

**Restructure of CIMO-Guide Part II,
Chapter 3 (Quality Management of Meteorological
Observing Systems):
Changes and Supplements**

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Genf, 6. April 2006

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0. Abstract

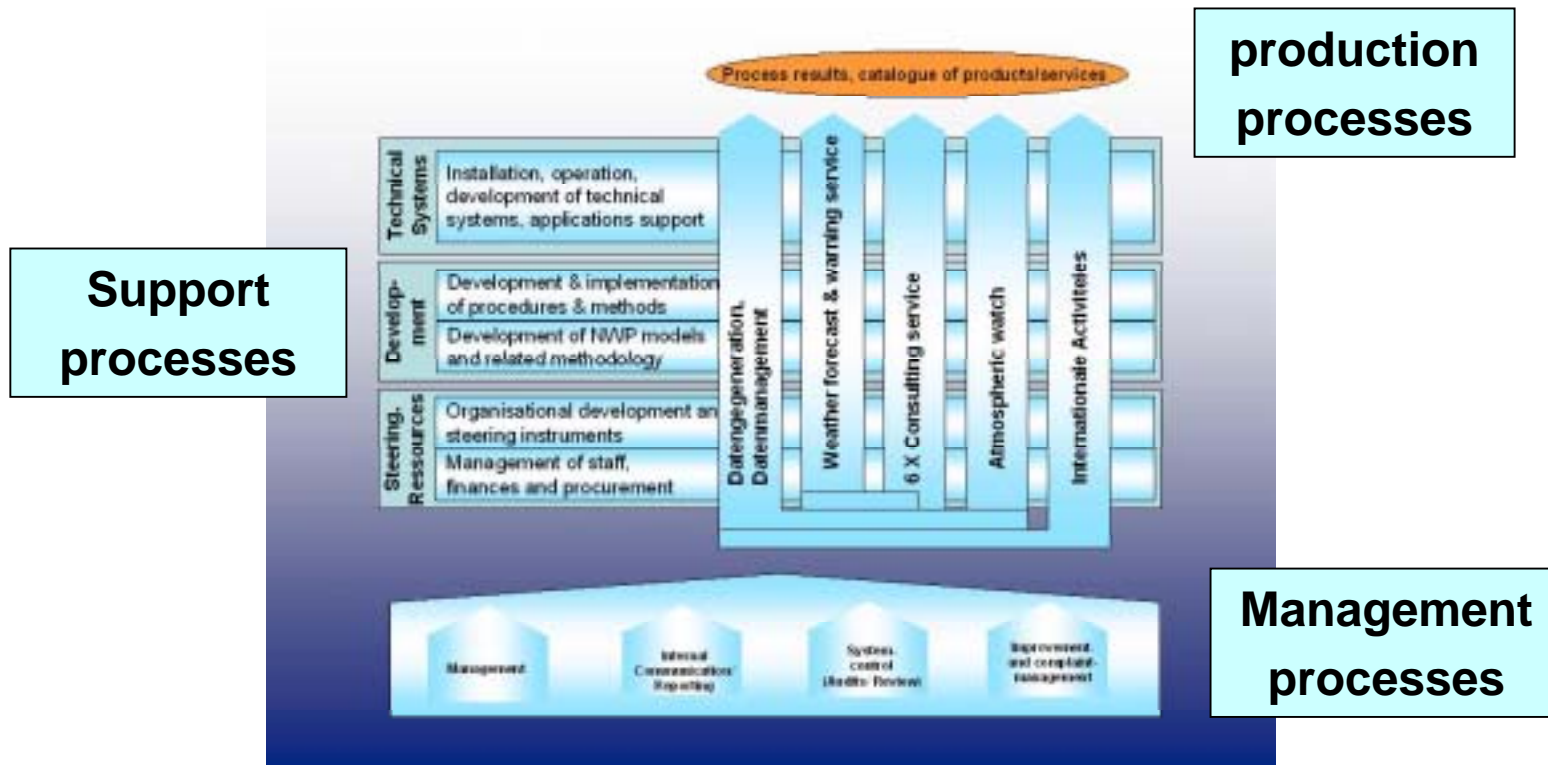
- Restructure CIMO-Guide Part III Chapter 3 for ***Quality Management of Meteorological Observing Systems***
 - ISO 9001:2000 (requirements for quality management systems)
 - ISO 17025:2005 (General requirements for the competence of testing and calibration laboratories)
- Connection to WMO-QM-Framework
- Aspects of IT-Service-Management according ISO 20000:2005

1. Restructure CIMO-Guide Part III

- **Task:** *Study on how to up-date and restructure CIMO-Guide, Part III, “Quality Assurance and Management of Observing Systems” with respect to international quality management guidelines and relevant ISO standards.*
- **Renaming:**
 - *Quality Management in NMHSs and Quality Assurance of Meteorological Observing Systems.*
- **Reason:**
 - *Quality Management covers all processes in NMHS (e.g. financial planning...)*
 - *Quality Assurance (see also definitions in QM-Framework of WMO) concerns the data generation processes, the related support processes and their control*

1. Restructure CIMO-Guide Part III

Process-landscape in a NMHS (e.g. DWD)



1. Restructure CIMO-Guide Part III

New structure and headlines of chapters:

1. Quality Management in **NMHSs** and Quality Assurance
2. **Quality Assurance:** Testing, Calibration, and Intercomparisons
3. Training of Instrument Specialists and **NMHSs-Employees**
4. Sampling Meteorological Variables and **Data Reduction**

2. Updating Chapter 3 of CIMO-Guide Part III

- **Task:** *Propose, in the form of CIMO-Guide text, how to up-date and re-write particularly Part III, Chapter 3 of CIMO-Guide.*

- **Renaming:**
 - *Quality Management **in NMHSs** and Quality Assurance*
- **Reason:**
 - *Quality Management covers all processes in NMHS (e.g. financial planning...)*
 - *Quality Assurance (see also definitions in QM-Framework of WMO) concerns the data generation processes, the related support processes and their control*

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapters:

1. General
2. **ISO-9000-Family, QM-Framework of WMO, ISO 17025 and ISO 20000**
3. **Introduction of a QM-System**
4. **Accreditation of Laboratories**
5. **QM-Tools**
6. **Introduction of TQM**

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapters (continued):

7. Factors Affecting Data Quality
8. Quality Assurance (Quality Control)
9. Performance Monitoring
10. Data Homogeneity and Metadata
11. Network Management
12. **Abbreviations and Definitions of Terms**
13. References

2. Updating Chapter 3 of CIMO-Guide Part III

Structure of Subchapter 2

- 2.1 ISO 9000: Quality management systems: Fundamentals and Vocabulary
- 2.2 ISO 9001: Quality management systems: Requirements
- 2.3 ISO 9004: Quality management systems: Guideline for performance improvements
- 2.4 ISO 19011: Quality management systems: Guidelines for quality and/or environmental systems auditing
- 2.5 QM-Framework of the WMO
- 2.6 ISO 17025: General requirements for the competence of testing and calibration laboratories

2. Updating Chapter 3 of CIMO-Guide Part III

Structure of Subchapter 2

2.7 ISO 20000

Service Delivery

- Service Level Management
- Financial Management
- IT Service Continuity Management
- Availability Management
- Capacity Management

2. Updating Chapter 3 of CIMO-Guide Part III

Structure of Subchapter 2

2.7 ISO 20000 (continued)

Service Support

- Change Management
- Incident Management
- Problem Management
- Release Management
- Configuration Management.

Security management common to both areas



**Adaption of ISO 20000
requirements to NHMS**

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 3 (Introduction of a QM-System)

3.1 Quality Policy

- **The top management defines a quality policy and the quality objectives (quality management commitment).**

3.2 Education and Training

- **The staff members have to be trained in QM topics.**

3.3 Process Analysis and Documentation

- **Write down, what you do**
- **Do what you have written down**
- **Prove it**
- **Improve permanently the processes**

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 3 (Introduction of a QM-System)

3.4 Realisation and Implementation

- Optimised processes
- Customer focus
- Definition of Quality objectives
- Training of employees

3.5 Evaluation and Process Control

- Carrying out internal audits
- Measure the processes
- Recommended: Pre-audit by the certification organisation
- Certification audit
- Improve permanently the processes

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 3 (Introduction of a QM-System)

Process organisation in the NMHS

- The main processes part of the processes described (see Slide5):
 - Forecast-processes (including hydrometeorological, agrometeorological, human-biometeorological aspects), weather warning
 - Consulting services (including climate and environment)
 - Data generation (from measurement nets)
 - International affairs
 - Research and development (GM-, LM-models)
 - Technical Infrastructure (Computing devices (PC, Supercomputer), communication (WLAN), Services for measurement equipment, data management, IT-service management)
 - Administration processes (Purchasing, financial and personnel-management, organisation, administration offices and immoveables, knowledge management, central planning and controlling, legal affairs)

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 3 (Introduction of a QM-System)

Process organisation in the NMHS

- Recommendation:
 - implement also regulations for the remedying of perturbations and incidents (e.g. failure of systems, accidents of employees).

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

Two following aspects must be fulfilled

- Management requirements (Chapter 4 in ISO17025)
- Technical requirements (Chapter 5 in ISO17025)

That means:

- QM-System must exist (all requirements of ISO 9001)
- QM-Manual (however named) for the laboratory
- Internal Audits
- Management-Review
- processes verified and validated
- QM-representative (respectively quality-manager) and head of the laboratory have to be nominated

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

Preparation of accreditation

- extensive documentation of the processes and methods
- trained employees
- internal auditing
- mastered processes and methods
- regulated responsibilities
- check of inquiries, offers and contracts
- controlled subcontractors (further calibration laboratories).

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

Documentation

- The documentation must contain the following aspects:
 - **management manual for the laboratory**
 - the **minimum process descriptions** (ISO 9001)
 - the documentation of all processes/methods
 - **work instructions for all partial steps** in the processes/methods
 - **equipment books** (manual including calibrating certificate)
 - **maintenance books**



**Accreditation-procedure
can be started**

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

Pre-audit

- recommended.
- main emphases are there:
 - Assessment of the personnel and spatial prerequisites
 - Assessment of the management system on suitability
 - Check of the documentation
 - Coordination of the scope.

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

Accreditation procedure

- 2 parts:
 - the assessment of the documentation and
 - the assessment of the examining laboratories themselves.

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

a) Assessment of the documentation

- check of the following documents:
 - management manual (or laboratory guide)
 - procedure instructions
 - work instructions
 - test instructions
 - equipment books
 - maintenance books
 - proof documents (e.g. training proofs)
 - records (e.g. over correspondences with the customer, calibration certificates,)
- **Important: All aspects of the standard ISO 17025 will be checked!**

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

b) Assessment of the laboratories

- assessment of the examining laboratories
 - The assessment of the staff (training, responsibility) and
 - The assessment of the rooms.

- The following aspects become particularly checked
 - Realization of the objectives of management
 - Organizational construction
 - The qualification of the staff
 - Adequacy/qualification of the technological facilities
 - Cooperation with the customers.

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

b) Assessment of the laboratories (continued)

- laboratory has to establish proof of
 - **Technical competence (choice and use of the examining and measuring tools)**
 - **Calibration of measuring tools**
 - **Maintenance of measuring tools**
 - **Reduction of the measurements on normals**
 - **Verification and Validation of methods.**
- Also corresponding measures (like ring tests)

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 4 (Accreditation of Laboratories)

Benefits and disadvantages of an accreditation

- Proving the competence in meteorological measuring and test methods.
- assessment of the measuring devices provided by suppliers
- disadvantages: increased effort.
- This is particularly valid if no a quality management system is introduced.

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 5 (QM-Tools)

- Basic tools of QMS like
 - Balanced Score card (BSC)
 - Ishikawa
 - FMEA
 - 6 Sigma

2. Updating Chapter 3 of CIMO-Guide Part III

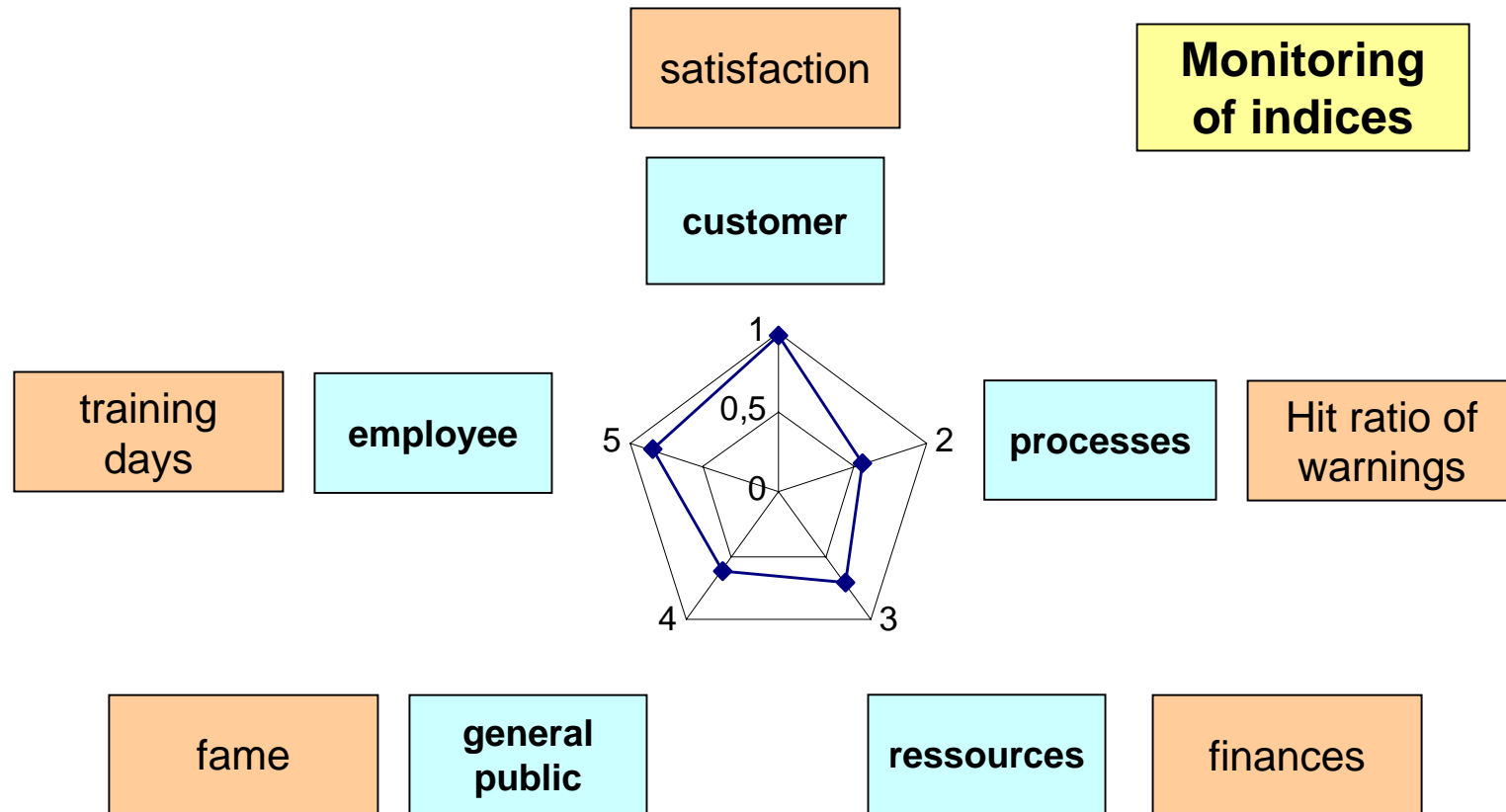
Subchapter 5 (QM-Tools): BalancedScoreCard

- **Balanced Score Card (BSC):**
 - 4 (5) views
 - *Finances*
 - *Customer*
 - *Processes*
 - *Employee*
 - *(General public)*
 - Mission (purpose of the organisation)
 - Vision (Goals of organisation)
 - Strategy (working mission and vision)

**Driver for QM
of NMHS**

2. Updating Chapter 3 of CIMO-Guide Part III

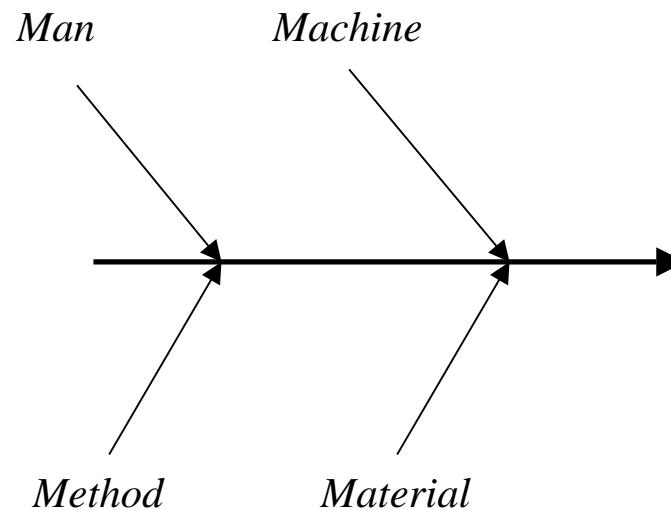
Subchapter 5 (QM-Tools): BalancedScoreCard



2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 5 (QM-Tools): Ishikawa-Diagramm

Visualisation of connections



2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 5 (QM-Tools): FMEA (Fault mode and effects analysis)

Error significance

B=110

without influence injury employee

Error cause

A=110

< 2ppb more than once/1 day

**Probability of error
detection**

E=110

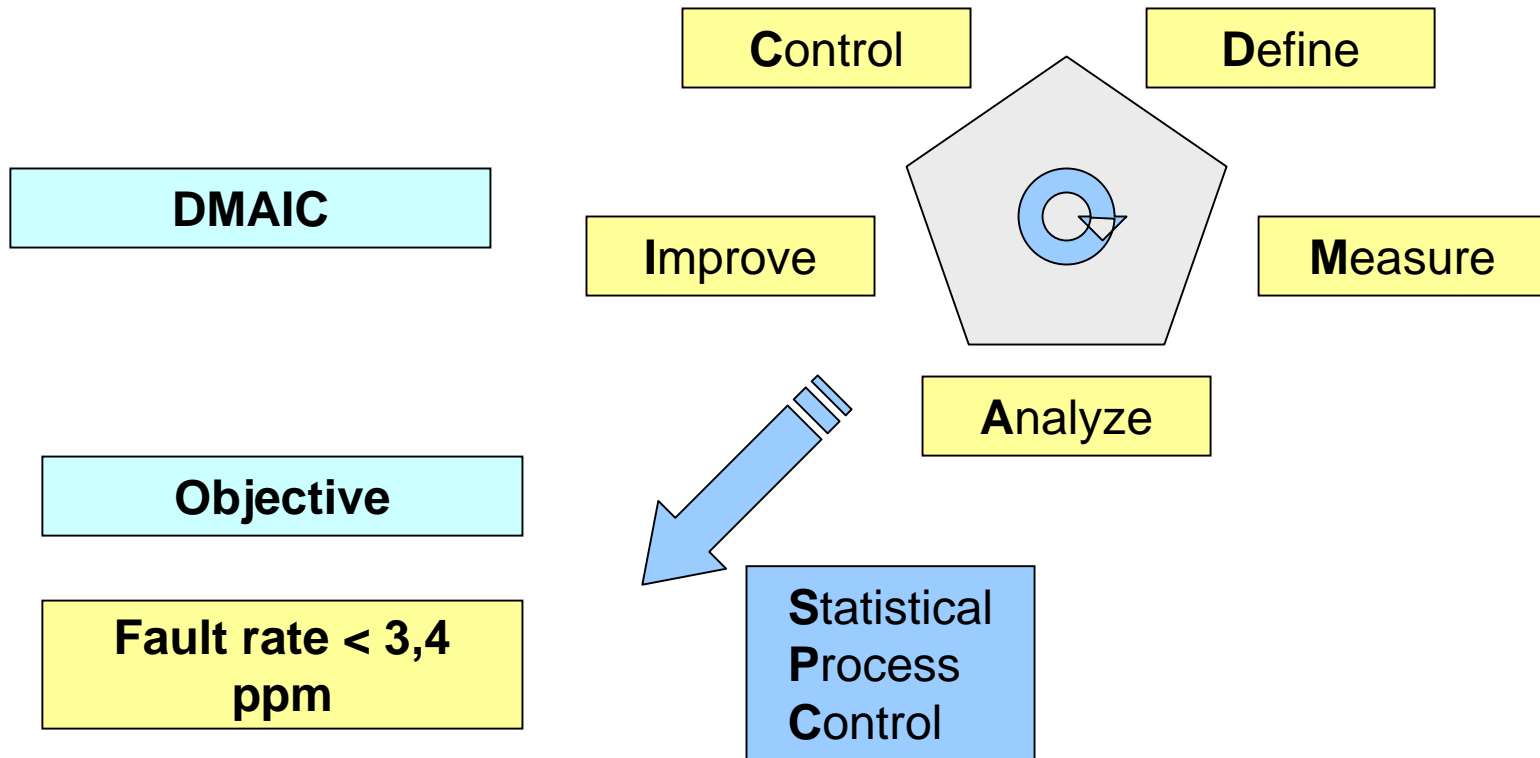
evident not perceptible

**Risk priority
number**

RPN = B•A•E = 11000

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 5 (QM-Tools): Six-Sigma



2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 6 (Introduction of TQM)

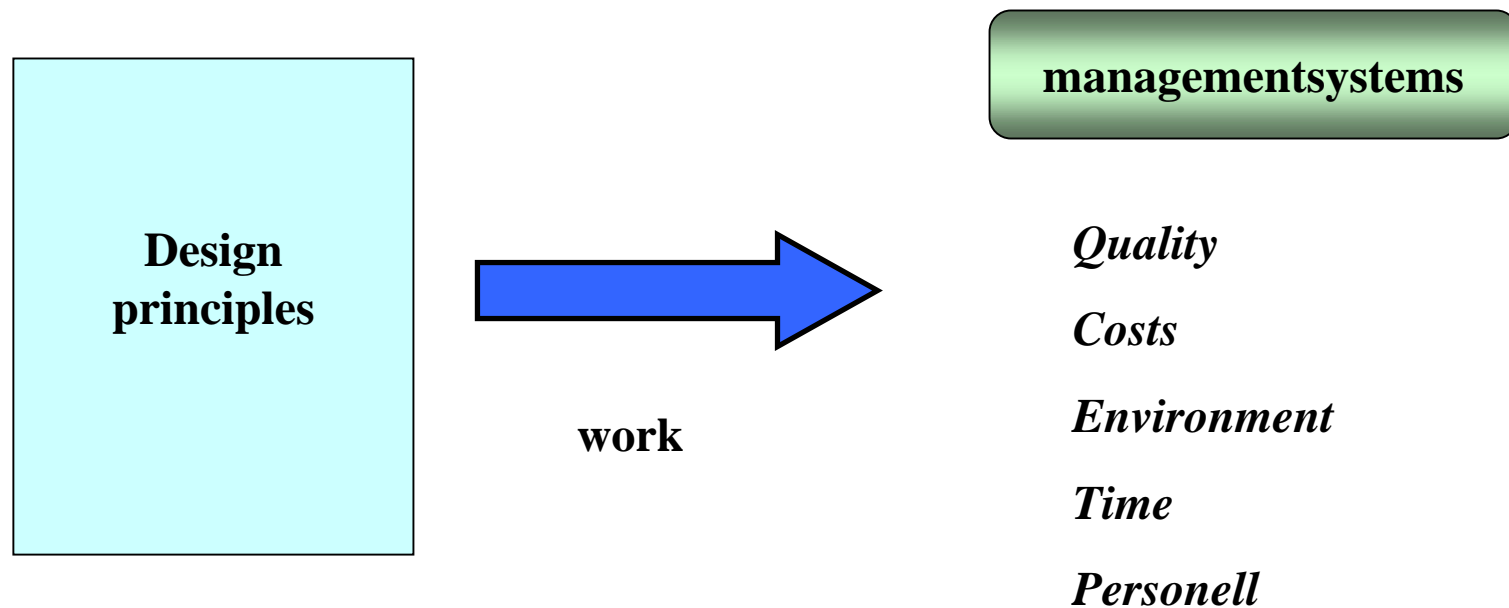
Changed point of view

- existing QMS is developed toward a system according to an excellence model (e.g. EFQM)
- Guidelines for performance improvements (ISO 9004)

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 6 (Introduction of TQM)

- TQM = Total Quality Management = all including management



2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 6 (Introduction of TQM)

TQM-concepts

- **EFQM** *European model for excellence*
- **Malcolm Baldrige** *MBNQA (Malcolm Baldrige National Quality Improvement Act (USA))*

2. Updating Chapter 3 of CIMO-Guide Part III

Subchapter 6 (Introduction of TQM)

Management-principles EFQM-model

- Customer focus
- Partnership with suppliers
- Involvement of people
- Processes and facts
- Continual Improvement and Innovation
- Leadership and goal pursuits
- Social (General public) responsibility
- Product focus

3. Proposals for Updating chapters 1, 2, 4, 5 of CIMO Guide Part III

- **Task:** *Investigate how to adapt the other Chapters to present international quality management guidelines and relevant ISO standards and make proposals in the form of CIMO-Guide text.*
- **Chapter 1 (Sampling Meteorological Variables):**
 - *Quality Control Concept should be added*
 - *Add Chapter 2 (Data reduction)*
 - *Renumbering*
 -

3. Proposals for Updating chapters 1, 2, 4, 5 of CIMO Guide Part III

Chapter 2 (Data Reduction):

- This chapter should be merged with chapter 1.
- The subchapter 2.8 Quality management should be renamed to Quality control, because there are only described quality control procedures

3. Proposals for Updating chapters 1, 2, 4, 5 of CIMO Guide Part III

Chapter 4 (Training of Instrument Specialists):

- The chapter should be renamed in **Training of Instrument Specialists and NMHSs-Employees**, because all other people within the organization have to be trained for instruments and QM-basics.
- Addition can be made in subchapter **General: IT-Service management**
- Class I Specialists specification: complete to (h), **Concepts of IT-Service Management**, to (i), **IT-Service Management understandings** and add (n) **QM-Reporting of process indices and related topics**.

3. Proposals for Updating chapters 1, 2, 4, 5 of CIMO Guide Part III

Chapter 4 (Training of Instrument Specialists) (continued):

- Class II Specialists specification: add (o) **Carrying out and Monitoring of IT-Services** and (p) **Reporting of process indices and related topics.**
- Class III Specialists specification: add (k) **Carrying out and Monitoring of IT-Services** and (l) **QMS basics,**
- Class IV (Instrument content): add (k) **Basic IT Updating and Service procedures** and add (l) **Basic QMS understanding**
- For Managers: add (d) **basic principles of QM standards (ISO 9000-Family), Accreditation (ISO 17025) and IT-Service-management (ISO 20000).**

3. Proposals for Updating chapters 1, 2, 4, 5 of CIMO Guide Part III

Chapter 4 (Training of Instrument Specialists) (continued):

- For Trainers: add (e) **Continual Improvement in QMS**.
- For Trainers and Instrument Specialists: add (k) Quality Control (QC) basic concepts from ISO 9001 resp. ISO 17025.
- Chapter **Training for quality**: Delete: The discipline 1986) and replace with **In a QMS according to ISO 9001** ..., and delete TQM and replace with **QMS**
- Chapter Distance Learning: add **Internet** resp. **Elearning via Internet**.
- References: Correct the citation of ISO Standards.
- Renumber the chapter from 4 to 3.

3. Proposals for Updating chapters 1, 2, 4, 5 of CIMO Guide Part III

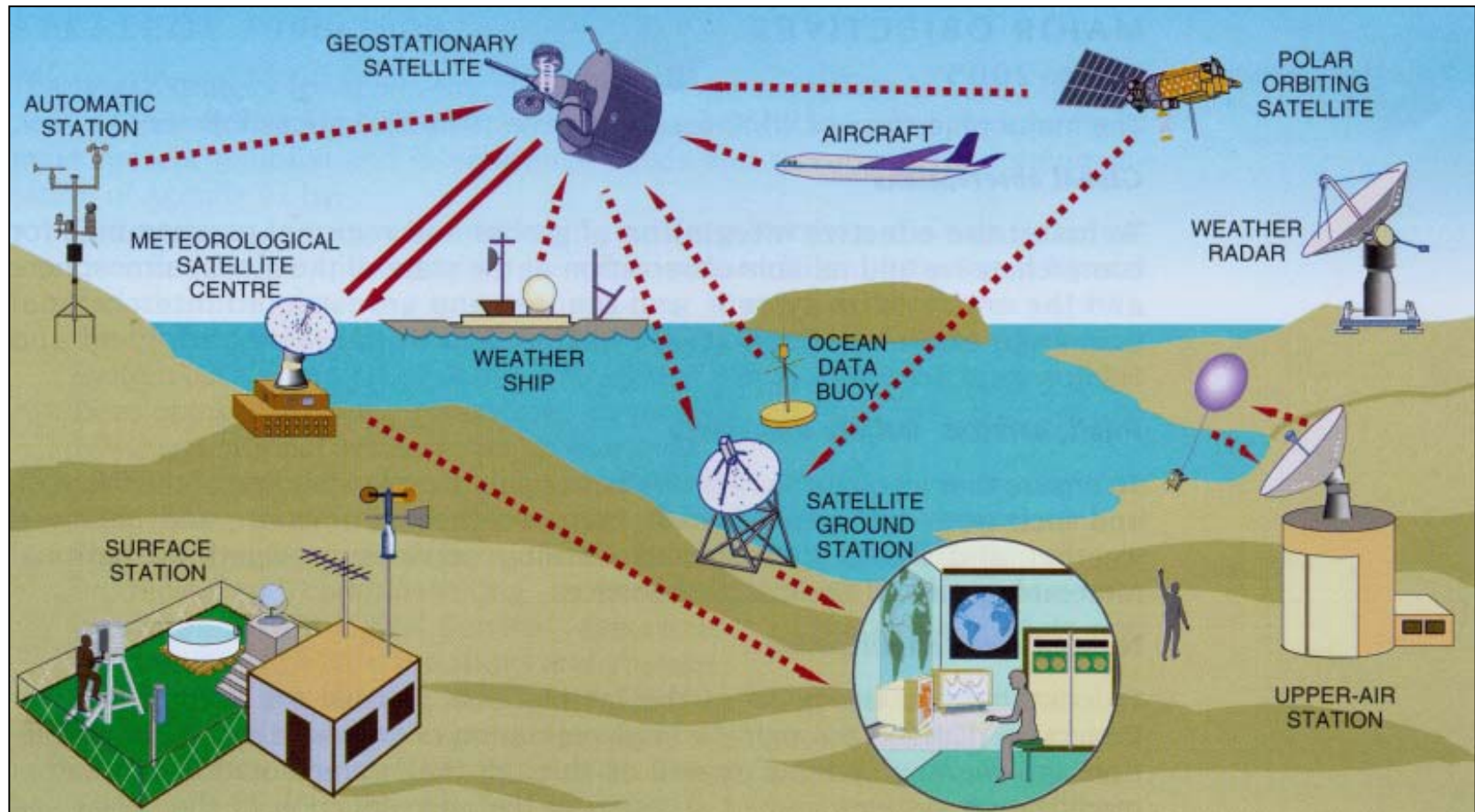
Chapter 5 (Testing, Calibration, And Intercomparison)

- The second reference (ISO 2859-1) is updated in 1999 and has got a technical corrigendum in 2001.
- The chapter 5 should be renumbered to chapter 2.
- The chapter should be renamed to **Quality Assurance: Testing, Calibration, and Intercomparisons.**

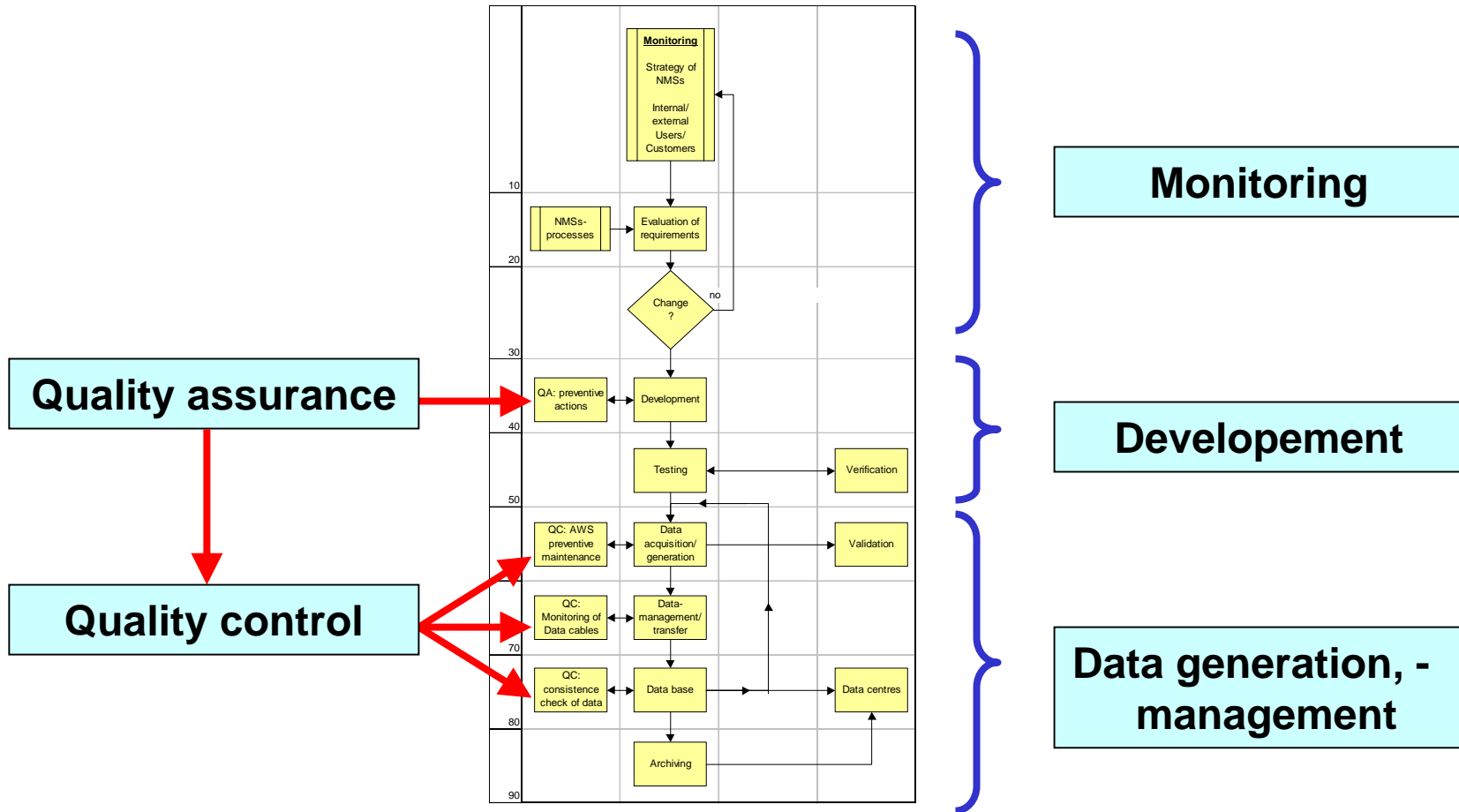
4. Work Process for Observation Generation

- **Task:** *Study and draft the work processes typical for observation generation as regards the instruments and methods of observation sector.*
- **General work process**
 - periodical process consisting of three parts (Monitoring, Development of new sensors or measurement systems and Data generation/management)
 - The work process for observation generation is a periodical process
 - The process is almost generic (can be adapted to the specific network of meteorological measurement stations).

4. Work Process for Observation Generation



4. Work Process for Observation Generation



5. Conclusion

- **Restructure CIMO Guide part III**
 - *emphasizing of QM*
 - *integration of all employees in training activities*
 - *Integration of ISO 17025 (Requirements for accreditation)*
 - *Integration of ISO 20000 (IT-Service-Management)*

- **Integration in QM-Framework**
- **Periodically Updating**
 - Reason: Changes in ISO-standards

5. Conclusion

Questions?