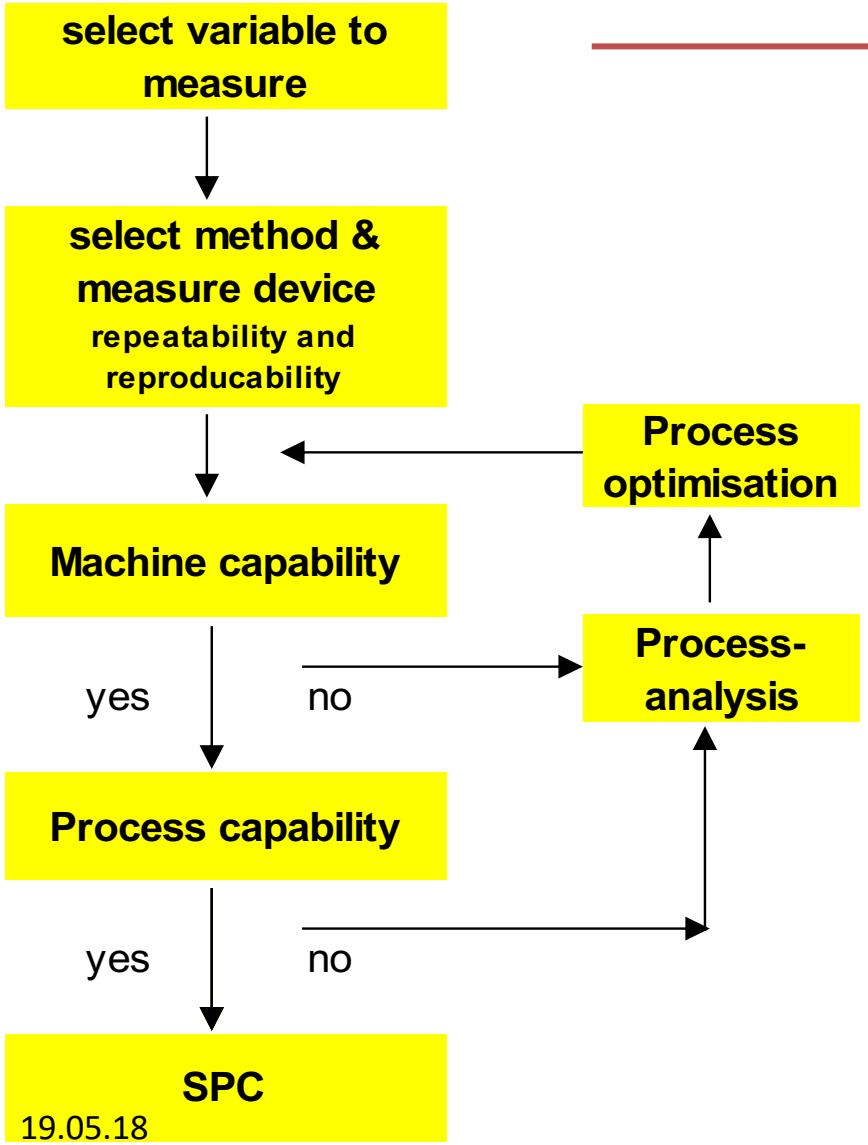
Process capability analysis → **C_{m}..machine capability**
C_{p}...process capability

SPC-Implementation

Specification of control mechanisms and corrective actions

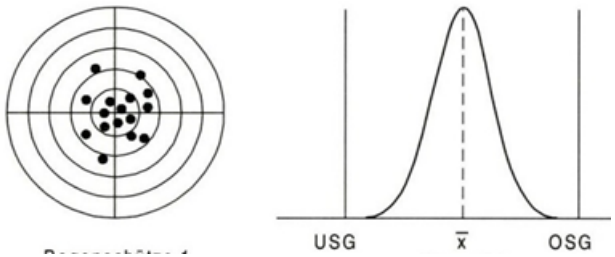
training, setup of **quality control charts** → **experiences, appropriate corrective actions**

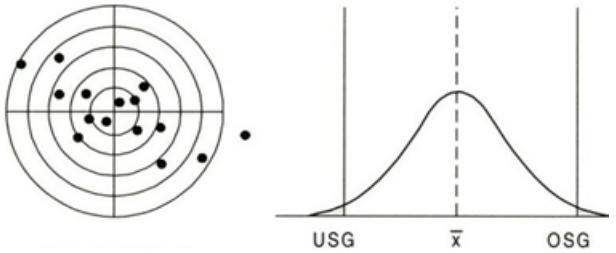
PROCESS CAPABILITY ANALYSIS

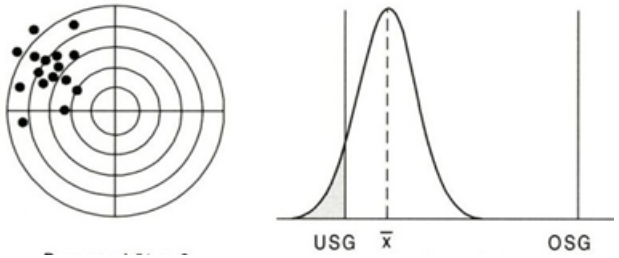


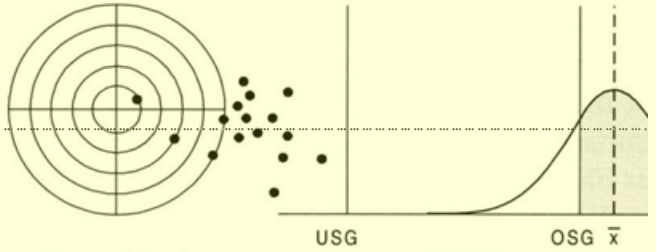
- Should be carried out by regular personell: Integration enhances self responsibilty & awareness for quality
- If done manually (without computer): enhances understanding

ACCURACY AND PRECISION

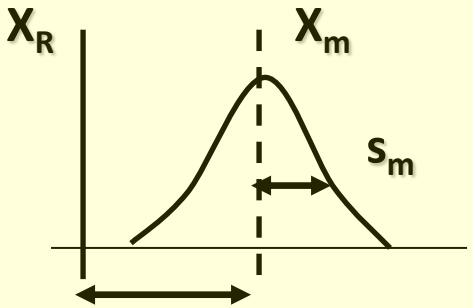




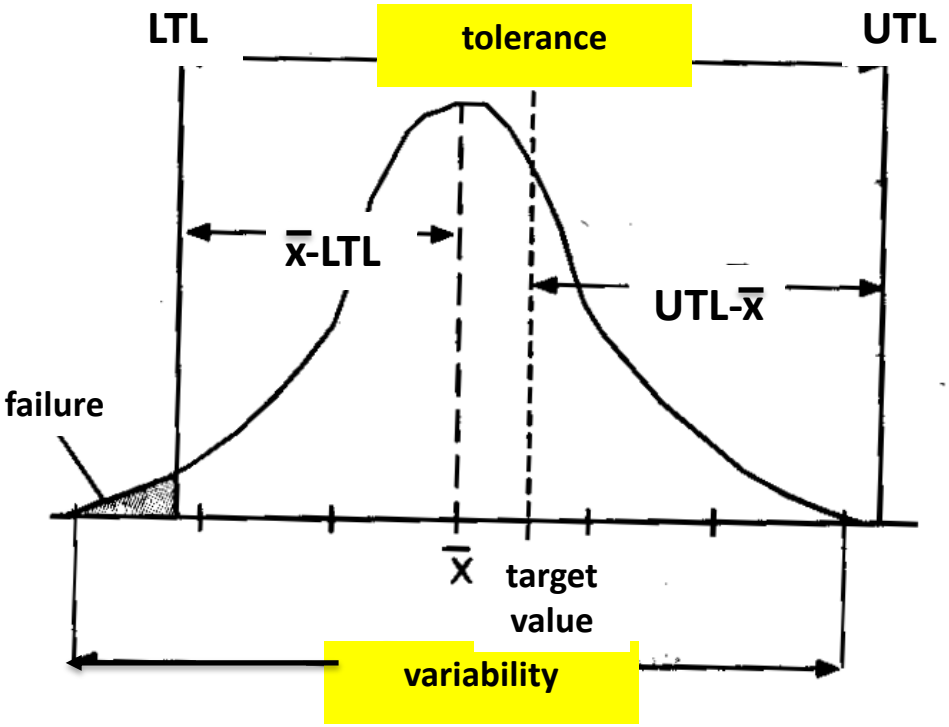


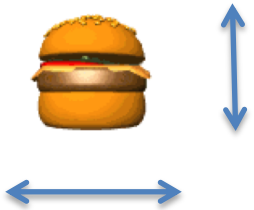


- not accurate
- not precise



Machine capability – short term





- **Relation of tolerance / variability**
- **Achievement of target value**

- Sample (n=50) under **constant conditions**
- calculate $\bar{X}$, s
- c_m = tolerance/variability = (OTG-UTG)/6s ... range of specifications / **variability** of machine
- c_{mk} = MIN(OTG-$\bar{X}$; $\bar{X}$-UTG)/3s ..... + deviation from target value
- **Capable of machine to produce products within specified limits** if c_m und $c_{mk} \geq 1$ (1.33)

Process capability – long term

- Includes effects of time (variability of temperature, material, operator skills, …)
- k (20-25) samples with n (3-5) subsamples in equidistant intervals (> 20d)
- calculate x, s or R per subsample
- calculate x_T, s_T or R_T of all samples
- c_p = (OTG-UTG)/6σ ……..(VARIABILITY)
- c_{pk} = MIN(OTG-x_T; x_T-UTG)/3σ σ = s_T/c_4 resp. R_T/d_2 ……(+CENTERING)

n	2	3	4	5	6	7	8	9	10
d_2	1.128	1.639	2.059	2.326	2.543	2.704	2.847	2.970	3.078
c_4	0.789	0.886	0.921	0.940	0.952	0.959	0.965	0.969	0.973

Capable if c_p and c_{pk} ≥ 1.33 (±4σ)
≥ 1.67 (±5σ)
≥ 2.00 (±6σ) „0-defect production“

Evaluation of process capability

$c_p < 1$ ← variability too high, tolerances too small

$c_p = 1$

$c_p = 1{,}33$

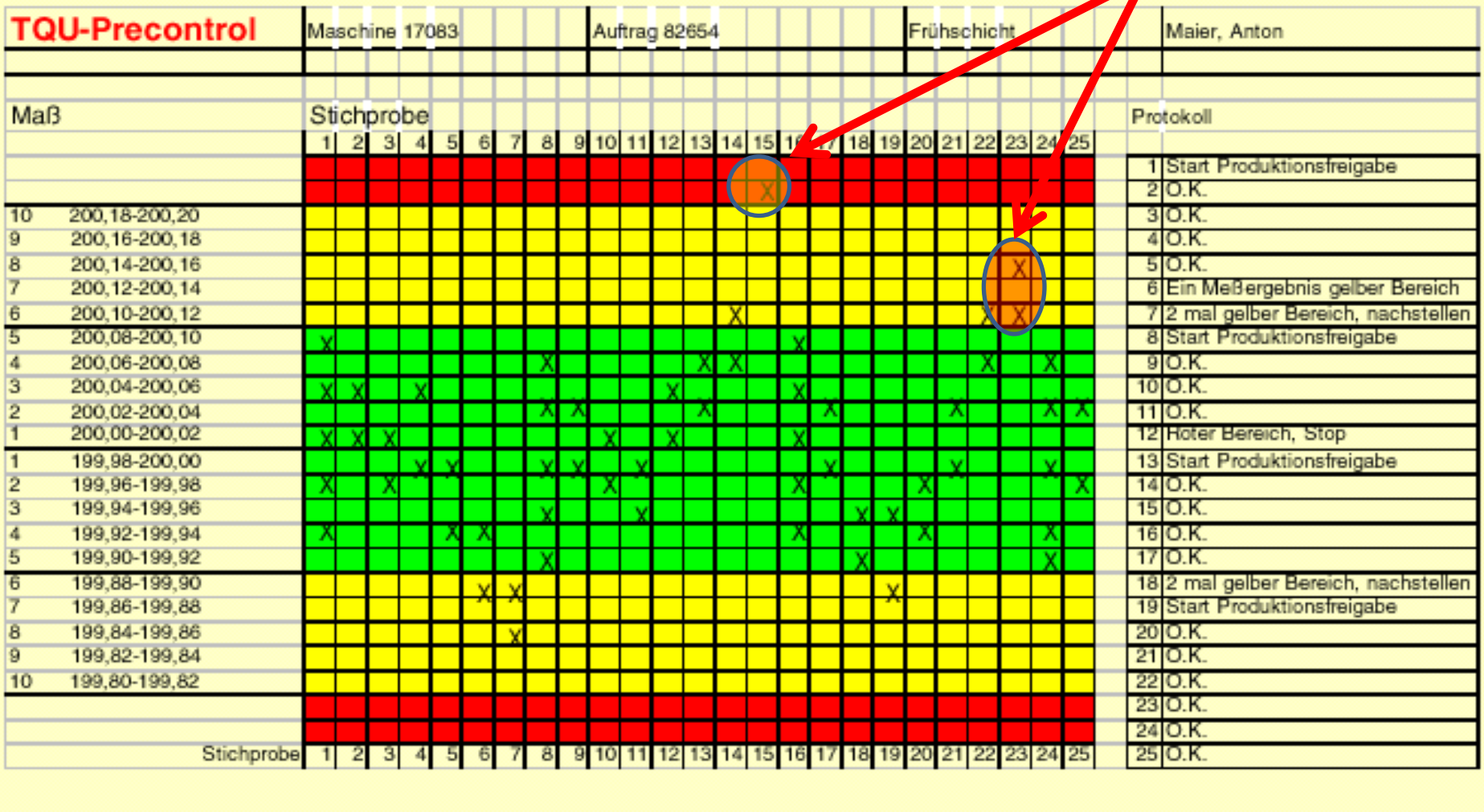
$c_p \geq 1{,}67$

$c_{pk} < 1$ ← not centered

$c_{pk} \geq 1{,}33$

Simplified SPC

STOP



TQU-Precontrol | Maschine 17083 | Auftrag 82654 | Frühschicht | Maier, Anton

Maß		Stichprobe 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
																X										
																X										
10	200,18-200,20																									
9	200,16-200,18																									
8	200,14-200,16																							X		
7	200,12-200,14																							X		
6	200,10-200,12														X								X	X		
5	200,08-200,10	X															X									
4	200,06-200,08								X					X	X								X		X	
3	200,04-200,06	X	X		X								X				X									
2	200,02-200,04								X	X				X				X				X			X	X
1	200,00-200,02	X	X	X							X		X				X									
1	199,98-200,00				X	X			X	X		X						X				X			X	
2	199,96-199,98	X		X							X						X				X					X
3	199,94-199,96								X			X							X	X						
4	199,92-199,94	X				X	X										X				X				X	
5	199,90-199,92								X										X						X	
6	199,88-199,90						X	X												X						
7	199,86-199,88																									
8	199,84-199,86							X																		
9	199,82-199,84																									
10	199,80-199,82																									
Stichprobe		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Protokoll	
1	Start Produktionsfreigabe
2	O.K.
3	O.K.
4	O.K.
5	O.K.
6	Ein Meßergebnis gelber Bereich
7	2 mal gelber Bereich, nachstellen
8	Start Produktionsfreigabe
9	O.K.
10	O.K.
11	O.K.
12	Roter Bereich, Stop
13	Start Produktionsfreigabe
14	O.K.
15	O.K.
16	O.K.
17	O.K.
18	2 mal gelber Bereich, nachstellen
19	Start Produktionsfreigabe
20	O.K.
21	O.K.
22	O.K.
23	O.K.
24	O.K.
25	O.K.

- if tolerance limits are already optimized: divided in 4 areas of same size
- very small sample sizes are sufficient
- STOP and eliminate cause if: 2 x yellow or 1 x red

Pareto-Diagram (ABC-ANAYLISIS)

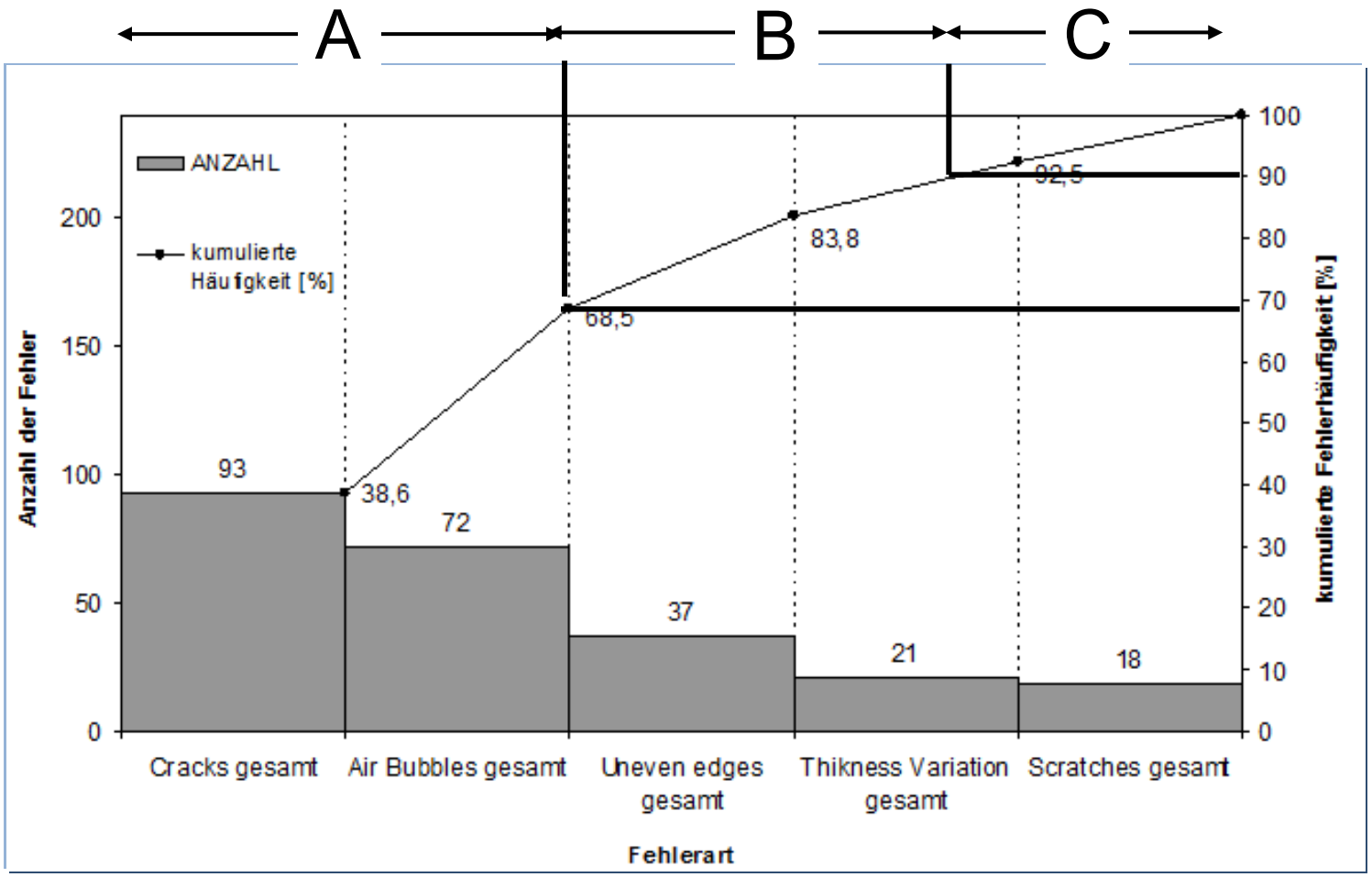
Records of failures over 4 weeks

	A	B	C	D	E	F
1				Quality Report		
2	Week 1	Mon	Tue	Wed	Thu	Fri
3	Defect Type					
4	Uneven Edges	2	2	3	2	0
5	Cracks	6	6	4	3	7
6	Scratches	0	1	0	1	0
7	Air Bubbles	2	0	2	1	3
8	Thickness Variation	1	0	2	1	2
9						
10	Week 2	Mon	Tue	Wed	Thu	Fri
11	Defect Type					
12	Uneven Edges	3	1	1	2	3
13	Cracks	4	4	4	3	3
14	Scratches	0	1	0	2	2
15	Air Bubbles	4	3	2	4	3
16	Thickness Variation	0	1	2	2	0

	A	B	C	D	E	F
17						
18	Week 3	Mon	Tue	Wed	Thu	Fri
19	Defect Type					
20	Uneven Edges	1	2	2	2	3
21	Cracks	4	6	4	4	3
22	Scratches	0	1	2	1	0
23	Air Bubbles	4	5	5	5	3
24	Thickness Variation	1	0	4	0	1
25						
26	Week 4	Mon	Tue	Wed	Thu	Fri
27	Defect Type					
28	Uneven Edges	3	2	1	2	0
29	Cracks	5	7	6	3	7
30	Scratches	1	1	0	2	3
31	Air Bubbles	6	5	4	6	5
32	Thickness Variation	0	1	1	2	0

Which failure should be minimized ?

Pareto-Diagram (ABC-ANAYLISIS)



- **Failures are sorted**
- **A-Failures are ~70 %, B ~20 % and C ~10 %**

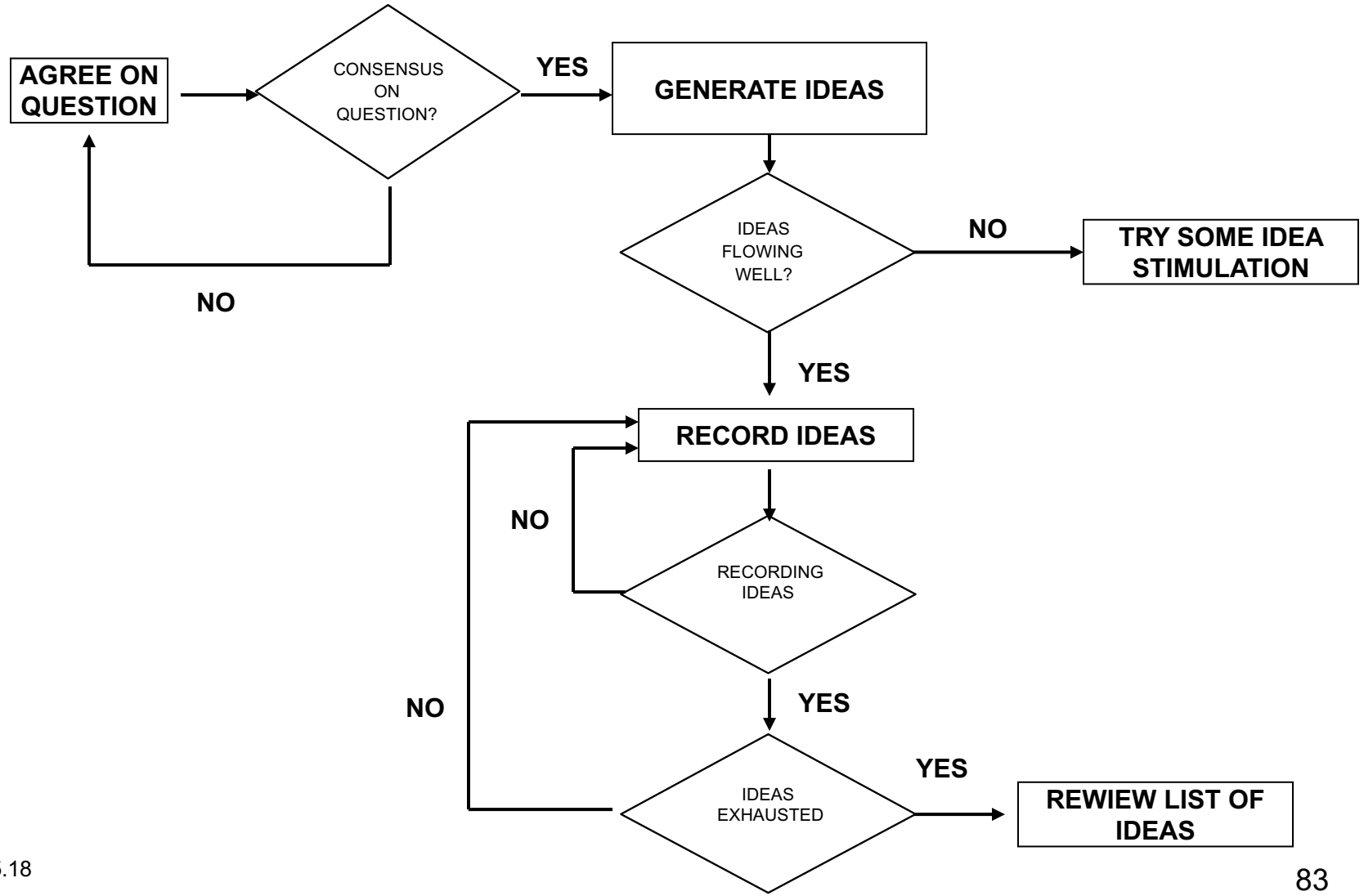
Brainstorming

- Simple method to collect ideas
- No training necessary
- Quantity before quality

Principles

- max. 10 people
- Moderator (stimulation, explanation)
- raporteur (recording)
- All are equal
- 15-30 min
- Modification of foreign ideas are possible
- No critics!

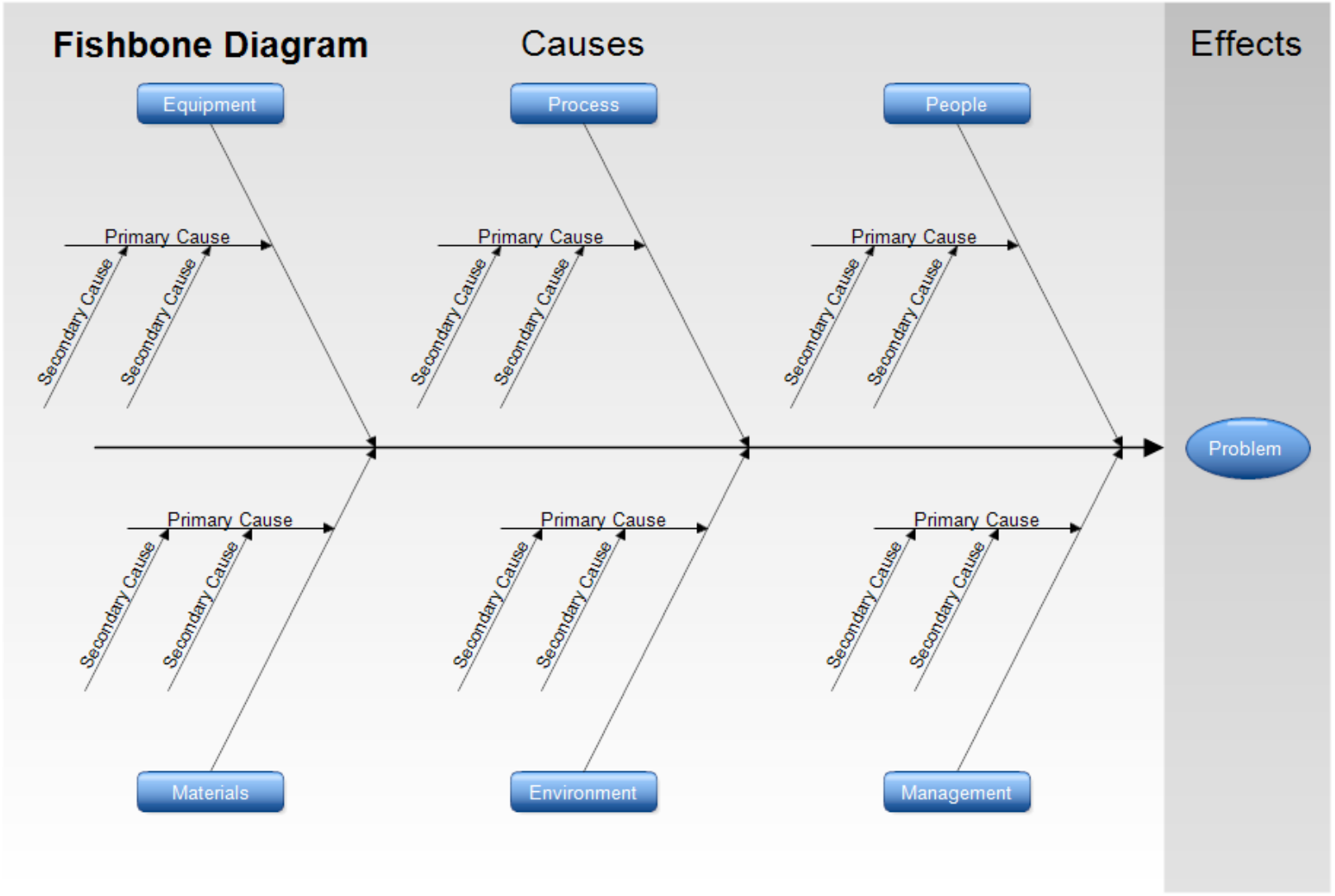
Brainstorming



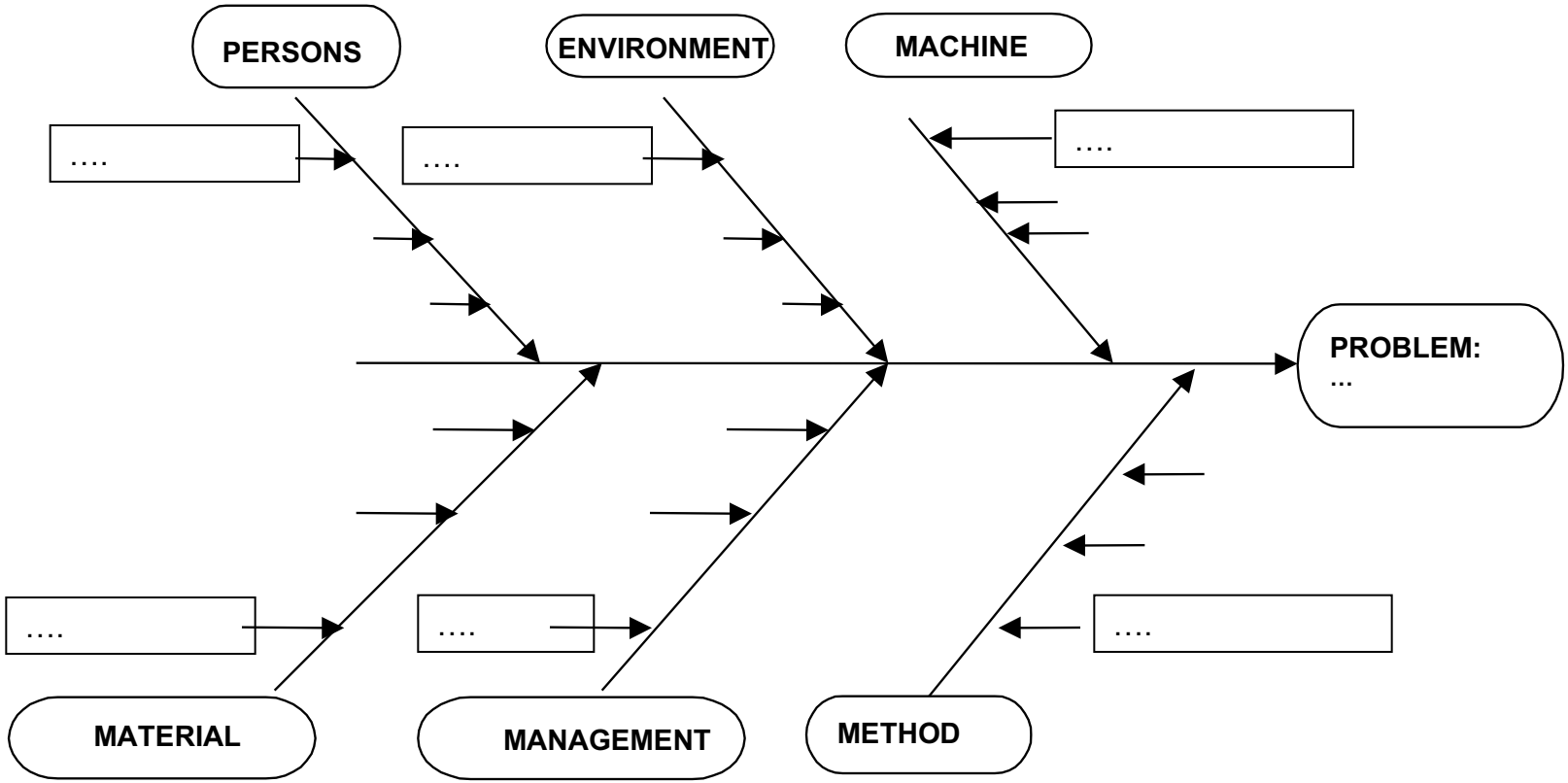
Method 635

- **6 participants write**
- **3 ideas** within 5 min. repeat 6 times
- repeat **5 times**, -> each participant gives 18 contributions

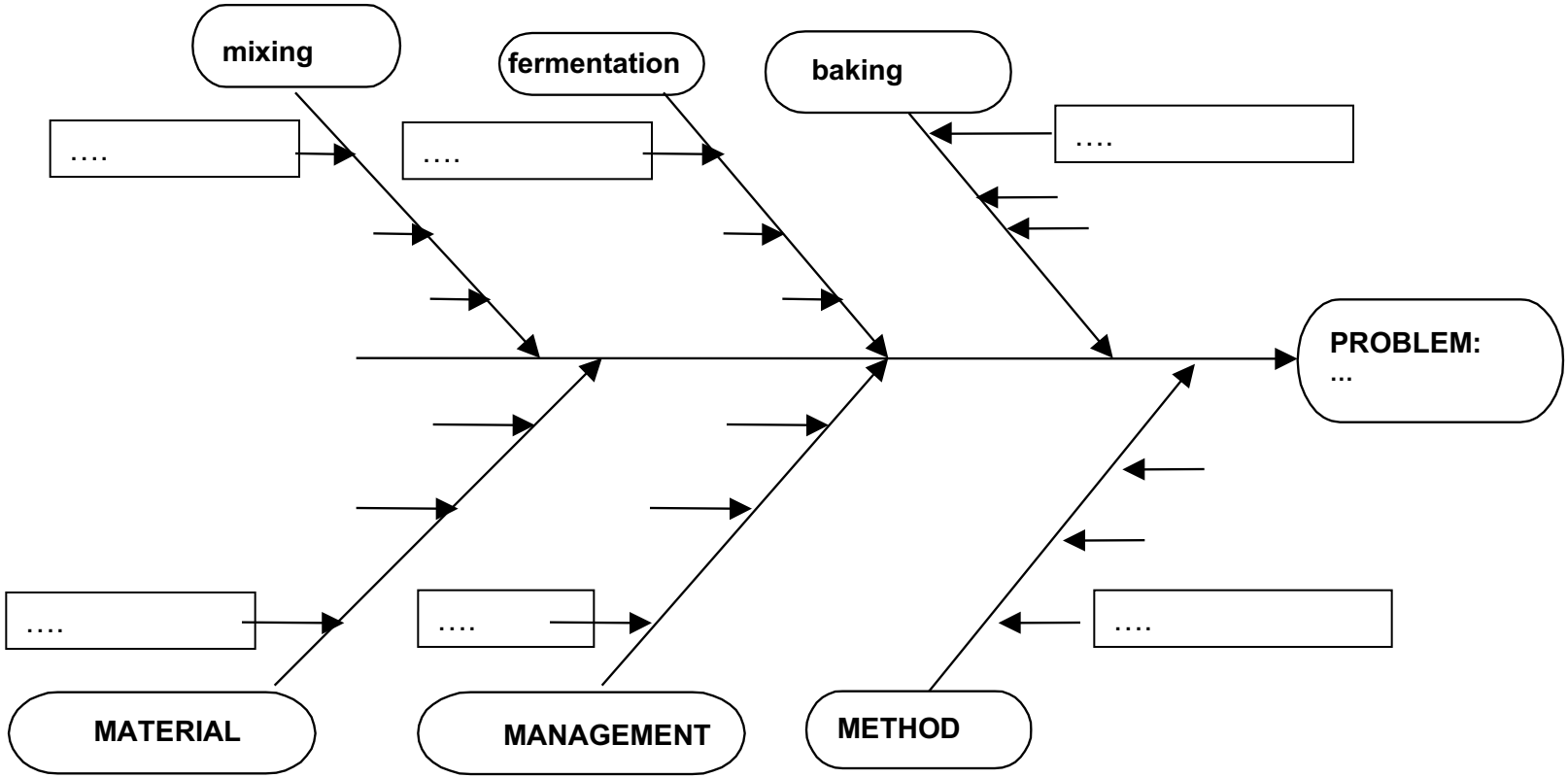
CAUSE-EFFECT-DIAGRAM (Fish bone, or Ishikawa)



Fish bone, or Ishikawa-Diagram



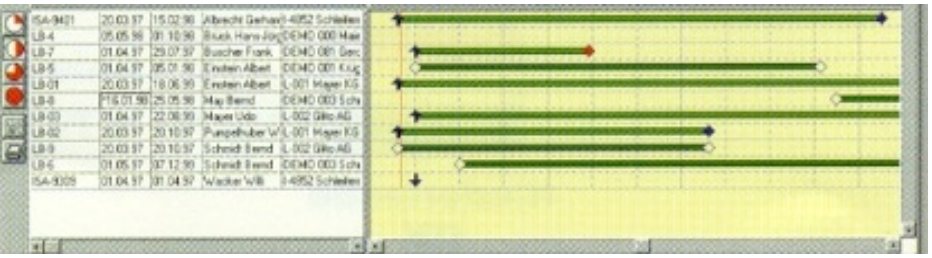
Fish bone, or Ishikawa-Diagram

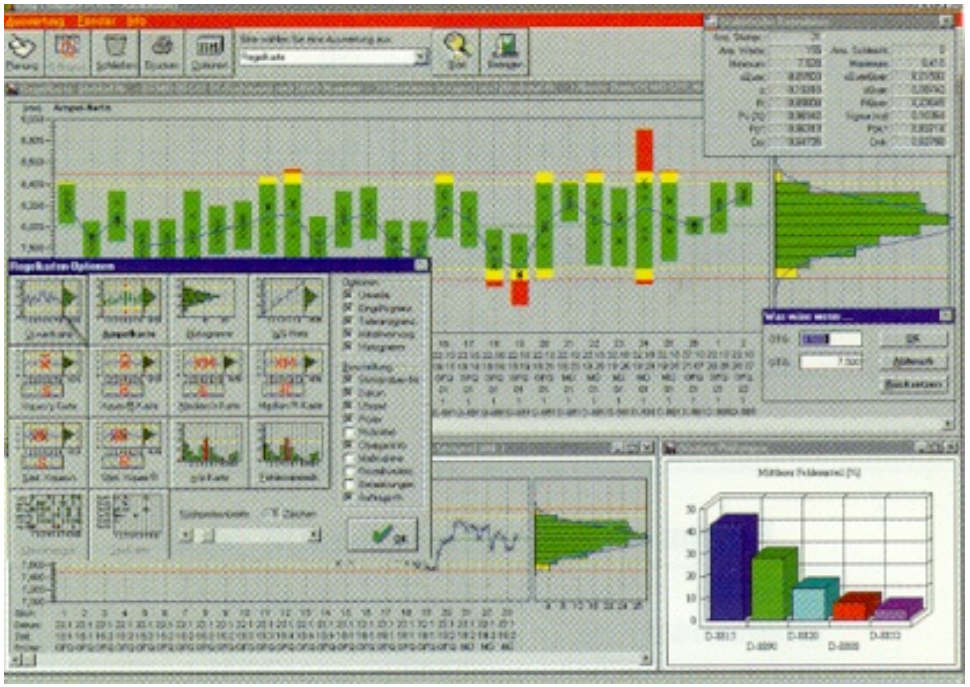


CAQ (Computer Aided Quality Management)

- Success of a QM-System depends on acquisiton, processing, evaluation and documentation of Q-Data throughout the Lifecycle of a product
- aim: make Q-Data available, precise and just in time for relevant user

Audit management





WHAT TO TAKE HOME

- **Quality**: fitness for use
- **Perceived Quality** is based on conscious and unconscious processing of **intrinsic** attributes (e.g. flavor, texture, etc.) and **extrinsic** attributes (price, brand, etc.), depends on previous experiences, personal and environmental variables, is perceived directly (e.g. appearance, flavor, texture, convenience, etc.) or is based on confidence (e.g. safety, naturalness, health benefits)
- **Trend**: nutritional value -> sensorial aspects: -> health aspects

WHAT TO TAKE HOME

- Quality has to be **designed, controled and improved**
- Systematic prevention is better than taking corrective actions
- **QFD** is a technique to translate consumer requirements into appropriate product properties, House of Quality documents results of planning processes
- **FMEA** is a tool to analyse potential failures and their causes and to assess associated risks : RPN= Occurance * Impact * Detection
- **Pareto Analysis** is a tool to analyse failures according to importance
- **SPC** keeps a capable process under control, based on statistics, by continuously monitoring and small corrections
- **process capability analysis** allows to quantify accuracy and precision of a process

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Food Safety Management

- **Food Borne Illnesses**
- **Hazards**
- **European Food and Drink Industry**

Food Quality Management

Food Safety Management

FQ&FS Management Systems

ISO 9000
FSCC 22000
IFS, BRC

TQM and cont. improvement

Conclusion

Food Borne Illnesses

EFSA estimates that **each year** about

- **5.262 foodborne outbreaks** are recorded
- **43.000 people are affected** and
- **25 die** of foodborne diseases
- *These number are under reported*

Source: EFSA, EDCD; The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2010; EFSA Journal 2012; 10(3):2597. [442pp.] doi:10.2903/j.efsa.2012.2597.

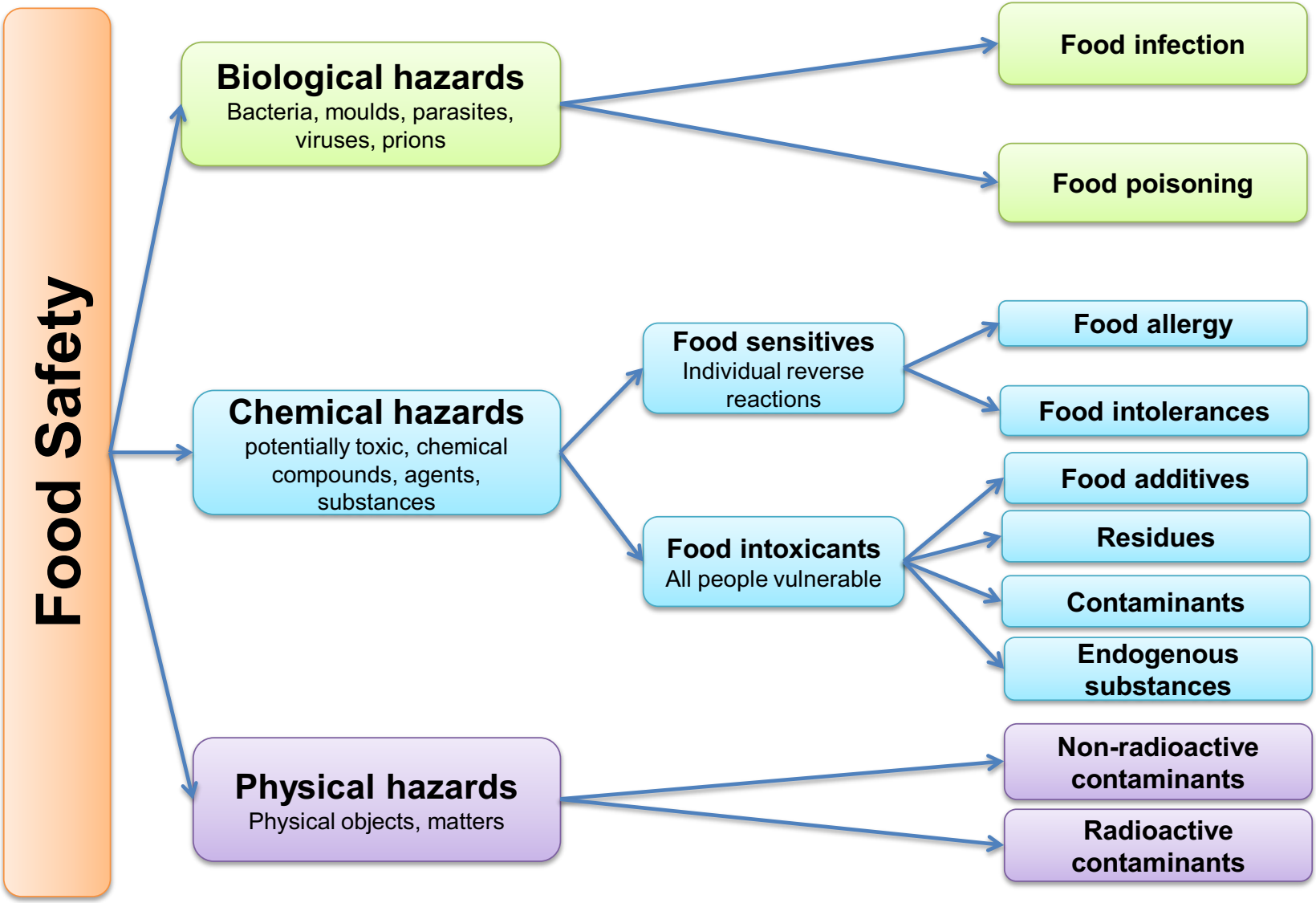
Food Borne Illnesses

CDC estimates that **each year** roughly

1 in 6 Americans (or 48 million) **gets sick**

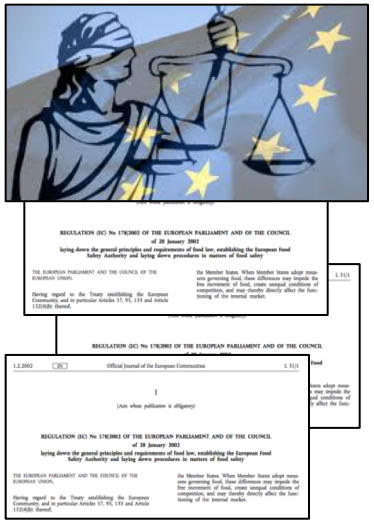
- **128.000 are hospitalized** and
- **3.000 die** of foodborne diseases

Source: CDC CS218786-A, 2011



Luning, Marcellis 2007

How to Avoid Unsafe Food? (Simplified)

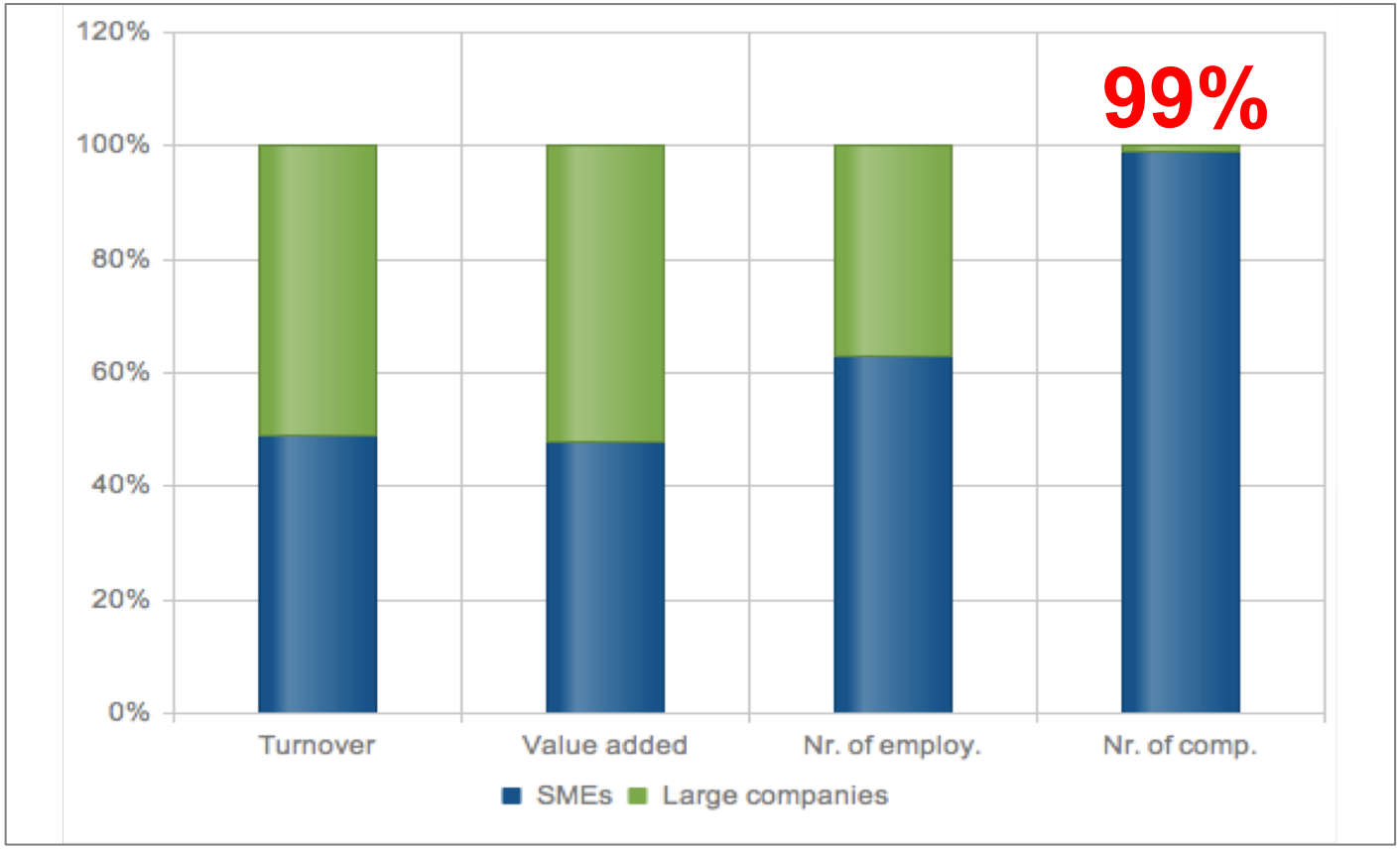


Law

National and International Guidelines and Best Practices

Standards, Schemes

The European Food Industry



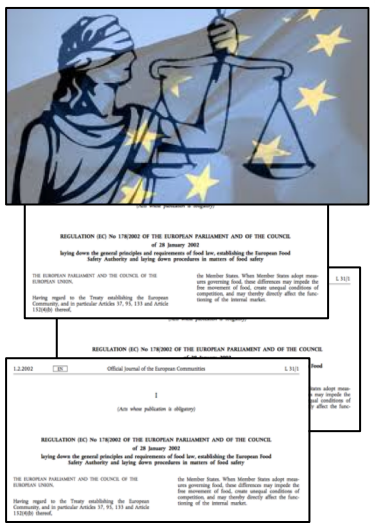
Source: Food and Drink Europe, 2012 http://www.fooddrinkeurope.eu/industry-in-focus/topic/small-and-medium-sized-enterprises-smes/figures

The European Food Industry

	Micro-companies (% in total)	Small companies (10-19) (% in total)	Small companies (20-49) (% in total)	Medium-sized companies (% in total)
Turnover	7	5	10	27
Added value	9	6	9	24
Nr. of employees	15	9	12	27
Nr. of companies	79	10	6	4

Source: Food and Drink Europe, 2012 http://www.fooddrinkeurope.eu/industry-in-focus/topic/small-and-medium-sized-enterprises-smes/figures

What about the 99% of SMEs?



Law

National and International Guidelines and Best Practices

Standards, Schemes

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FQ&FS
Management Systems

- Development
- GMP
- Food Quality Management functions
- Certification – Accreditation
- GFSI and recognized schemes

Food Quality Management

Food Safety Management

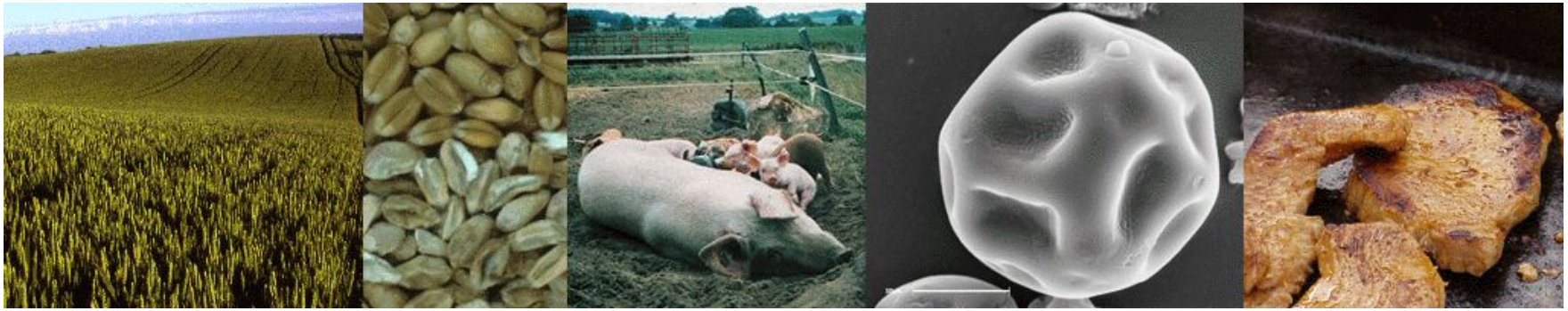
FQ&FS Management Systems

ISO 9000
FSCC 22000
IFS, BRC

TQM and cont. improvement

Conclusion

Food Supply Chain



CODEX ALIMENTARIUS

global reference point for FQFSMS, Includes general principles for Food Hygiene (GHP), PRP and HACCP, set basis for GxP

LEGISLATION

STANDARDS: ISO 9000, 22000

GFSI recognized **SCHEMES**: FSSC 22000, IFS, BRC

BEST PRACTICE: widely accepted as benchmarks to achive safety and quality goals

GMP

Good manufacturing practice

Although there is no binding set of regulations and no defined legal foundation for the GMP, it still stands as the basis for many quality systems

Businesses have to develop a quality manual and are also being certified by an independent inspecting authority regarding GMP

All behavioural measures and rules in the manufacturing of products that have to be considered and adhered to, to manufacture in a reproducible and the desired quality corresponding way.

GMP and HACCP are two important pillars for food safety

Both the Codex Alimentarius and ISO 22.000, as well as the IFS have integrated GMP and HACCP

GMP is thus an essential part of quality management

The main responsibility for the production and distribution of safe foods lies with the food business operator

GMP and GHP is being described in form of guidelines

These measures include detailed manufacturing specifications, examinations, inspections, maintenence work, cleanliness, spatial requirements and professional competence of all involved persons.

Example: GMP in the food-packaging industry

29.12.2006 EN Official Journal of the European Union L 384/75

COMMISSION REGULATION (EC) No 2023/2006

of 22 December 2006

on good manufacturing practice for materials and articles intended to come into contact with food

(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

(6) The rules on GMP should be applied proportionately to avoid undue burdens for small businesses.

Example: GMP and food contact materials

Reg. Nr. 2023:2006 for good manufacturing practice,
Objects affected through the contact with foods or their intended pre-products

„…ensure that materials and articles are consistently produced and controlled to ensure conformity with the rules applicable to them and with the quality standards appropriate to their intended use by not:

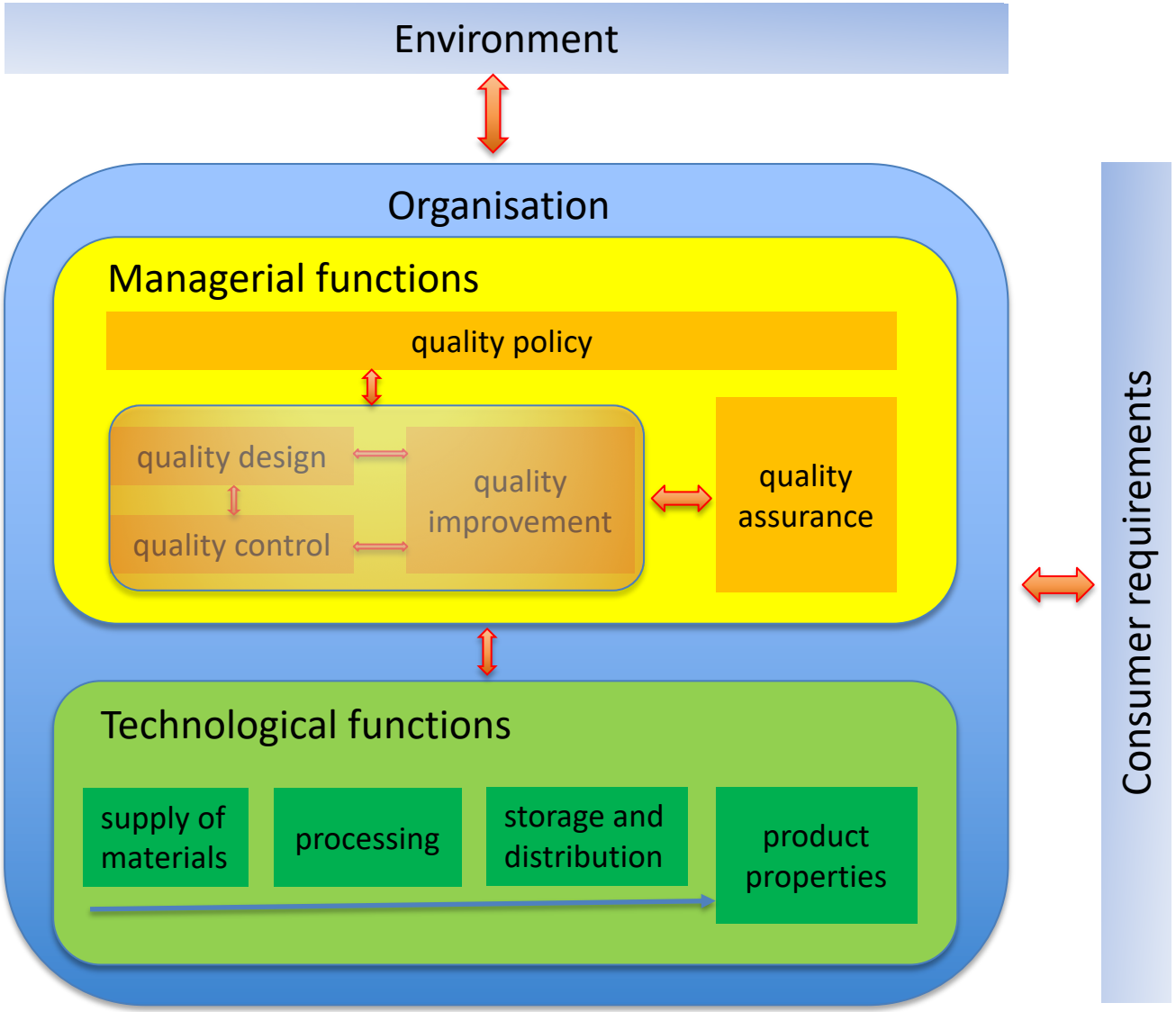
- endanger human health
- causing an unacceptable change in the composition of the food
- causing a deterioration in the organoleptic characteristics thereof.“

GMP Requirements

for different sectors:
feed - food- cosmetics - pharmaceuticals

- Quality management handbook
- traceability
- labelling
- Assessment of raw materials, additives and final products
- Qualification of personell
- Implementation of approriate production conditions
- Implementation of hygiene measures

Food Quality Management functions



- in a company some general functions (managerial + technological) have to be in place in order to assure FQ and FS
- these are the most important areas for a successful integrated FQ&FS MS
- BRC Food and FSSC 22000 chapters are very similar to these functions

Luning, Marcellis 2007

PROCESSES IN QUALITY MANAGEMENT FUNCTIONS

Quality strategy & policy:

- Quality targets
- Quality levels of products
- Quality levels of ressources
- Quality Management System (QMS)

Quality Design:

- Specifications of raw materials and products
- Requirements of production processes
- Quality levels of ressources

Quality Control:

- actual quality of raw materials and products
- actual quality of production process
- actual quality of process environment

Quality Improvement:

- Changes in specifications of raw materials and products
- Changes in production process
- Changes in quality of raw materials

Quality Assurance

- Requirments of QMS
- provision of organisational and technological resources
- control of performance of QMS
- Implementation of necessary changes

ADVANTAGES OF A SYSTEMATIC QUALITY DESIGN

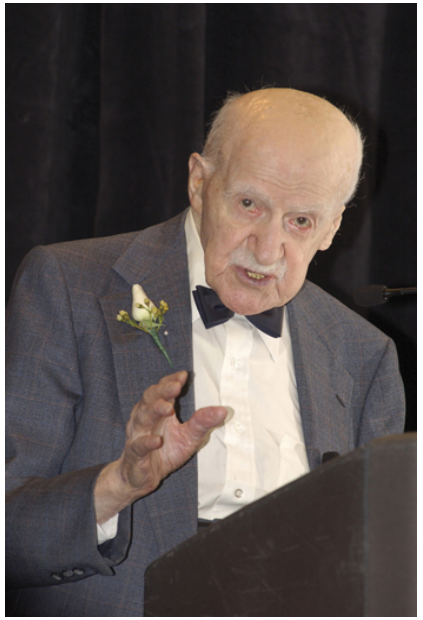
- Avoiding of flops and costs
- Planning of lifecycles of products should cover cost for development of new products
- Consideration of economic trends: changes through globalisation, offers and needs etc.)
- Consideration of social developments: trends of consumer behaviour
- Consideration of new scientific findings and new technologies
- Consideration of growth target of company, new markets
- Consideration of new laws, health programmes, agricultural policies, etc.
- ... Etc.

Which benefits are there in having a quality management concept?

- Operational procedures are becoming transparent
- Useless duplications of work can be avoided
- Problems are becoming apparent and removeable
- Responsibilities are clearly defined
- Precautionary measures are applied for the prevention of errors
- Intensive cooperation and motivation of all employees result in better quality

QUALITY DESIGN ACCORDING TO JURAN

1. Specify **quality targets**
2. Identify **persons** who are concerned with efforts to reach quality targets
3. Identify **consumer demands**
4. Develop **product attributes** relevant to consumer demands
5. Develop **processes** to achive product attributes
6. Implement **process control measures**



1904 Romania
1912 USA
1954 Japan (TQM)

QUALITY TARGETS

Level	horizon	target	example
Strategic targets	> 5 years	organisation	Leader in international competition
Tactic targets	3-5 years	organisational units	Development of a modular product structure
Operative targets	1-2 years	employees	Development of requirement specifications for a module

Certification - Accreditation

Certification

procedure, where a *„third party“* (TÜV, Quality Austria, ..) **confirms that a:**

- **Product** (product norms)
- **Process** (ISO norm)
- **Persons** (Q-Manager)

complies with a specification

Communauté Européenne

Accreditation

procedure, by that an *authorised Organisation* (AT: Ministery for Economics) **acknowledge formal, that a company or a person is competent, to fulfil special tasks**

Global Food Safety Initiative (GFSI)

- founded in May 2000
- a retail driven organisation for the **continuous improvement** of FSM systems
- 65% of food retailers worldwide
- synchronizes existing food standards to avoid multiple audits

- Standard owners (BRC-British Retail Consortium, FFSC-Foundation for Food Safety Certification) can apply to be benchmarked against a guidance document and recognized by GFSI

  -> less audits from retailers

  -> reduces competition between standard owners

- provides a **platform for collaboration** between food safety experts from retailer, manufacturer, service providers associated with the food supply chain, international organizations, academia and government

GFSI recognised Standards

- International Featured Standard (IFS)
- ISO 22.000 + PAS 220 -> FSSC 22.000
- BRC Food Standard
- SQF 2000
- Dutch HACCP
- Global Aquaculture Alliance BAP
- Global Red Meat Standard
- Sinergy 22.000

IN COMMON

- Management system existing
- Comply with GxP
- Performed HACCP

MAIN DIFFERENCES

- structure
- Scope, emphasis and requirements
- Evaluation procedure
- Length of validity

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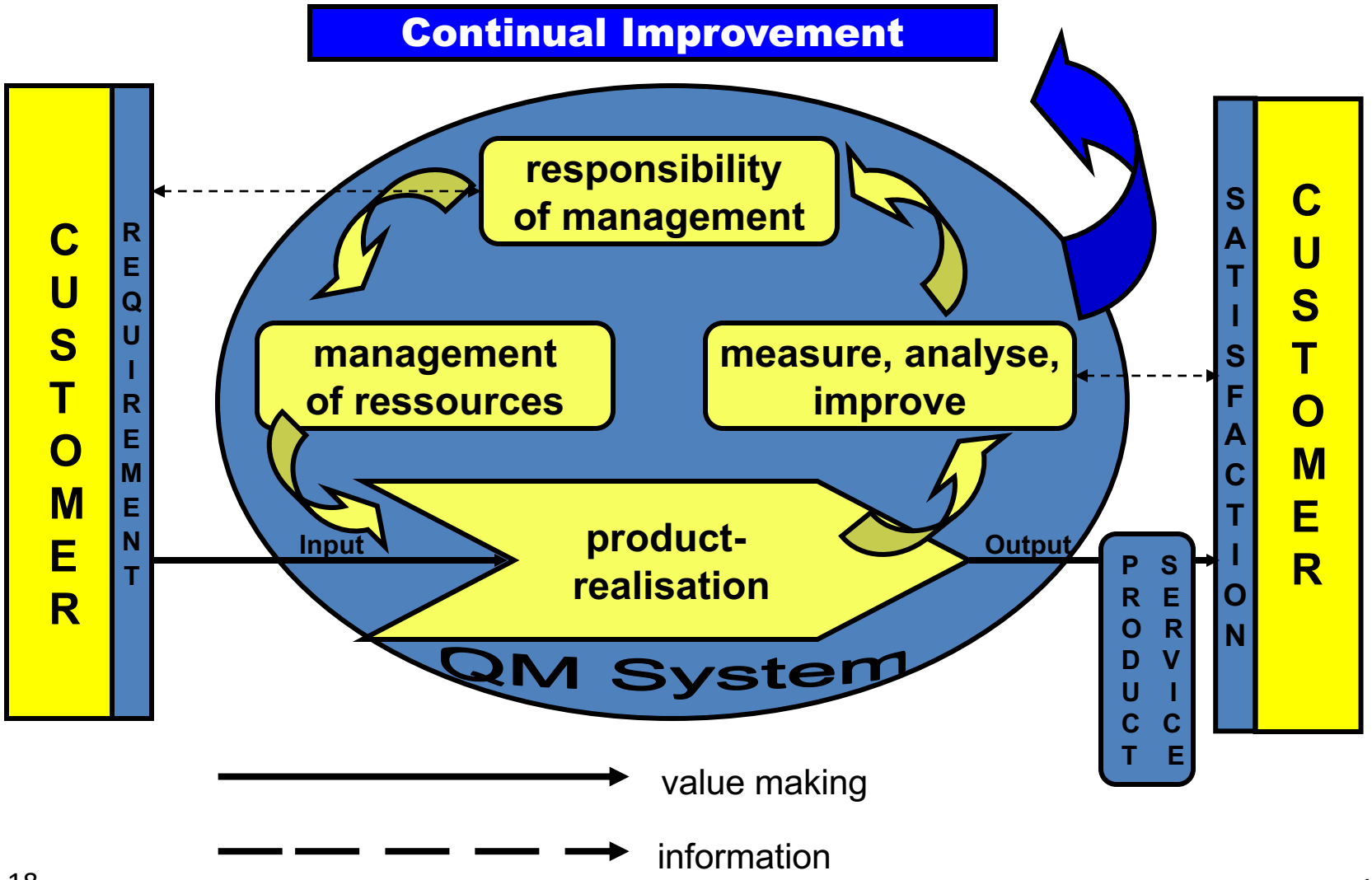
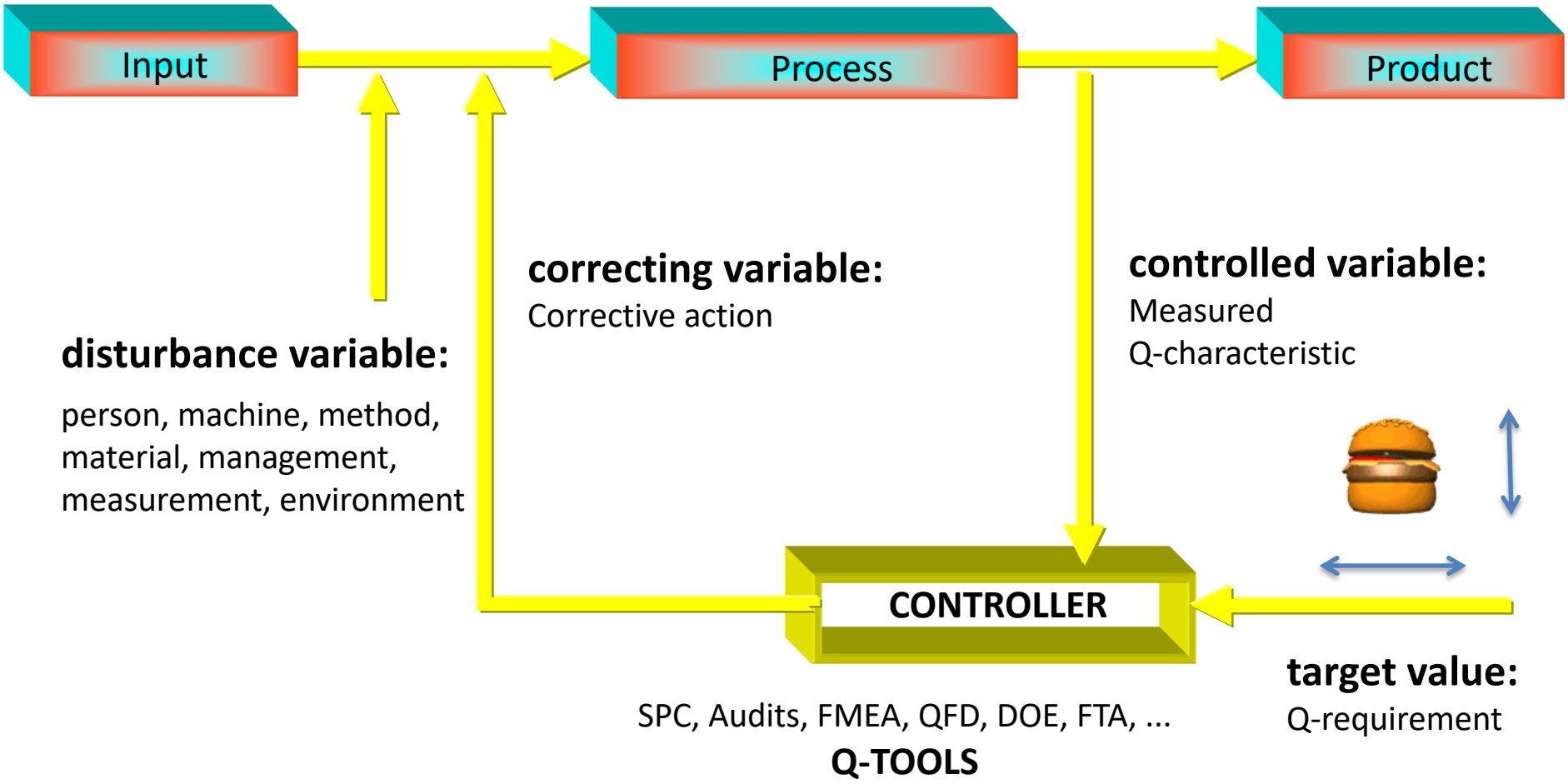
FQ&FS MS some common elements

- **Process orientation**: structure should follow process
- **Management Commitment**: Strategy and Policy
- **Process management**: measure – evaluate - improve
- **Documentation**
- Non-conformities and corrective actions
- Traceability (EU VO 178/2002), product withdrawal and recall
- Complaint handling
- Self assessment and continual improvement
- **HACCP, Hygiene, hygienic design, cleaning and desinfection, pest control, foreign body detection, waste disposal, Allergen-Management**

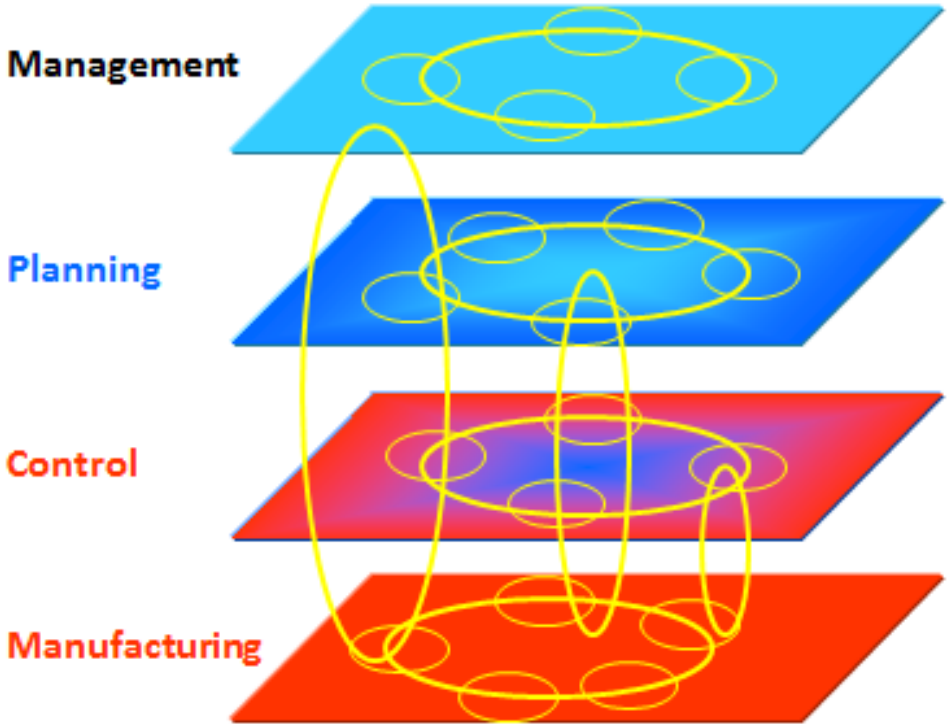
Process orientation: System - Process - Model



Process

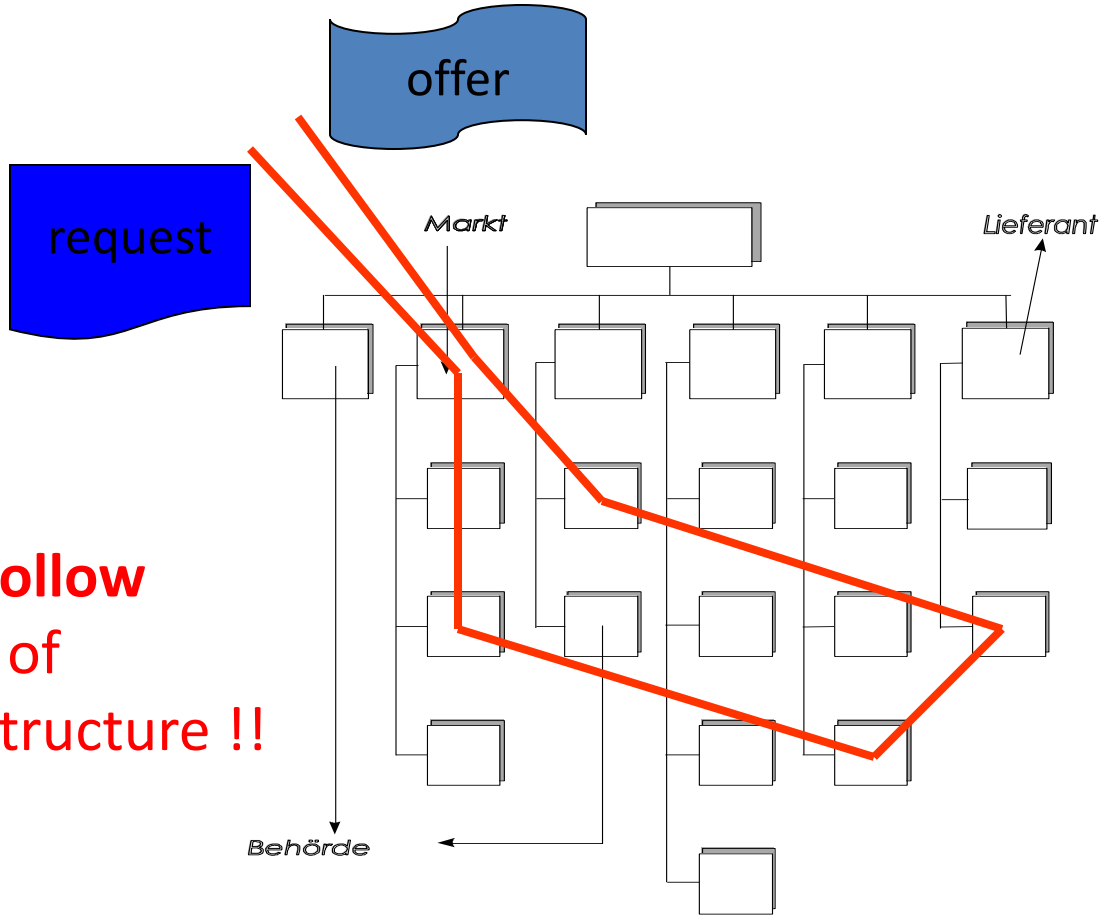

Input
Process
Product
correcting variable:
Corrective action
controlled variable:
Measured
Q-characteristic
disturbance variable:
person, machine, method,
material, management,
measurement, environment
CONTROLLER
target value:
Q-requirement
SPC, Audits, FMEA, QFD, DOE, FTA, ...
Q-TOOLS

Process orientation



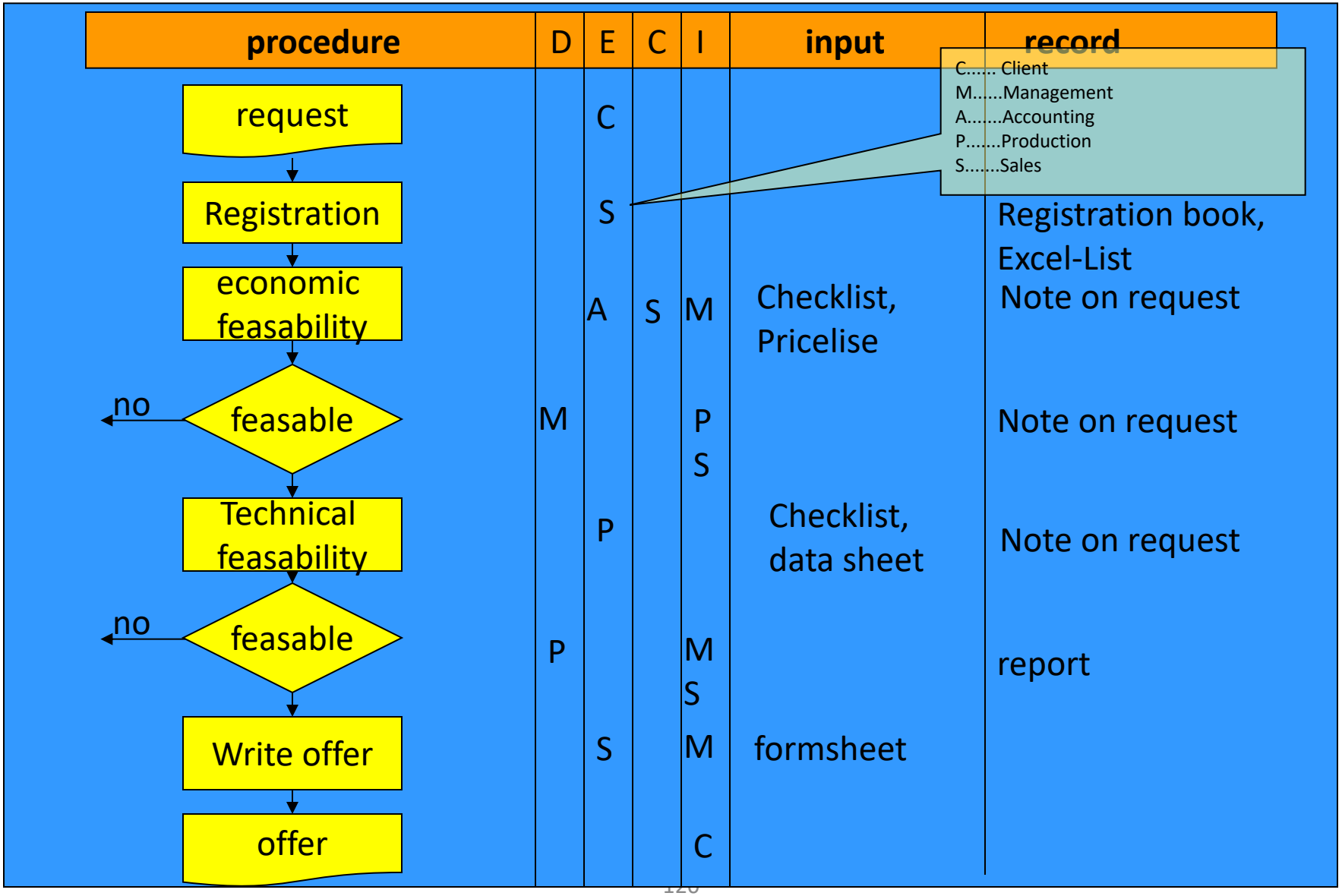
- Main tasks have to be described with control loops
- Relationships between management, production, testing, improvement should be visible
  -> gives automatically continual improvement

a process in a structure



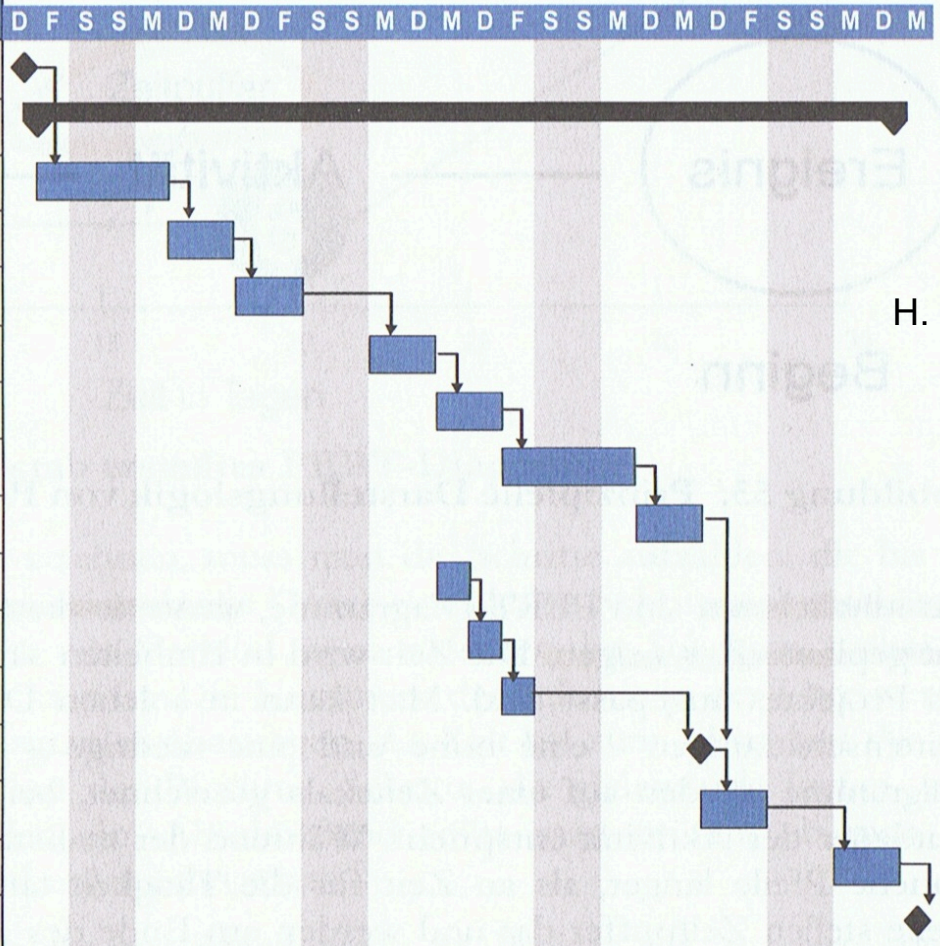
structure should follow processes instead of processes follow structure !!

Process description: Decision Execution Cooperation Information diagram



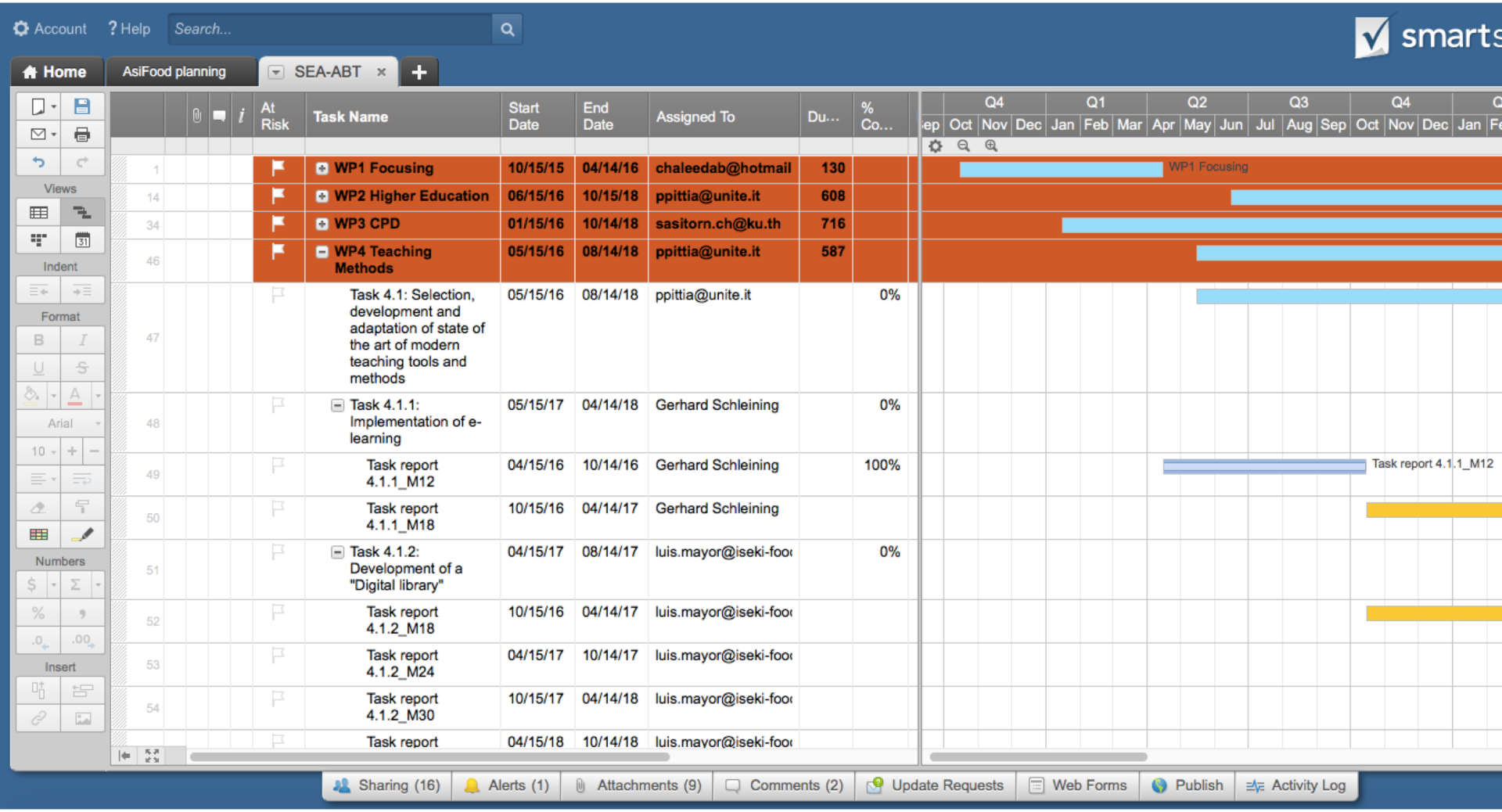
Process description: Gantt diagram

Nr.	Vorgangsbezeichnung
1	Voraussetzungen für den Rohbau erfüllt
2	**Rohbau**
3	Verschalen für das Fundament
4	Fundamentplatte gießen
5	Fundament aushärten
6	Mauerwerk Erdgeschoß erstellen
7	Verschalen für Decke Erdgeschoß
8	Decke Erdgeschoß gießen
9	Decke Erdgeschoß aushärten
10	Innentreppe verschalen
11	Innentreppe gießen
12	Innentreppe aushärten
13	Erdgeschoß fertig
14	Mauerwerk Obergeschoß erstellen
15	Dachstuhl aufbauen
16	Richtfest

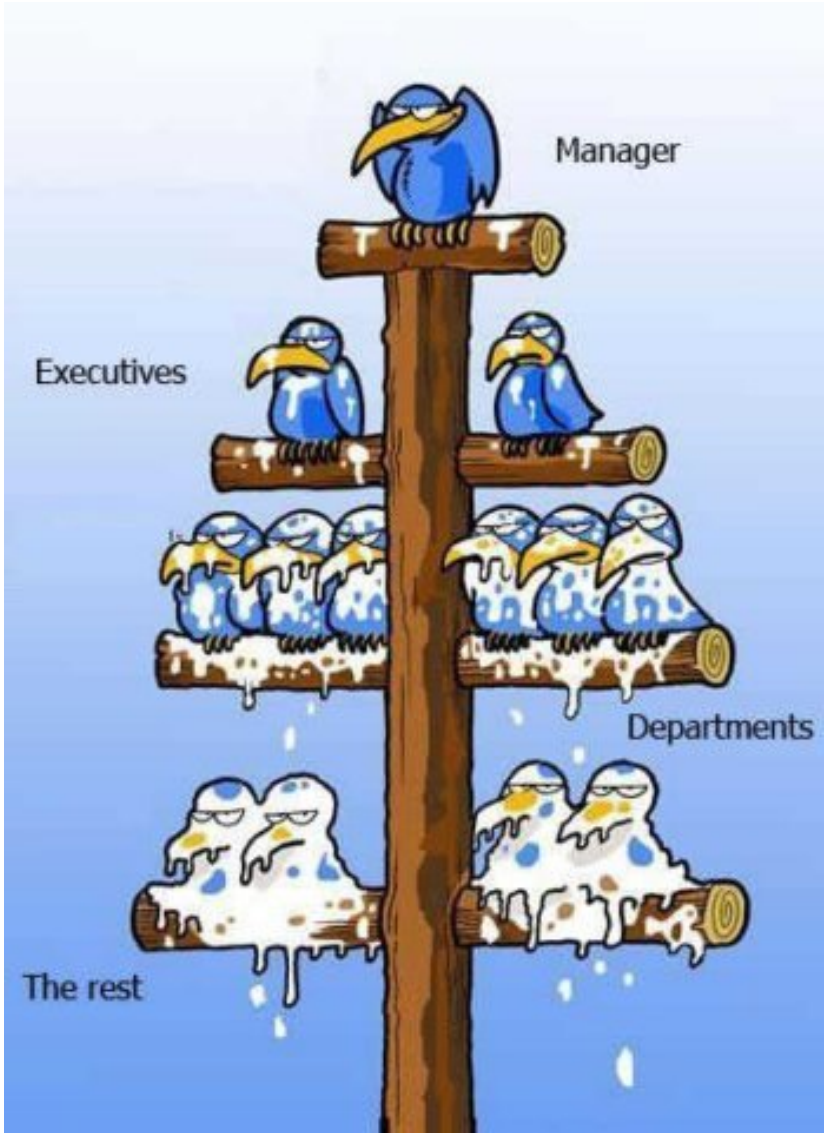


H. L. Gantt (1861 - 1919)

https://www.smartsheet.com



Responsibility of Management



- Provide clear and measurable targets
- Provide resources
- Active involvement, live policy ….
- Monitor activities
- Awarding of special achievements
- represent company to others

Strategies must concern all !!

marketing

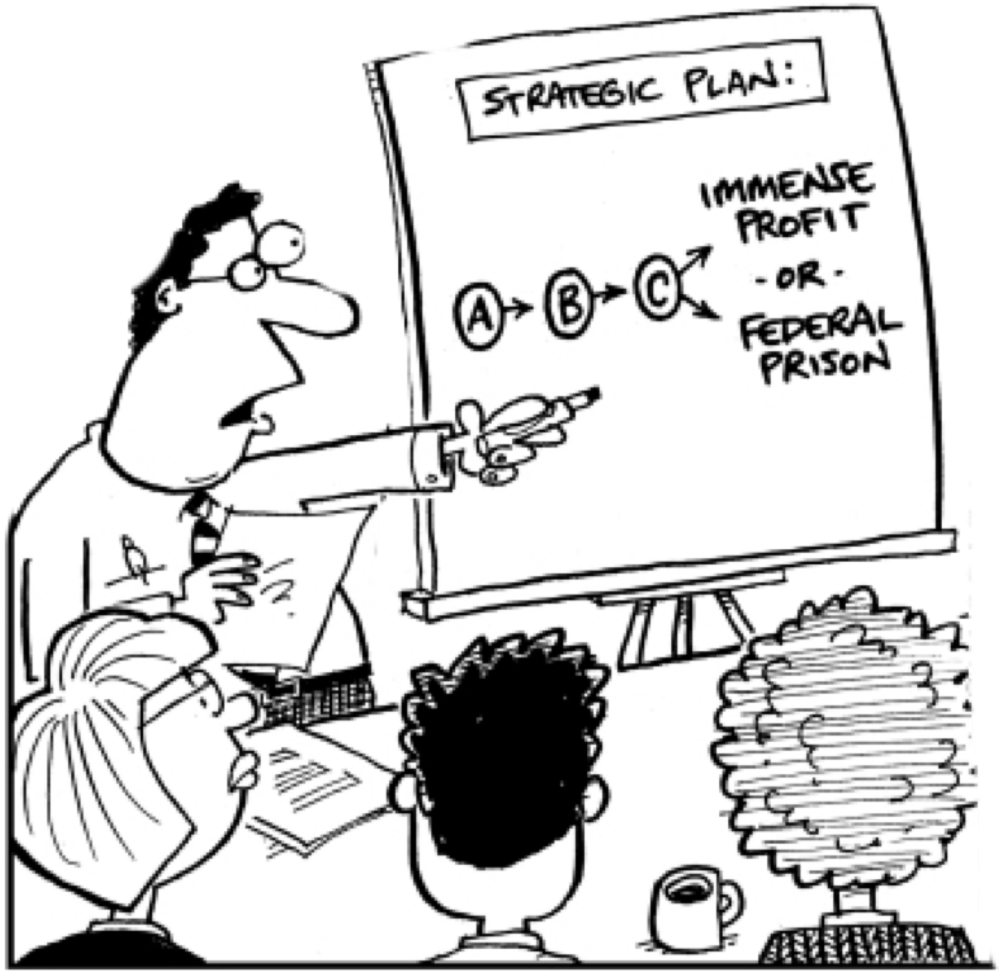
products

employees

location

raw materials

company



"Stay with me now, people, because in Step C things get a bit delicate."

What is a quality policy ?

1. Defines **frame** for specification and evaluation of **quality targets**
2. follows strategy of **continual improvement**
3. Should be **basis for motivation** of employees
4. Should lead to **realisation of quality targets**

….. Vision

- picture of the **long term future** of the company
- **how** and **what** do we want to achieve **until when**?

“ …In the next 5 years our company wants to be associated with high quality and healthy food…“

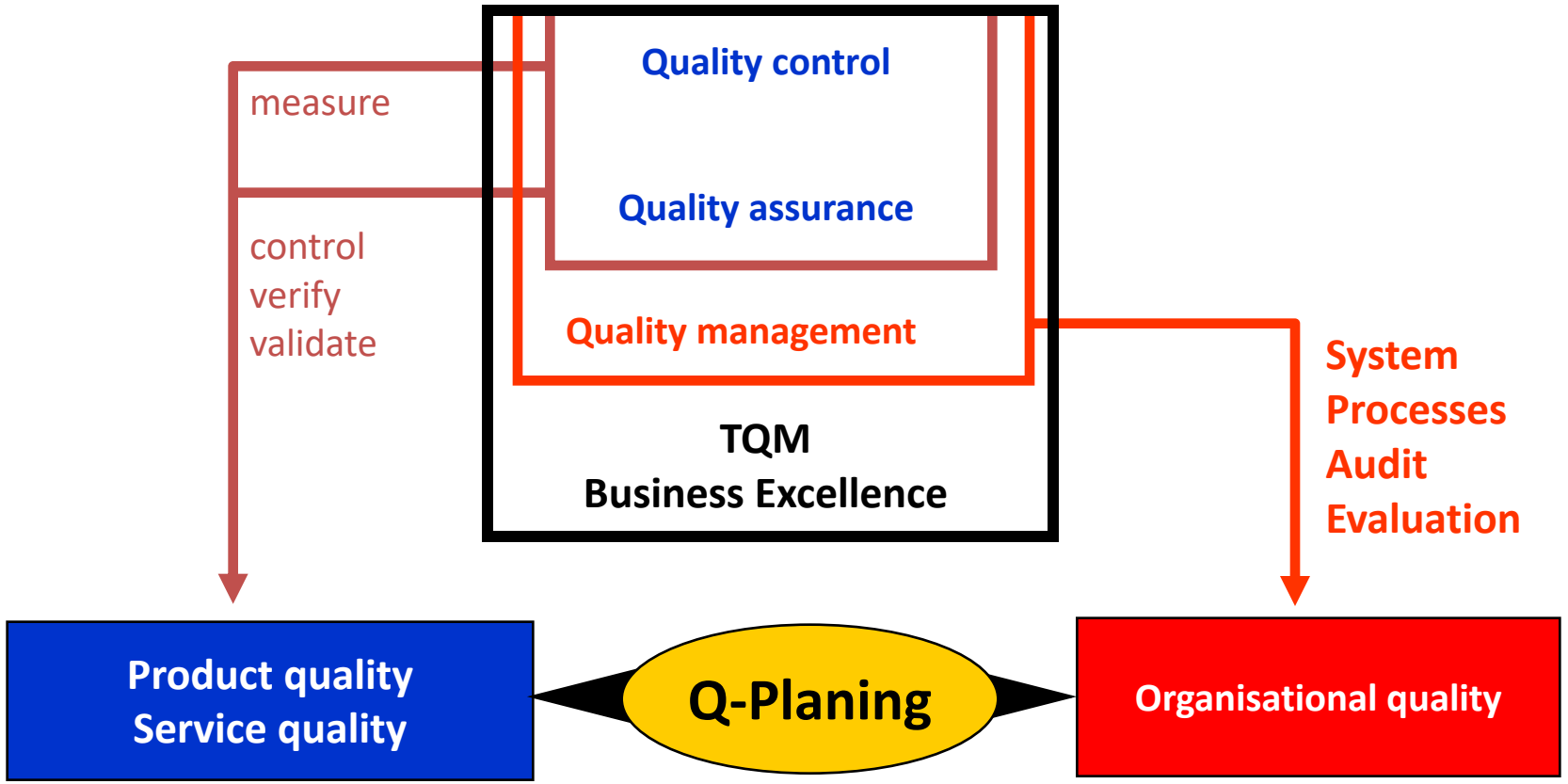
….. Mission

- in order to realize Vision
- has an aim
- follows a concept
- a measurable target should be achieved
- should also support the success of the clients

„…We develop products for young people, who want to eat healthy…“

- How can the aims be achieved ?
- **all** employees must know and should contribute

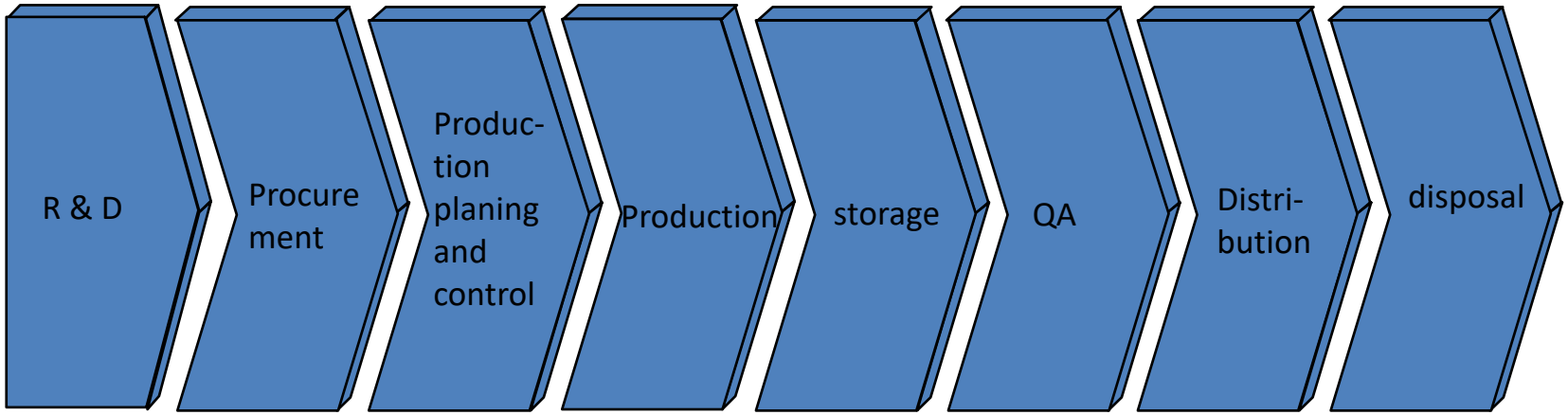
Process management: measure – evaluate - improve



Process management: evaluation

- Is the process specified?
- Is the process documented ?
- Are responsibilities clear defined ?
- Are employees qualified
- Is training necessary
- Is the required quality delivered ?
- Is the process efficient ?

Process management: example of indices



Modified from Rieg

Process management: measure – evaluate - improve

Example: customer satisfaction

Source: Hofer & Hofer 2004

Audit

Failures result from habits
(organizational blindness)

Quelle n. bekannt

Audit aims

To find weak points

To search for excellence and potentials for improvements

- **„Skill“-Audit**
- **„Best in class“- Audit**
- **Keep knowledge**
- **Inputs for improvements**

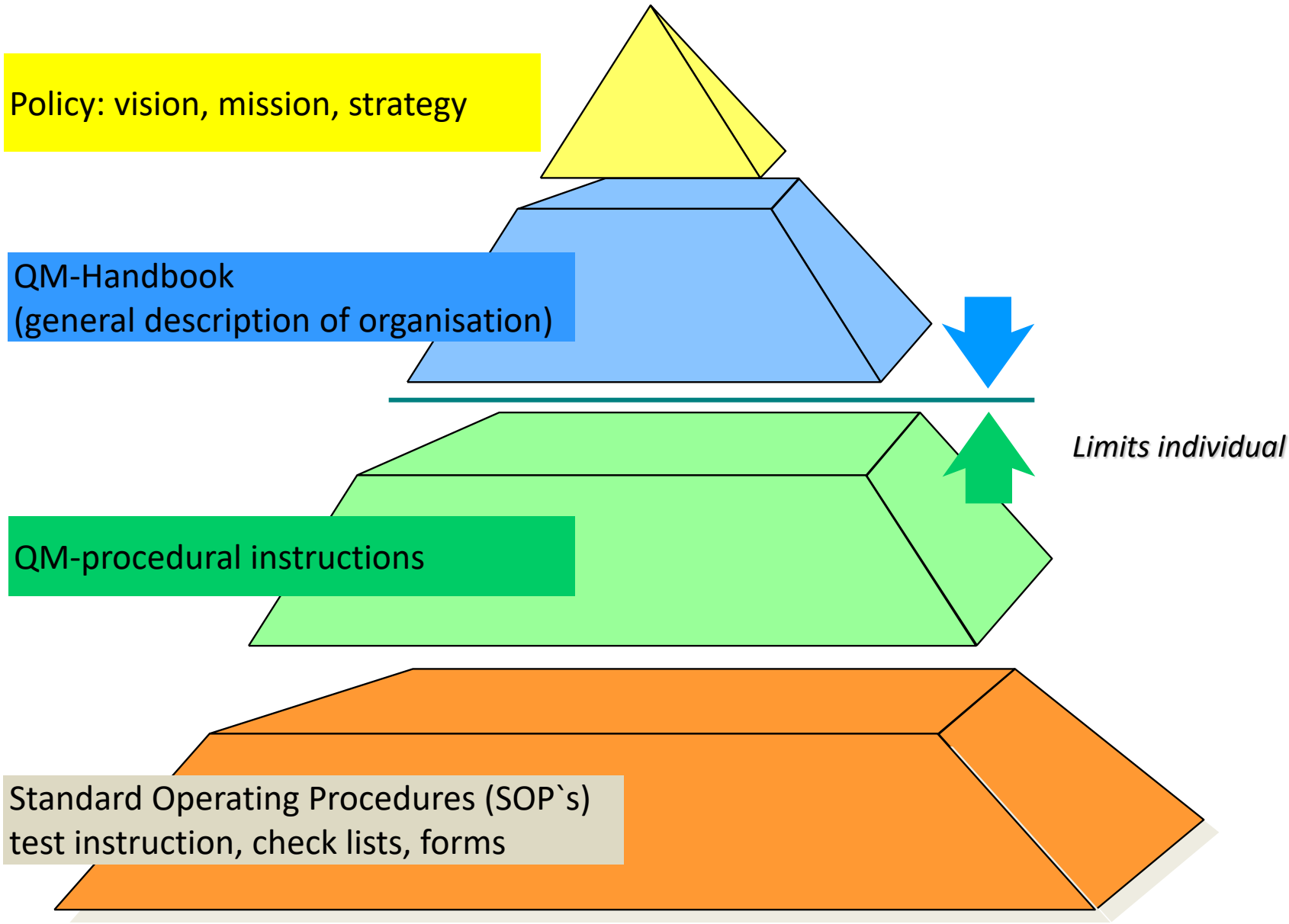
Types of Audits

- **SYSTEM: review of documentation, efficiency of structure and procedures, interfaces, responsibilities, awareness of employees**

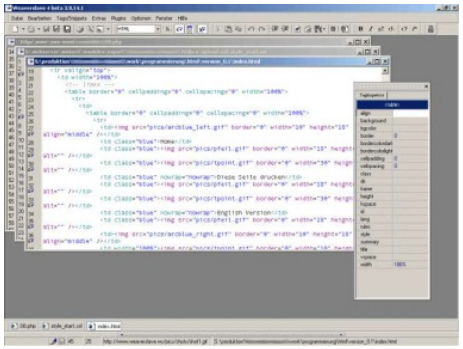
- **technical or organisational PROCEDURE: review of used methods, control measures, compliance of quality with target (recipe, specifications, consumer requirements)**

- **PRODUCT: consumer requirements, quality records, traceability**

Documentation



Documentation: example ISO 9001



4 Quality management system

4.1 general requirements

4.2 Documentation requirements

4.2.1 General

4.2.2 QM handbook

4.2.3 control of documents

- *Review - approval*
- *usability*
- *Availability: mark old versions*
- *Change control: changes must be marked*

4.2.4 control of records

- *Review – approval*
- *Availbility: security*

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Main FQ & FS MS

overview on structure and requirements

(ISO 9000)

ISO 22.000

Food Safety System Certification 22000

IFS Food

BRC GLOBAL STANDARDS

19.05.18

Food Quality Management

Food Safety Management

FQ&FS Management Systems

ISO 9000
FSCC 22000
IFS, BRC

TQM and cont. improvement

Conclusion

ISO 9000: Main requirements

- Organisation: **customer** oriented: clients, coworkers, feedback
- **Process** orientation
- Continual **improvement**
- Involvement of **senior management**
- **Process Management**: decisions for processes and products are based on **measurement** and **analysis** of numbers, data and facts
- Management of Resources: Efficiency of **training**
- **Documentation**

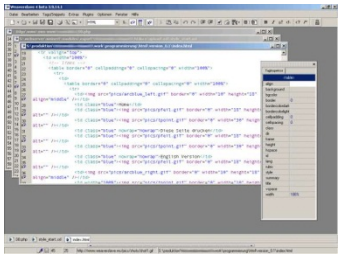
ISO 22000

- Management standard for Food safety
- Based on ISO 9001 **+ HACCP, traceability**
- valid 3 years, yearly audits
- Applicable for **all food related companies:**

  Primary production, processing, feed,
  Distribution, Catering, Services, Transport and Logistic,
  equipment, packaging

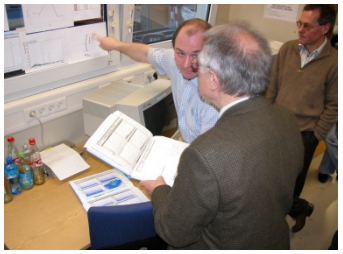
ISO 22000: Certification procedure

Opening discussion



Document reviews

Tour of premises & Interviews



Concluding discussion

Certificate validity: 3 years,
Annual surveillance audits

FSSC 22.000

Standard of **Foundation for Food Safety Certification** (Gorinchen, NL), to evaluate **all organisations along the food chain**

Board of members: 11

Board of stakeholders: 15 representatives (ISO, Federation of Food & Drink Industries of EU, Internat. Food Distributers Association, ….

History

ISO 22.000 was not sufficient for GFSI approval:

1. lack of PRPs (prerequisite programmes: GHP - specific reuquirements for food hygiene)
   - Publicly Available Specification (PAS) 220 was developed by multinational companies to specify requirements for prerequisite programs to assist in controlling food safety standards within the manufacturing processes of the food supply chain and is intended to be used in conjunction with ISO 22000 (building, defense, hygienic design, cleaning, waste management, maintenance, supplier qualification, allergen management etc.), now replaced by ISO 22002-1

2. lack of Industry owned scheme with regulatory and customer requirements
   - FSSC 22.000 was developed by FoodDrinkEurope and FSSC (Foundation for Food Safety Certification)

FSSC 22.000

Published in 4 parts

a) ISO 22.000

b) PAS 220

c) Additional requirements

d) Guidance

FSSC 22.000

a) ISO 22.000

- FS Management Systems: Documentation
- Management Responsibility: policy, responsibility, communication, emergency preparedness
- Resourcemanagement
- Planning and realisation of safe products: HACCP, traceability, control of non-conformities
- Validation: Monitoring, Improvement

b) PAS 220

- Construction of buildings, equipment, cleaning and sanitizing, maintenance
- Utilities: air, water, energy
- Pest control
- Personal hygiene
- Waste disposal
- Recall procedures
- Food defense

FSSC 22.000

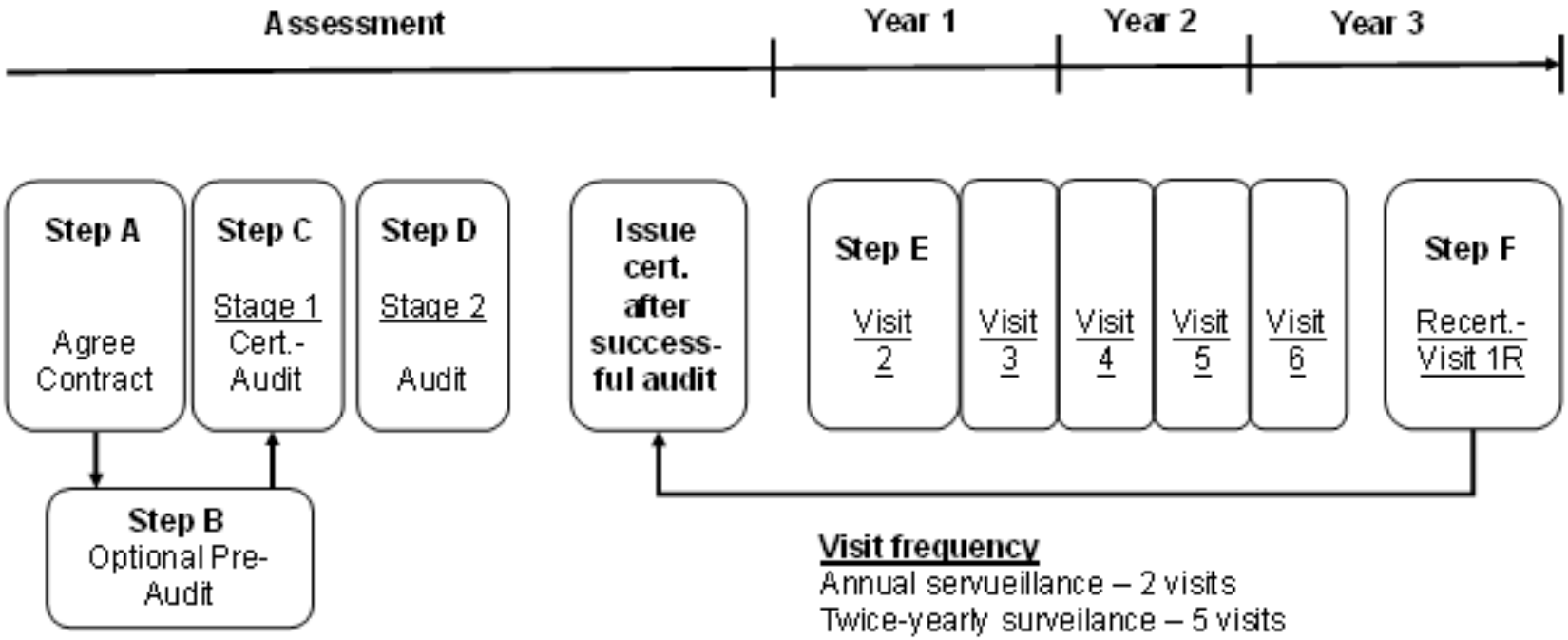
c) Additional requirements

- Services
- Supervision of personnel in application of Food Safety principles

d) Guidance

PART II - Requirements and regulations for certification bodies (CB)
PART III - Requirements and regulations for providing accreditation (AB)
PART IV - Regulation for the Board of Stakeholders

FSSC 22.000 - Auditing



C: HACCP, PRPs

D: evaluation of records, interviews

After eliminating the non-conformities, a technical review of the audit will be conducted to confirm the issue of a certificate

BRC Global Standard for Food

- Standard owner: British Retail Consortium, 1996 to comply with UK Food Safety Act
- tailor made for **food manufacturers**, does **not cover** the whole food chain
- Similar requirements as FSSC 22.000

3 categories:

Food packaging	Distribution	Products

Additional details: www.brcglobalstandards.com

www.tsoshop.co.uk/gempdf/BRC_Catalogue_2013.pdf

IFS 6 (International featured Standard for Food)

- Standard to evaluate **food suppliers**
  2001: german retail sector decided to install a regulation for private manufacturers
- Valid: 12-18 months

Reasons for implementation

- Consumers are more sensible (incidents, allergens, …
- globalisation
- Laws gets stricter: traceability, ….
- Retailers react with more pressure to manufacturer

„Since the introduction of IFS Food, the recall rate has gone down 40% and the number of customer complaints has gone down 27%“

Read more:
www.ifs-certification.com
www.food-care.com

Objectives of IFS Food

It is to be audited *), whether or not a manufacturer is able to continually deliver a safe product, which complies with both the quality requirements (specification of the business enterprise) as well as applicable legislation.

*) every 12 months→ or acc. to necessity,
Execution in respective national language

IFS 6: Evaluation and rating

- 251 requirements, **10 critical non-conformities (KO)**

	points
A 100% conform	20
B small deviations	15
C conform only to a small amount	5
D not conform	0 (-20)

evaluation	
High	> 95%
Basic	75-95%
failed	<75; 1 KO; > 1 MAJOR (high risk)

- When failed: new audit, earliest after 6 weeks

IFS 6: 10 critical non-conformities

1. responsibility of management
2. CCPs
3. Personal hygiene
4. Specifications for products, raw materials, packaging
5. Customer Recipes
6. Foreign body management
7. Traceability applies to all processing steps
8. Internal audits are carried out according to a plan
9. Procedures for recall
10. corrective actions

IFS 6: 10 critical non-conformities

1. **responsibility of management**

   - it has to be assured that all co-workers know their duties and responsibilities
   - and work according to them

IFS 6: 10 critical non-conformities

1. responsibility of management
2. **CCPs**
   - A monitoring system is in place
   - CCPs are under control

IFS 6: 10 critical non-conformities

1. responsibility of management
2. CCPs
3. **Personal hygiene**
   - Rules are existing
   - Rules are followed by employees and **externals**

IFS 6: 10 critical non-conformities

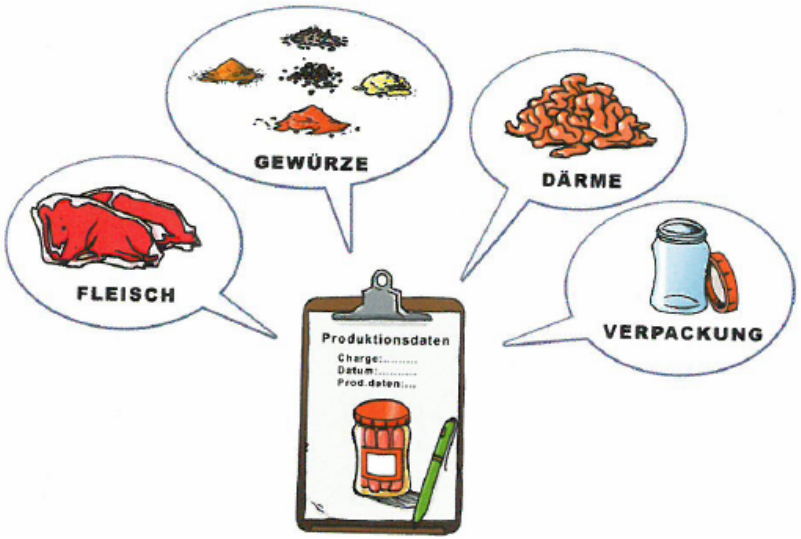
1. responsibility of management
2. CCPs
3. Personal hygiene
4. **Specifications for products, raw materials, packaging**
   - are existing, actual, checked and approved
5. **Customer Recipes**
   - are fully accepted and carried out

IFS 6: 10 critical non-conformities

1. responsibility of management
2. CCPs
3. Personal hygiene
4. Specifications for products, raw materials, packaging
5. Customer Recipes
6. **Foreign body management**
   - Foreign bodies are identified in a risk analysis
   - Techniques are in place for detection and to avoid contamination

IFS 6: 10 critical non-conformities

1. responsibility of management
2. CCPs
3. Personal hygiene
4. Specifications for products, raw materials, packaging
5. Customer Recipes
6. Foreign body management
7. **Traceability** applies to all processing steps



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IFS 6: 10 critical non-conformities

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4. Specifications for products, raw materials, packaging
5. Customer Recipes
6. Foreign body management
7. Traceability
8. internal audits are carried out according to a plan
9. **Procedures for recall**
   there is an effective system in place:
   - to recall all kind of products
   - to inform customers in time
   - with clearly defined responsibilities

IFS 6: 10 critical non-conformities

1. responsibility of management
2. CCPs
3. Personal hygiene
4. Specifications for products, raw materials, packaging
5. Customer Recipes
6. Foreign body management
7. Traceability
8. internal audits are carried out according to a plan
9. Procedures for recall
10. **corrective actions**
    - are carried out in time
    - responsibilities and time frame are clearly specified

IFS: Structure: 4 sections

1. **Protocol for achievements**

   Audit: requirements, conditions, procedure, aim

2. **Requirement catalogue**

3. **Requirements for certifying bodies and auditors**

   EN 45011, IFS audit portal (www.food-care.com),
   self evaluation questionnaire (www.grps.de)

4. **Report**

IFS: 2. Requirement catalogue

Corporate responsibility

- Corporate policy and responsibility
- Customer-orientation
- Effectiveness of QM-systems

Requirements on the QM-system

- PDCA-cycle
- HACCP-system
- Hazard analysis
- Documentation

Resource management
(Plan and control resources)

- Personnel hygiene
- Legal requirements, Checkup inspections
- Social- and sanitary facilities

Production process

- Premises and operating environment
- Site security and Food Defense
- Traceability
- Maintenance, Repairs
- Waste disposal
- Pest control
- Disinfection

Measurements, Analyses, Improvements

IFS: Measurements, Analyses, Improvements

Essential criteria

- Check and adaption of the QM-system

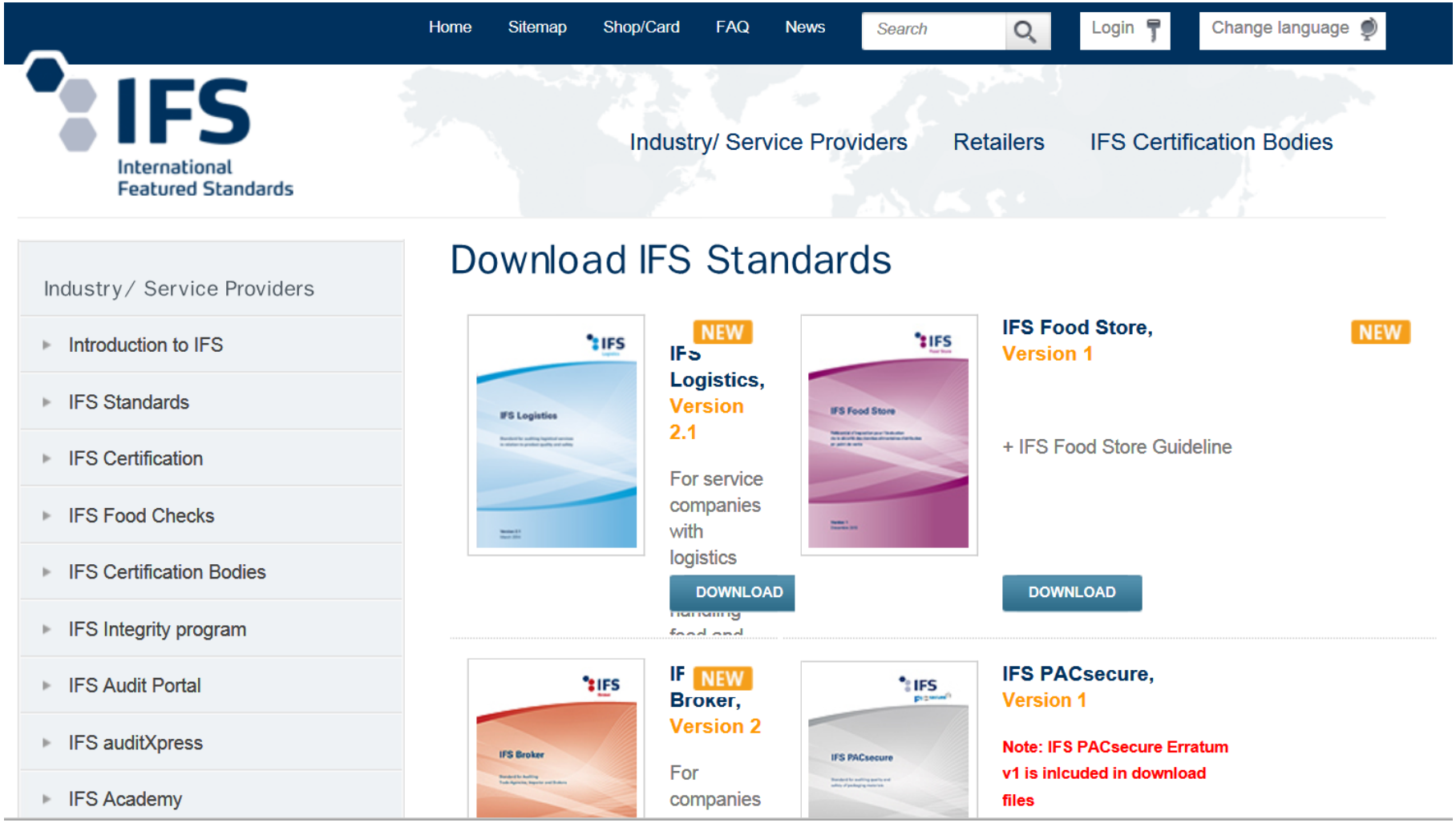
- Requirements for the prevention of product contaminations

Internal audits
Process control
Quantity control
Physical. and chem. risks
Product analysis and -clearance
Complaints
Correntions
Product recalls

GMO, Allergen-Management

- Cereals containing gluten
- Crustaceans
- Eggs
- Fish
- Peanuts
- Soy beans
- Milk (Lactose incl.)
- Nuts
- Celery
- Mustard
- Sesame
- Sulfur and relevant products

Traceability ! (EU VO 178)
Simulation of a recall ?
How do I control the problem ?



http://www.ifs-certification.com/index.php/en/ifs-certified-companies-en/document-download/download-standards

BRC & IFS versus FSSC 22000

	BRC and IFS SCHEMES	FSSC 22000
STRENGTH	• checklist character, very detailed • BRC gives access to the British market • BRC widely accepted	• modular, more logical • easier to implement and maintain • rising trend
WEAKNESS	• bureaucratic and unlogical • lot of technical vocabulary, complicated • audits are getting tremendously resource intensive	

Other standards

Worldwide standard for retailers,
Catering companies,
Fastfood-chains etc.

Safe Quality Food (SQF)

Standard of *SGS* for Food safety

Total Quality Management (TQM)

integrative holistic philosophy of management for continuously improving
the **quality** of **products** + **processes**

Food Quality Management

Food Safety Management

FQ&FS Management Systems

ISO 9000
FSCC 22000
IFS, BRC

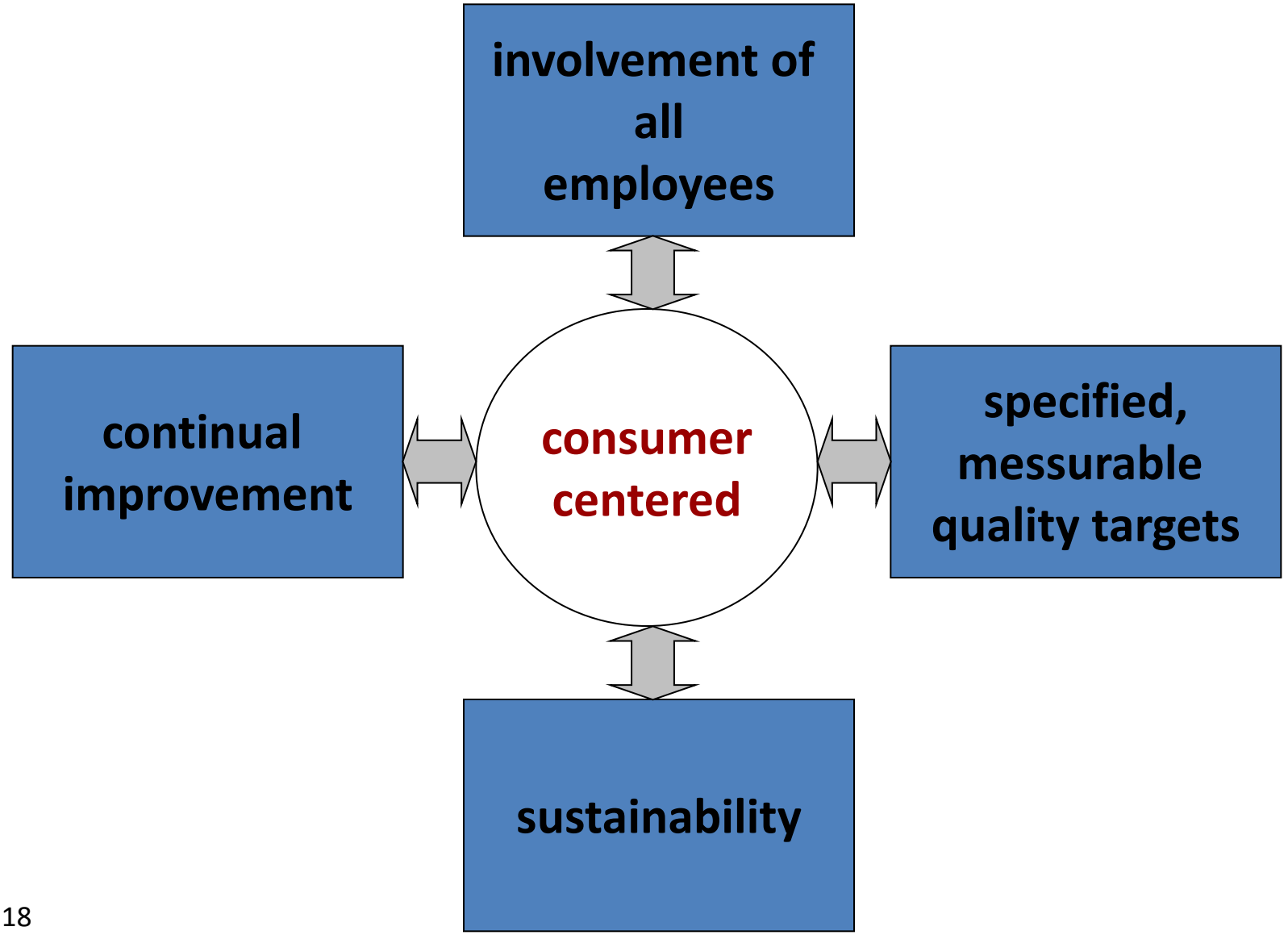
TQM and cont. improvement

Conclusion

Why TQM ?

- ~ **85%** of failures are based on management
- ~ **30%** of labour resources are used to correct failures
- the effort to keep existing cusomers satiefied is ~ **25%** of the effort to acquire new customers
- „quality“ is changing and needs to be permanent monitored and adapted

Main components of TQM



Summarised aims of TQM

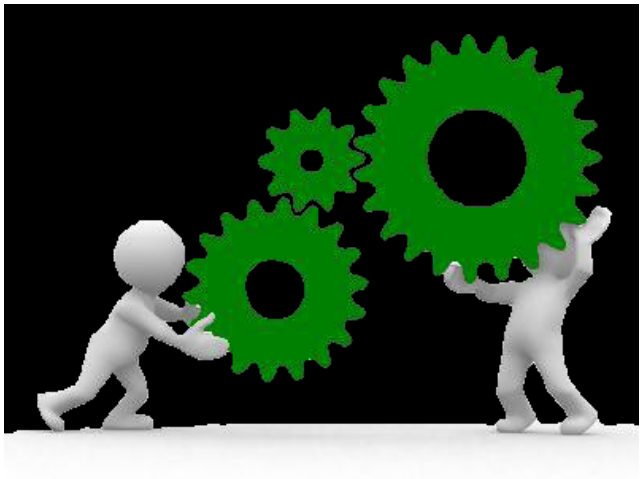
- Fulfil **customer requirements**
- Practice **cooperation**
- **All act** in the **interest of the enterprise**
- Accomplish customer requests in **time**, adhere to delivery dates
- **Award** excellence
- Reduce **costs**
- Improve **human relations** and pleasure of work
- Look for **causes of problems** an not for guilty party
- Establish **confidence**
- **Prevent** failures
- Recognize **co-worker as client**
- **Continual improvement**

Continual Improvement (Kaizen)

Kai	Changes
Zen	to something better

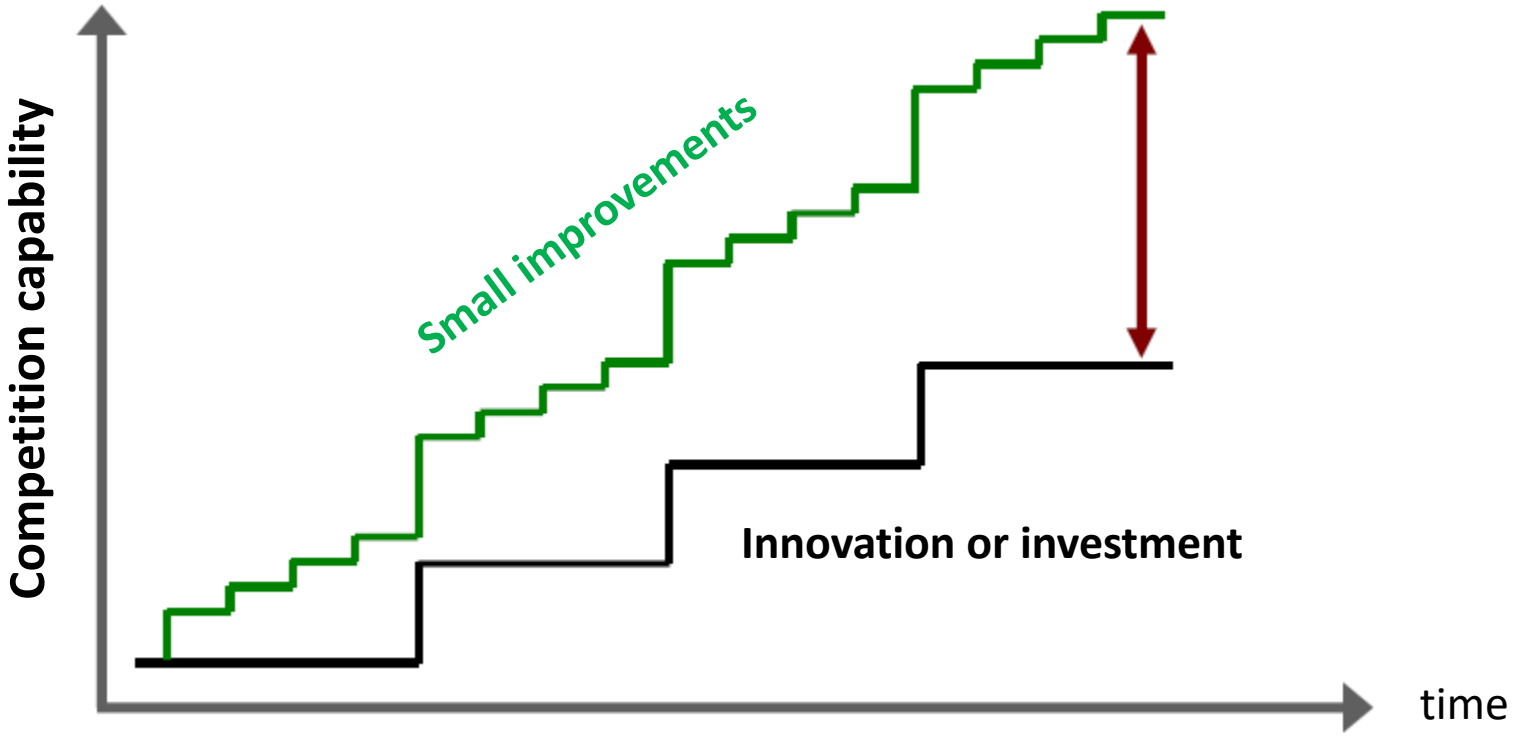
- Use ideas of **all employes** for the benefit of the enterprise

➢ Leads to culture of Innovation, Team work and continual improvement



Continual Improvement (Kaizen)

- CI versus Innovations and Investments



Continual Improvement (Kaizen)

- **Needs also changes in leadership**

"I am the boss, because I know everything best !"

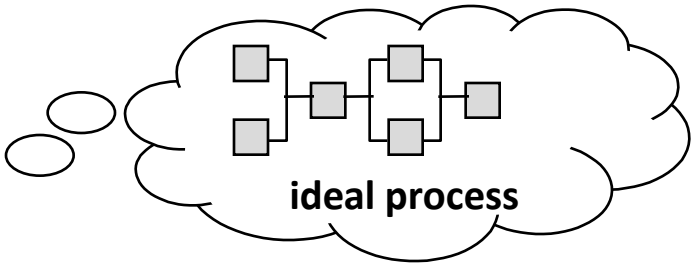
open atmosphere and team work create solutions which can be accepted by everybody

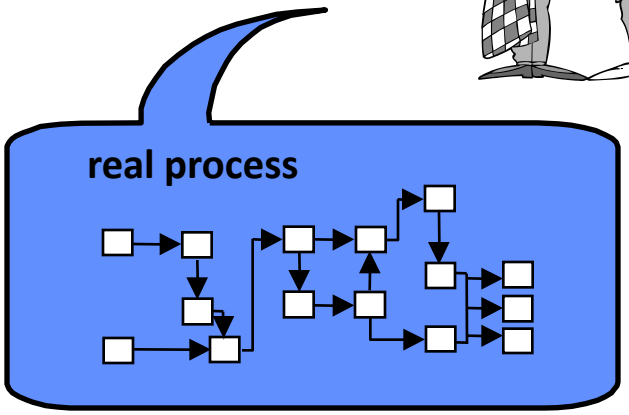
Continual Improvement (Kaizen)

- **Use real place of value making**

Continual Improvement (Kaizen)

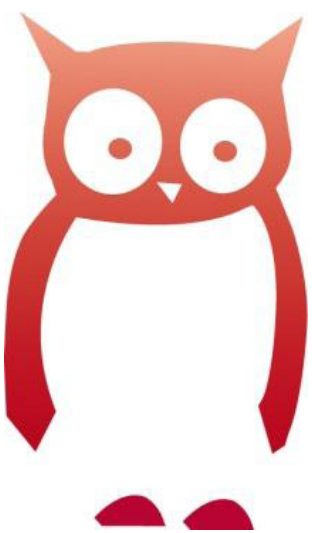
- **The ideal process**

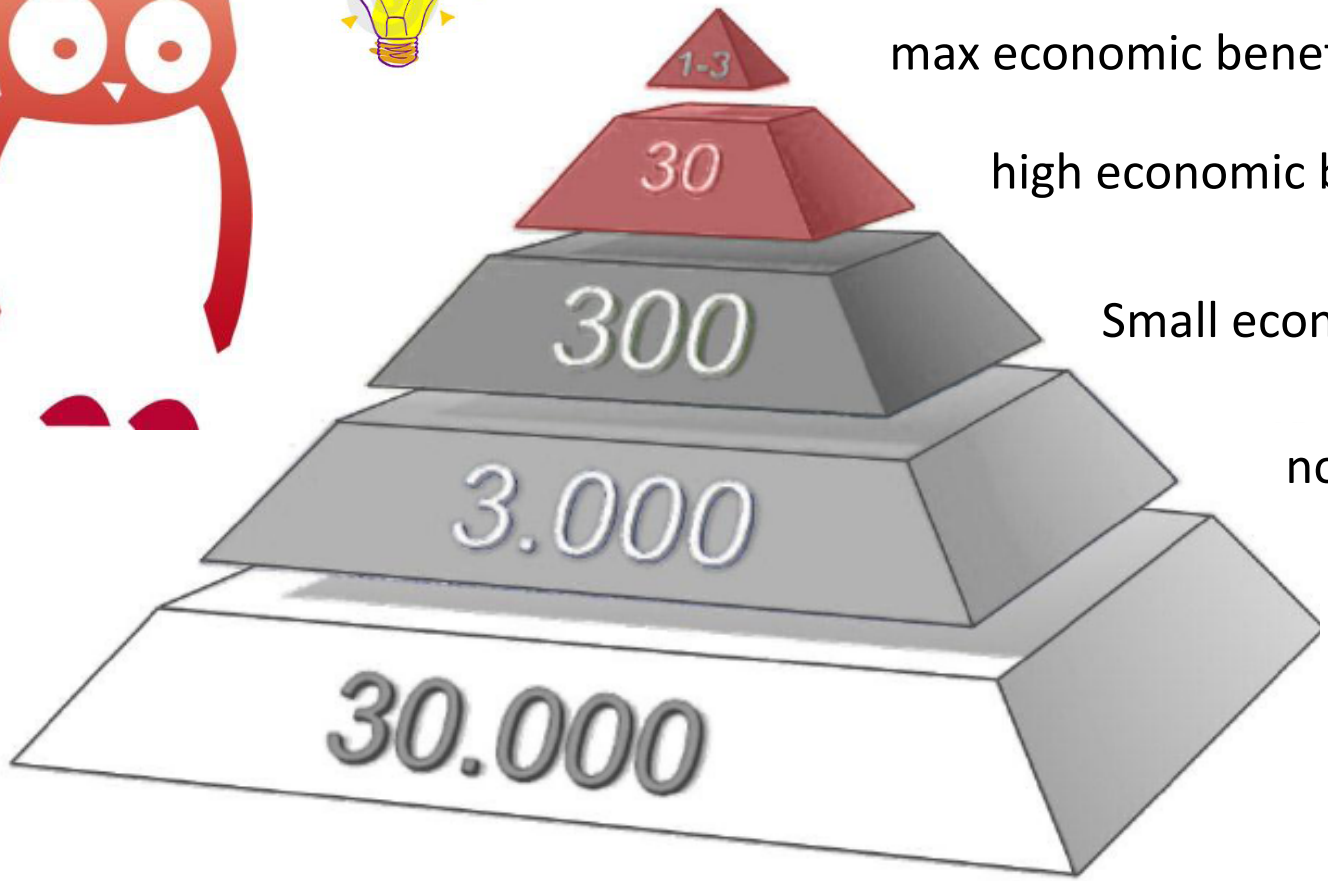




Continual Improvement (Kaizen)

- **pyramid of ideas**





max economic benefit

high economic benefit

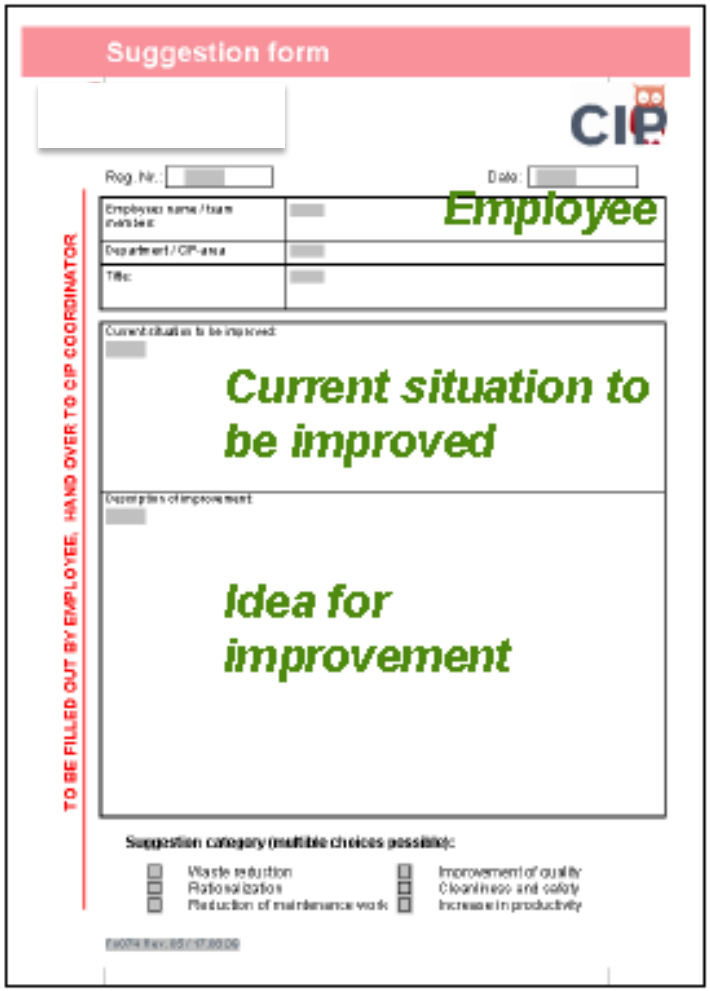
Small economic benefit

no economic benefit

ideas coming from problems

Continual Improvement (Kaizen)

- **Suggestion scheme**



- Employees submit ideas and get awarded
- Ideas must be benecial for organisation, like:
  - reduction of time, resources, waste, …
  - Improvement of process, quality, ..

Continual Improvement (Kaizen)

- **Activity days**
  - To collect ideas actively
  - And enhance team work

5S red cards: improve process

Green cards: look for losses in production

Continual Improvement (Kaizen)

Activity days: 5S red cards

1 Seiri: remove uneccessary items

2 Seiton: clean working place

3 Seiso: keep working place clean

4 Seiketsu: implement rules and standards

5 Shitsuke: keep and improve standards

Continual Improvement (Kaizen)

Activity days: green cards: look for losses of material and time in production

1. **Over production**
2. **stock**
3. **Transport**
4. **Waiting times**
5. **Movement of coworkers**
6. **Overload of work**
7. **Defect products**

Continual Improvement (Kaizen)

How to measure improvement

$$\text{suggestion ratio} = \frac{number\ of\ suggestions}{number\ of\ employees}$$

$$\text{benefit ratio} = \frac{benefit}{number\ of\ employees}$$

$$\text{participation ratio} = \frac{number\ of\ active\ employees}{number\ of\ employees}$$

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Conclusion

- Important to learn from mistakes: Self assessment and Continual improvement
- SMEs are *not able* to cope with the *variety and complexity* of the elaborated, higher standards – must be scaleable
- Basic structure/modules of the three benchmarking standards/schemes *is the same*
- Global GAP: for good agricultural practice, the primary production, esp. for fruits and vegetables

thank you for your attention

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http://www.dlwt.boku.ac.at https://www.iseki-food.net