



Quality management for building performance

CLIMA 2019, Bucharest

The QUANTUM Project –

New Standards, Tools and Services for Quality Management of Building Performance

Dr.-Ing. Stefan Plessner



Why Quantum?

CLIMA 2019

Built environment facing climate change

REHVA 13th HVAC World Congress

26 - 29 May, Bucharest, Romania

A photograph of a modern building's exterior, showing a grid of large windows. The windows reflect the surrounding environment, and some show interior office spaces with desks and chairs. A semi-transparent green rectangular box is overlaid on the right side of the image, containing the main text.

Smart Buildings don't work by itself!

Why Quantum? - The Gap

The Call

EeB-07-2015 - New tools and methodologies to reduce the gap between predicted and actual energy performances at the level of buildings and blocks of buildings.

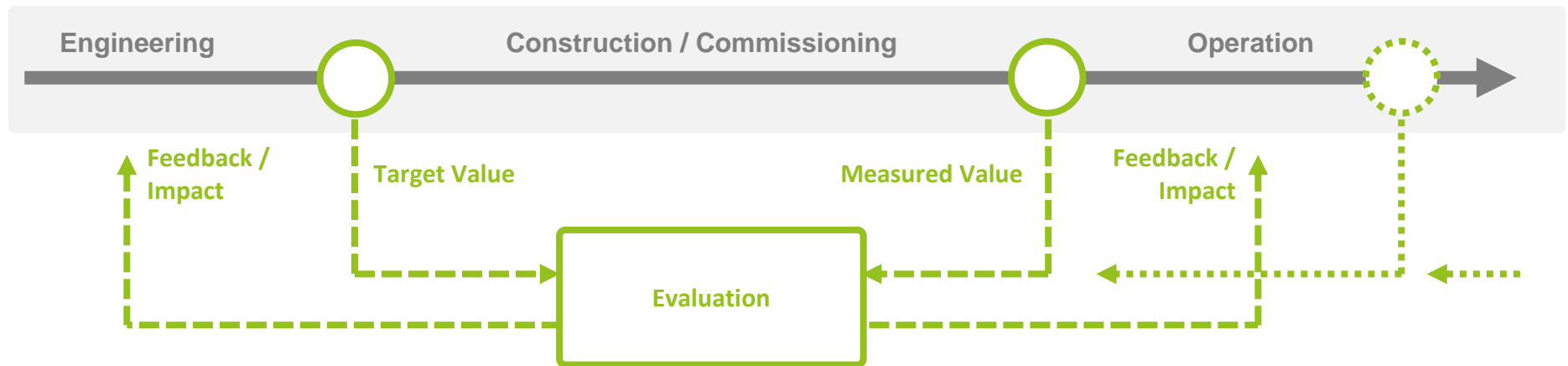
QUANTUM: The gap in building performance is ... caused ... by a lack of quality.

Project Partners

1. Technische Universitaet Braunschweig, Germany (Coordinator)
2. Factor 4 BVBA, Belgium
3. ENESA a.s., Czech Republic
4. E7 Energie Markt Analyse, Austria
5. COWI A/S, Denmark
6. SYNAVISION GMBH, Germany
7. Norges Teknisknaturvitenskapelige Universitet, Norway
8. Ceske Vysoke Ucení Technické v Praze, Czech Republic
9. Ethniko Kai Kapodistriako Panepistimio Athinon, Greece
10. REHVA, Netherlands
11. EKODOMA, Latvia
12. Building Research Establishment LTD, United Kingdom
13. Energy Team spa, Italy
14. eERG Group - Politecnico di Milano, Italy

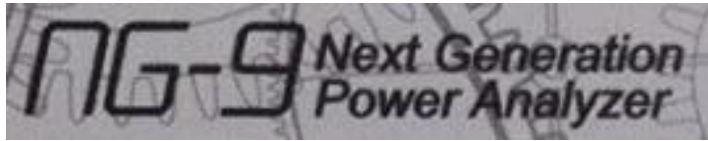


Quality Control Loop





**QM needs
to be digital!**



- **HPS/NG9 (by Energy Team, Italy):**
Cost effective and easy to install in-situ energy metering devices with online data analysis



- **Comfortmeter (by F4, Belgium):**
Completely web-based questionnaire for perceived user comfort



- **Performance Test Bench (by synavision, Germany):**
First tool for the digital specification and automated validation of BMS



REHVA Guidebook

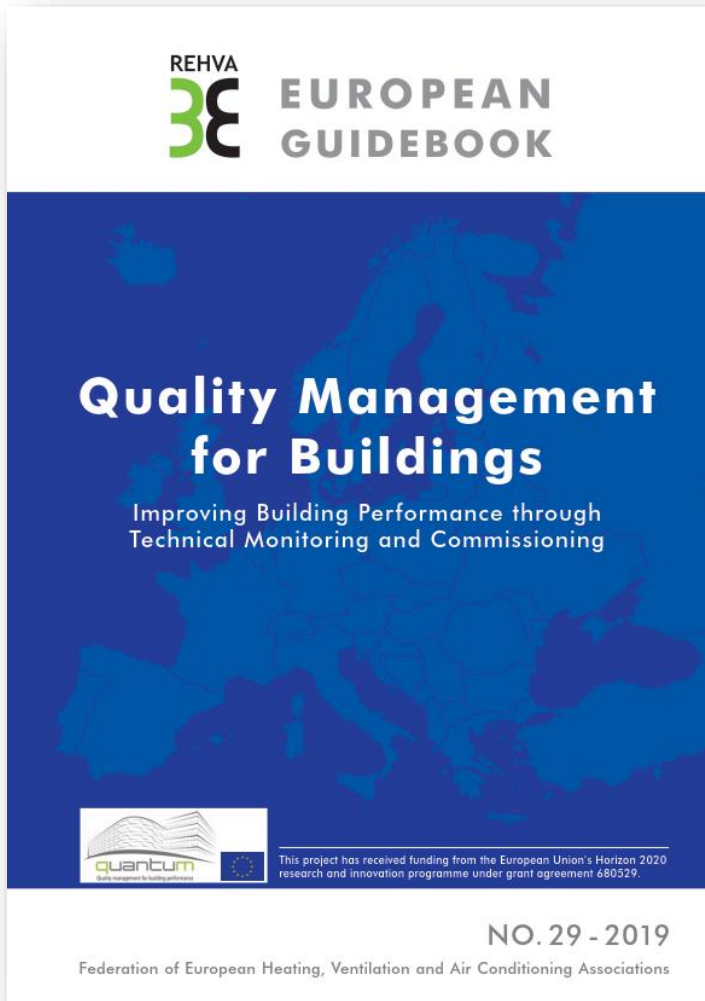




Table 3. Comparison TMon and Cx (OPR: Owners Project Requirements, BoD: Basis of Design).

	TMon	Cx	TMon + Cx
Nomination of aCx service provider	Contract service provider	Contract service provider	Contract service provider
OPR		Write OPR with Building Owner or give guidance to Building Owner	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	Give guidance to Design Engineers for writing BoD and check BoD on compliance with OPR
Commissioning plan	Describe TMon / Cx Process in the project		Describe TMon / Cx Process in the project
Cx In the Design Phase	Derive target values for building and system operation and specify testing procedures		Derive target values for building and system operation and specify testing procedures
Cx In the Construction Phase		Check Design on compliance with OPR	Check Design on compliance with OPR
		Check Construction on compliance with OPR	Check Construction on compliance with OPR
Cx In the Startup Phase	Check data from trial operation against target values and report		Check data from trial operation against target values and report
		Check start up procedures, prerequisites for testing systems functions and cross system functions and report	Check start up 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	Review O&M and system manuals on completeness, timeliness, consistency and plausibility
Training for O&M Personnel		Check schedule and execution of training	Check schedule and execution of training
Training for building occupants during operation		Check schedule and execution of training	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 135 „Technical Monitoring“



Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety



Mechanical and Electrical
Engineering Working Party
of National, Regional
and Local Authorities

Technical Monitoring 2017

Technical Monitoring as an Instrument
for Quality Assurance

Recommendation No.: 135e

AMEV

Mechanical and Electrical Engineering Working Party of National, Regional and Local Authorities

Gas condensing boilers

Gas condensing boiler test values (to be considered from a nominal capacity of > 50 kWth)	Target value	Measurement	[Unit]	Notes
Gas consumption	Maximum value	Meter reading	[m³]	Evaluation as monthly or yearly value
Excess heat produced	Maximum value	Meter reading	[kWh]	Evaluation as monthly or yearly value
Degree of utilisation (thermal) (minimum value)	Minimum value	Calculation	[-]	Evaluation per day
Use hours	-	Meter reading	[h]	
Launches	-	Meter reading	[number]	
Launches per use hour or duration per launch	Maximum value or minimum value	Calculation	[-]	Evaluation per day
Inlet temperature	Set value and tolerance	Measurement	[°C]	Evaluation per day
Return flow temperature	Set value and tolerance	Measurement	[°C]	Evaluation per day
Exhaust temperature	Maximum value	Measurement	[°C]	Evaluation per day
Condensate quantity	Minimum value	Meter reading	[l]	Evaluation per day [l/kWh]
Outdoor air temperature	—	Measurement	[°C]	If needed, additional conversions necessary for regulation, e.g. as a moving average



- QM is a third party task!
- QM starts with setting targets!
- QM needs to be based on data – data must be made available!





Quality Management makes buildings perform smart!