



Quality management for building performance

QUANTUM-REHVA Guidebook Task Force

Quality Management for Buildings - Improving Building Performance through Technical Monitoring and Commissioning

Dr. Stefan Plesser, Technical University Braunschweig

Ole Teisen, Sweco Danmark A/S



Building Standards

& Innovation > Participant Portal > Opportunities

OPPORTUNITIES HOW TO PARTICIPATE PROJECTS & RESULTS EXPERTS SUPPORT ▾ LOGIN REGISTER

TOPIC : New tools and methodologies to reduce the gap between predicted and actual energy performances at the level of buildings and blocks of buildings

Topic identifier: EeB-07-2015
Publication date: 11 December 2013

Types of action: IA Innovation action

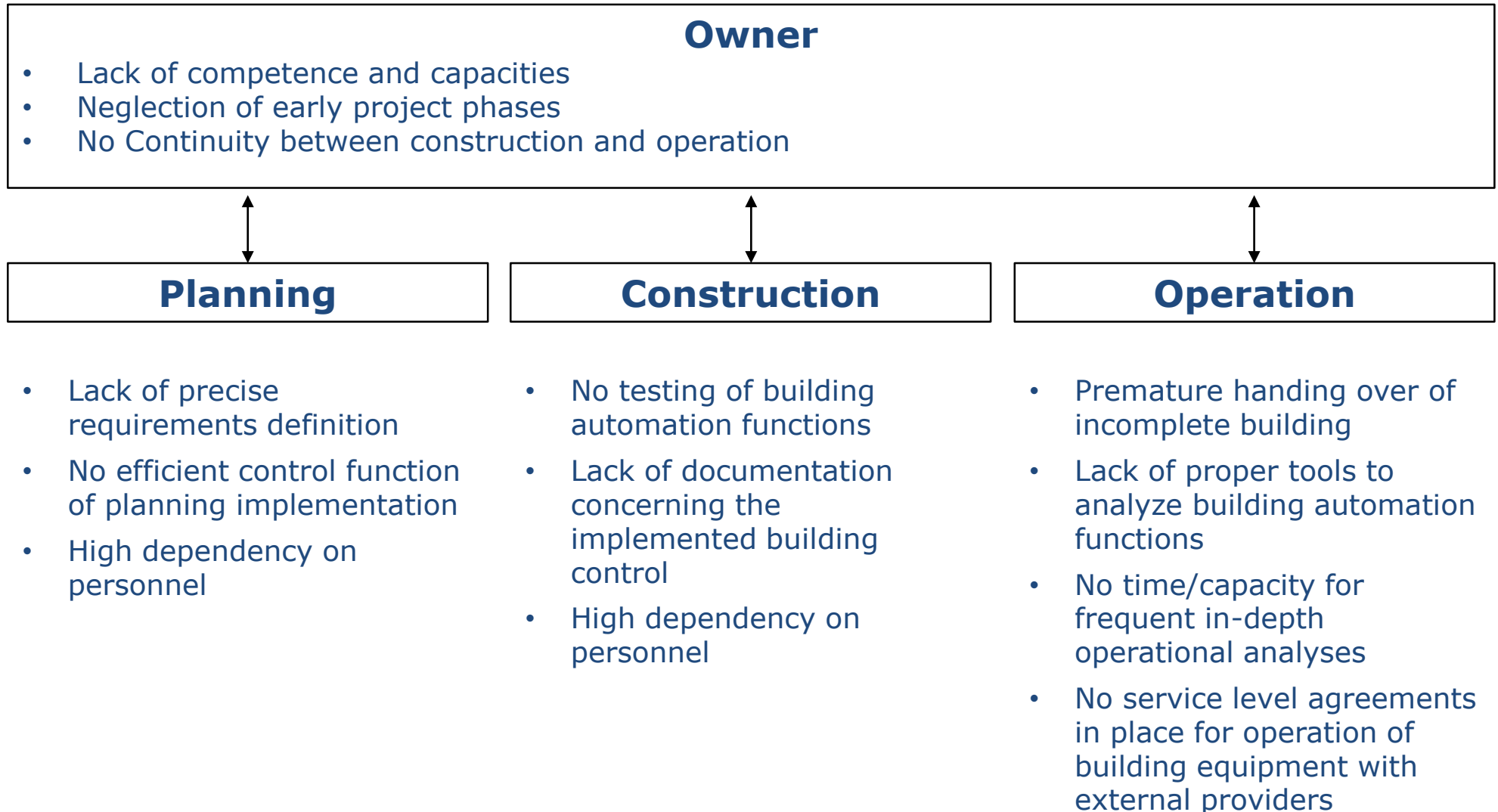
DeadlineModel
Opening date: Scope: At building level, the research focus is on developing methodologies and tools to monitor and assess actual building energy performance, considering relevant factors such as user behaviour, complex energy systems performance and weather forecast, and to be able to predict accurately building energy loads and consumption along the whole lifecycle. The new methods and tools could include energy performance diagnostics for predictive maintenance (related to different construction typologies and their thermal behaviour), to provide the accuracy required to properly value retrofit technologies and support decision making during the different stages in the life of the buildings. The effective monitoring and management of energy flows to reduce energy consumption and to ensure that the building is operated in a way that meets design intent should also be addressed. Common indicators, measuring technologies and data analysis methods should be developed to monitor building performance during operation.

Horizon 20

Topic Descripti

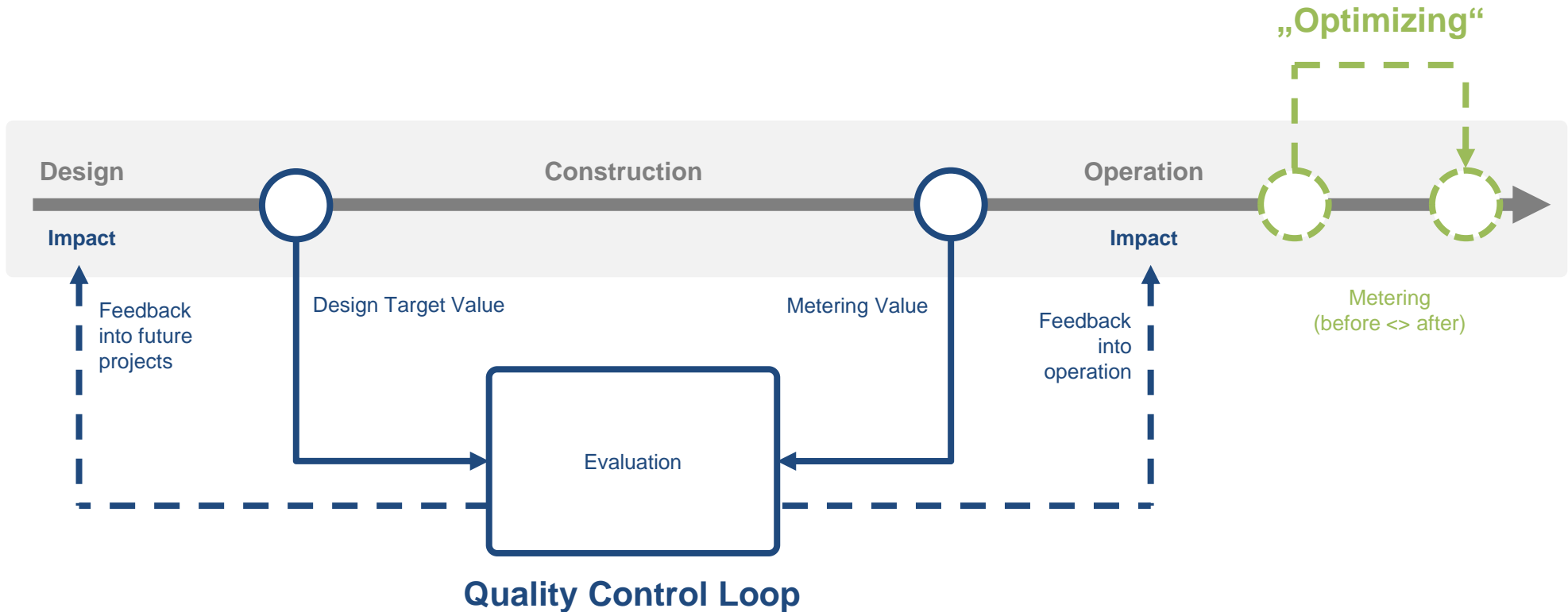
A holistic “open” approach to building control and monitoring systems is required, integrating any possible existing control and monitoring infrastructure. The commissioning, sign-off and maintenance phase should be addressed. High quality, reliable and non-intrusive (including wireless) data acquisition methodologies are also needed. A positive impact on health and safety (e.g. hygienic aspects of ventilation or DHW systems) as well as comfort is an aspect to consider.

Challenges for Building Performance: Excessive Demand



Guidebook

Quality Control Loop to check for fulfillment of requirements.



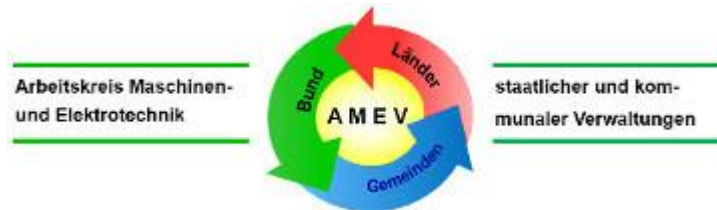
Guidebook for decision makers

| | TMon | Cx |
|--|---|---|
| Nomination of a Cx service provider | Contract service provider | Contract service provider |
| OPR | | Write OPR with Building Owner or give guidance to Building Owner |
| BoD | | Give guidance to Design Engineers for writing BoD and check BoD on compliance with OPR |
| Commissioning Plan | Describe TMon Process in the project | Describe Cx Process in the project |
| Cx in the Design Phase | Derive target values for building and system operation and specify testing procedures | Check Design on compliance with OPR |
| Cx in the Construction Phase | | Check Construction on compliance with OPR |
| Cx in the Startup Phase | Check data from trial operation against target values and report | Check startup procedures, prerequisites for testing systems functions and cross system functions and report |
| O&M Manual, Systems Manual | | Review O&M and system manuals on completeness, timeliness, consistency and plausibility |
| Training for O&M Personnel | | Check schedule and execution of training |
| Training for building occupants during operation | | Check schedule and execution of training |
| Commissioning in building operation | Check data from ongoing operation against target values and report | Check data from ongoing operation against target values and report |



AMEV Recommendation Technical Monitoring

- Official call for quality management in construction projects and for existing buildings in order to ensure that technical and economic potentials are reached in normal operation
- Clear definition of the work packages, services, and results in order to request Technical Monitoring in public tenders
- First to define the role of quality management as a third party service in construction projects



AMEV: Working committee at the German Ministry of Interior, Building and Community



— AMEV Recommendation Technical Monitoring

- Derive target values from design
- Recommendations for project setup

- Definition of services of the TMon service provider
- Definition of services of others (e.g. engineer, contractor)
- Requirements for monitoring concepts and reports
- Advice on cost, effort, potential and financing

- Working documents
 - Annex 1: Text modules for TMon services
 - Annex 2: Required services of engineers
 - Annex 3: Required services of contractors
 - Annex 4: Minimum requirements for buildings & systems test parameters
 - Annex 5: Advice on metering devices and data management

— Key steps for the implementation of Technical Monitoring

Step 1: Design

- Definition of technical objectives
- Definition of testing procedures

Step 2: Trial operation

- Run trial operation under specified conditions (1-4 weeks)
- Hand over operation data
- Evaluate operation data and report

Step 3: Continuous or repeated testing

- Monitoring
- Quarterly or annual testing



Guidebook for decision makers

| | TMon | Cx |
|--|---|---|
| Nomination of a Cx service provider | Contract service provider | Contract service provider |
| OPR | | Write OPR with Building Owner or give guidance to Building Owner |
| BoD | | Give guidance to Design Engineers for writing BoD and check BoD on compliance with OPR |
| Commissioning Plan | Describe TMon Process in the project | Describe Cx Process in the project |
| Cx in the Design Phase | Derive target values for building and system operation and specify testing procedures | Check Design on compliance with OPR |
| Cx in the Construction Phase | | Check Construction on compliance with OPR |
| Cx in the Startup Phase | Check data from trial operation against target values and report | Check startup procedures, prerequisites for testing systems functions and cross system functions and report |
| O&M Manual, Systems Manual | | Review O&M and system manuals on completeness, timeliness, consistency and plausibility |
| Training for O&M Personnel | | Check schedule and execution of training |
| Training for building occupants during operation | | Check schedule and execution of training |
| Commissioning in building operation | Check data from ongoing operation against target values and report | Check data from ongoing operation against target values and report |

Commissioning

- Defining up owners requirements for the building (OPR)

| | Owners project requirement |
|------------------------------------|---|
| Room temperature | <ul style="list-style-type: none"> # room temperature min.: 21 °C, max.: 26°C # only short-term overrun time in summer > 32 °C # user possibility setpoint adjustment +/- 2K |
| Air quality | <ul style="list-style-type: none"> # Room without connection to the facade the conditioning should be adjusted to other office rooms # mechanical ventilation and exhaust ventilation # draughts should be avoided # relative humidity min.: 30% # room humidity according to recommendation (depending on room temperature) |
| Lighting | <ul style="list-style-type: none"> # consistent and glare-free spotlighting of the workplaces # with direct and indirect light component # LUX-amount according to recommendations |
| Sun protection (insulation) | <ul style="list-style-type: none"> # outside, motor control # inside, mechanical control |

Commissioning

- Defining up owners requirements for the building
- Planning the quality management process
- Cx in Design
- Cx in Construction and Testing Phase



Commissioning

- Defining up owners requirements for the building
- Planning the quality management process
- Cx in Design
- Cx in Construction and Testing Phase
- O&M and Systems Manuals
- Training and information



Landeskapitäl | HANNOVER | Fachbereich Jugend und Familie

KITA KARL-IMHOFF-WEG
Die Kita wird gemeinsam von der Niedersächsischen Landesregierung und der Niedersächsischen Bundesagentur für Arbeit verwaltet. Die Betriebskosten werden von der Niedersächsischen Bundesagentur für Arbeit übernommen.

BELEUCHTUNG
FLURLEISTE
HAARLEISTE
FENSTER
DEPTE

SONNENSCHUTZ

LÜFTUNG_KÜHLUNG
NACHTSTREBEN
TAUSETZER

SONNENSCHUTZ_BELEUCHTUNG

LÜFTUNG

HEIZUNG

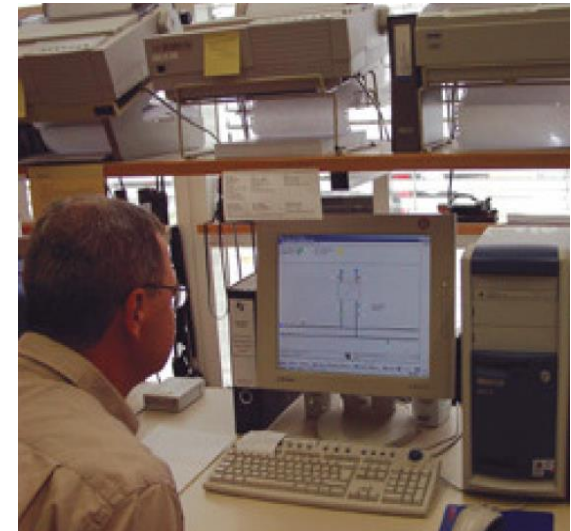
STÖRMELDER OBERHALB DER TÜR ZUR TECHNIENZENTRALE
 WENN ETWAS MIT DER TECHNIK NICHT STIMMT, NUTZEN DIE BITTE FOLGENDEN KONTRAKT

energy **DBU**

FRAU WÜRRIEHAUSEN-SEELIG (ITALIENUNG) OTTO-RHEINHOLD-WEG 1
KARL-IMHOFF-WEG@STEFANSTIFT.DE 30563 HANNOVER
 T: 0511 / 32103006
 M: 0517 / 73360660

— Commissioning

- Defining up owners requirements for the building
- Planning the quality management process
- Cx in Design
- Cx in Construction and Testing Phase
- O&M and Systems Manuals
- Training and information
- Commissioning in Building Operation



Technical Monitoring vs. Commissioning

Both services are important, but:

TMon:

- Robust
- Cost effective
- Transparent
- Fast
- Digital

→ Scalable on European building stock!

| | TMon | Cx |
|--|---|---|
| Nomination of a Cx service provider | Contract service provider | Contract service provider |
| OPR | | Write OPR with Building Owner or give guidance to Building Owner |
| BoD | | Give guidance to Design Engineers for writing BoD and check BoD on compliance with OPR |
| Commissioning Plan | Describe TMon Process in the project | Describe Cx Process in the project |
| Cx in the Design Phase | Derive target values for building and system operation and specify testing procedures | Check Design on compliance with OPR |
| Cx in the Construction Phase | | Check Construction on compliance with OPR |
| Cx in the Startup Phase | Check data from trial operation against target values and report | Check startup procedures, prerequisites for testing systems functions and cross system functions and report |
| O&M Manual, Systems Manual | | Review O&M and system manuals on completeness, timeliness, consistency and plausibility |
| Training for O&M Personnel | | Check schedule and execution of training |
| Training for building occupants during operation | | Check schedule and execution of training |
| Commissioning in building operation | Check data from ongoing operation against target values and report | Check data from ongoing operation against target values and report |

Cx:

- Sophisticated
- Complex
- Expert-based
- Slow
- On-site

→ Limited potential!

Who are we addressing?

Decision-makers, not experts!

| Stakeholder | Opportunities |
|---------------------|---|
| Building owners | <ul style="list-style-type: none">● have a fully operational building on day one of use● reduce cost for energy, maintenance and claim management● reduce cost overruns |
| Engineers | <ul style="list-style-type: none">● improve transparency in owners requirements● accelerate handover● reduce claim management |
| Contractors | <ul style="list-style-type: none">● improve transparency in engineering requirements● accelerate handover● reduce claim management |
| Facilities Managers | <ul style="list-style-type: none">● improve building operation● reduce user complaints● reduce staff cost |
| Users | <ul style="list-style-type: none">● improve user acceptance and productivity● reduce sick leave through healthier indoor environment |

— To be approved today

GUIDEBOOK TITLE PROPOSAL

1) **Quality Management for Buildings**

Technical Monitoring and Building Commissioning

2) **Quality Management for Buildings**

Improving Building Performance through Technical
Monitoring and Commissioning



— To be approved today

REVIEWERS PROPOSAL

- **Bonnie Brook**
 - **Andres J. Sepúlveda**
 - **Oliver Baumann**
-
-