

The Building Commissioning Procedure in Finland (ToVa)

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Indoor Climate and Building Services



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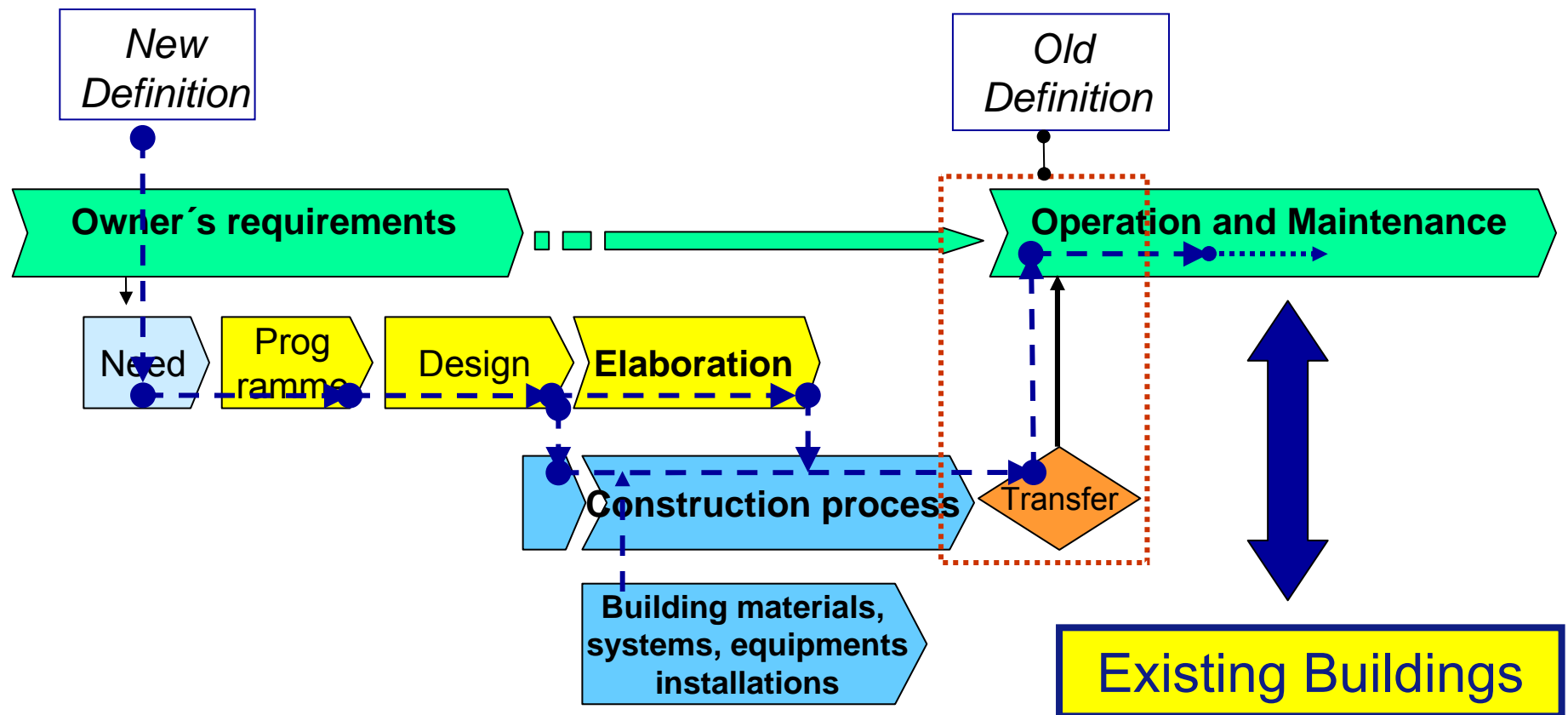
Topics

- Cx definition
- Cx aims
- Cx process
- Performance and energy efficiency risks
- Cx plans
- Organizing Cx
- Cx and quality management
- Cx profitability
- Cx principles

Commissioning Cx (ToVa)

- Cx (ToVa) process should be launched as early as in programming phase
 - To check that:
 - Owner's and users' needs and requirements are clearly documented
 - Indoor and energy performance requirements are included to owner's program
 - To audit that design solutions and installation outputs meet given requirements
 - To verify that the building satisfy given indoor and energy requirements in use
- Cx is included as a part of routine facility management process over building life cycle

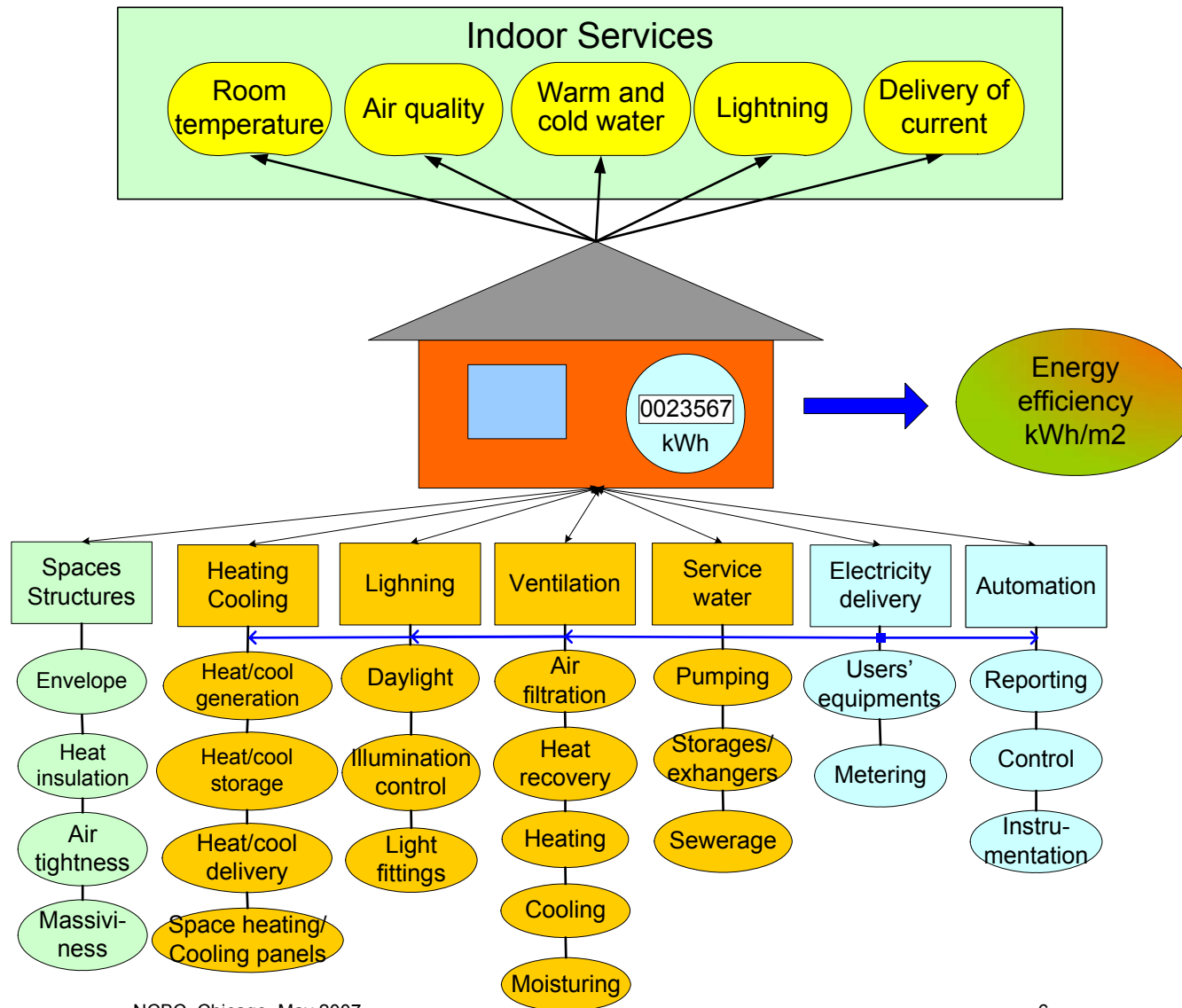
Cx definition in Finland



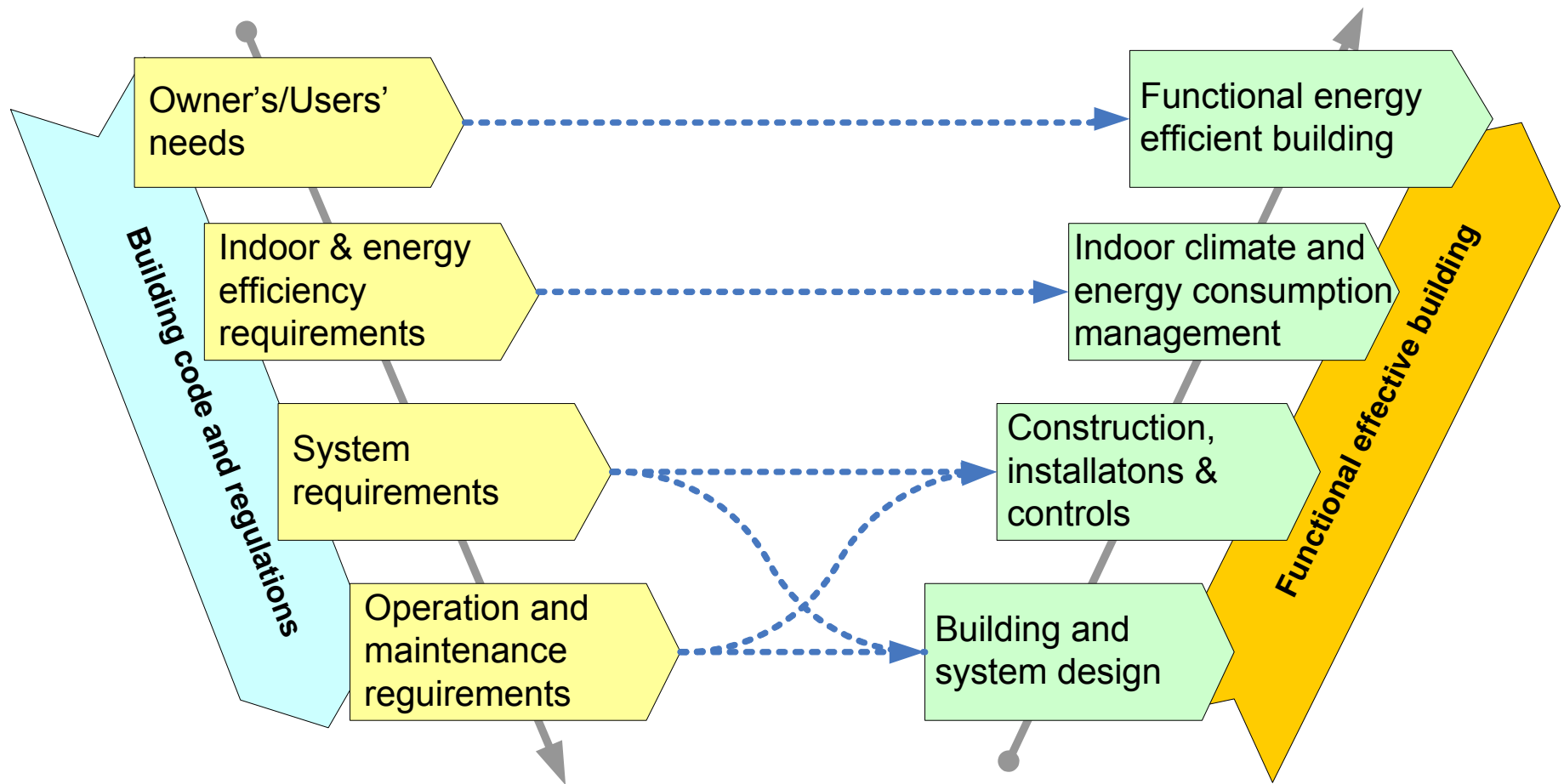
The goals of Cx activities

- To provide safety, healthy and comfortable spaces for living and business
- To improve design quality by more effective feedback
- To improve energy efficiency of buildings and building systems
- To decrease operation costs
- To improve operation and maintenance personnel introductory briefing and training
- To improve documentation during the building life-cycle
- To meet customer needs and expectations and satisfy customer requirements

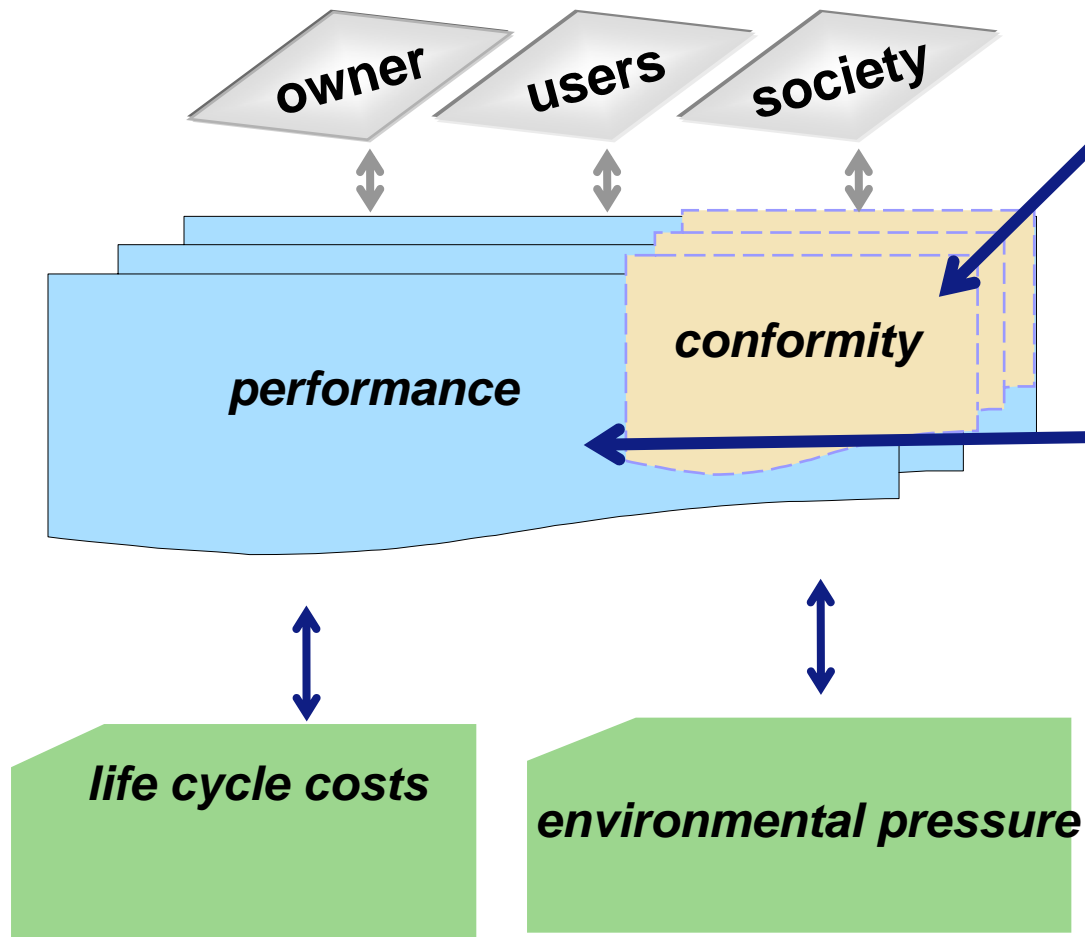
Components of indoor climate and energy efficiency



Management of needs and requirements during building process



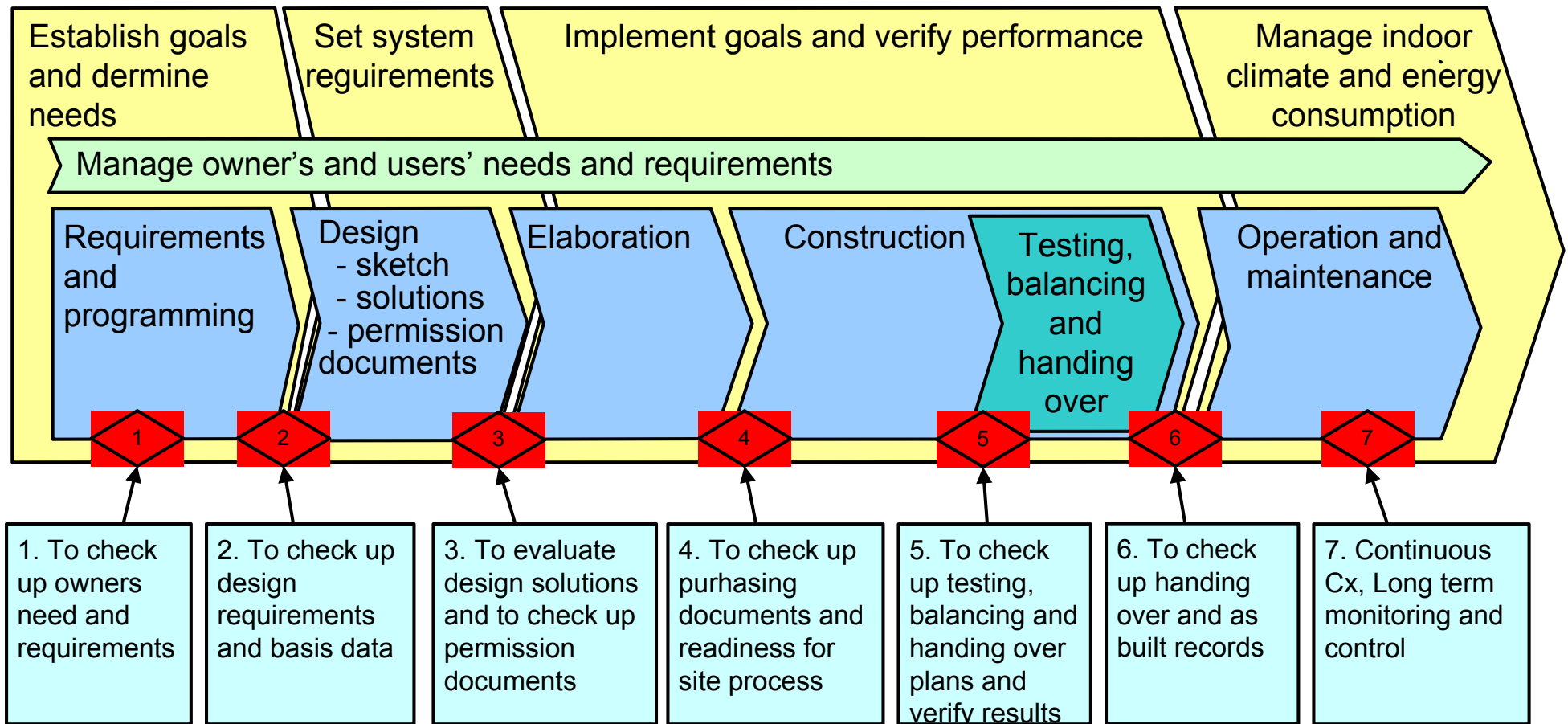
FRAME FOR PERFORMANCE SPECIFICATIONS



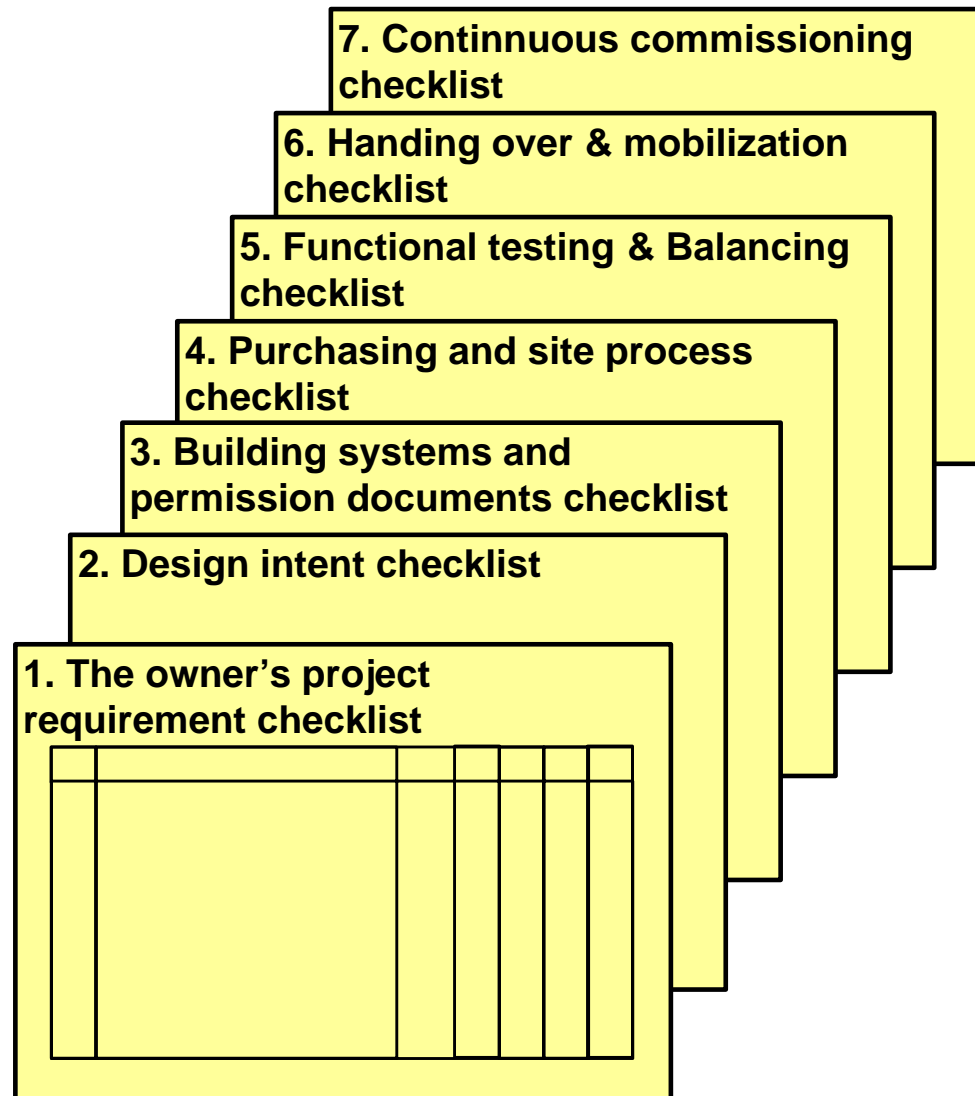
- A CONFORMITY** VTT ProP®
- A1 LOCATION**
 - A1.1 Site features
 - A1.2 Traffic services
 - A1.3 Environmental impacts
 - A2 SPACES**
 - A3 SERVICES**

- B FUNCTIONALITY**
- B1 INDOOR**
 - B1.1 Indoor climate
 - B1.2 Sound
 - B1.3 Illumination
 - B1.4 Vibration
- B2 LIFE CYCLE AND DAMAGE RISKS**
- B3 MODIFIABILITY**
- B4 SAFETY AND SECURITY**
 - B4.1 Structural safety
 - B4.2 Fire safety
 - B4.3 Operation safety
 - B4.4 Break-in-security
 - B4.5 Natural catastrophes
- B5 PLEASANT ENVIRONMENT**
- B6 ACCESSIBILITY**
- B7 USABILITY**

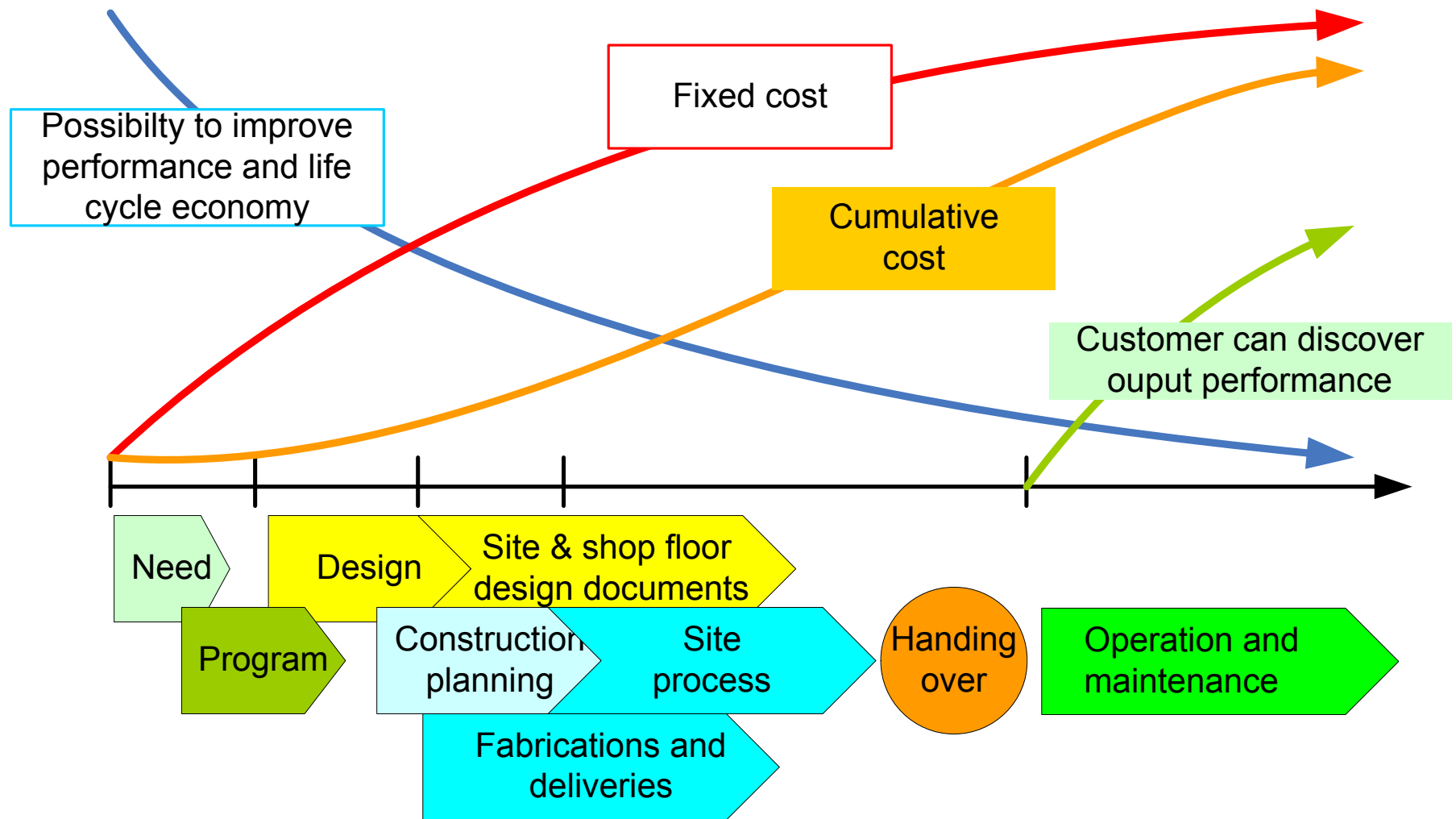
Cx process



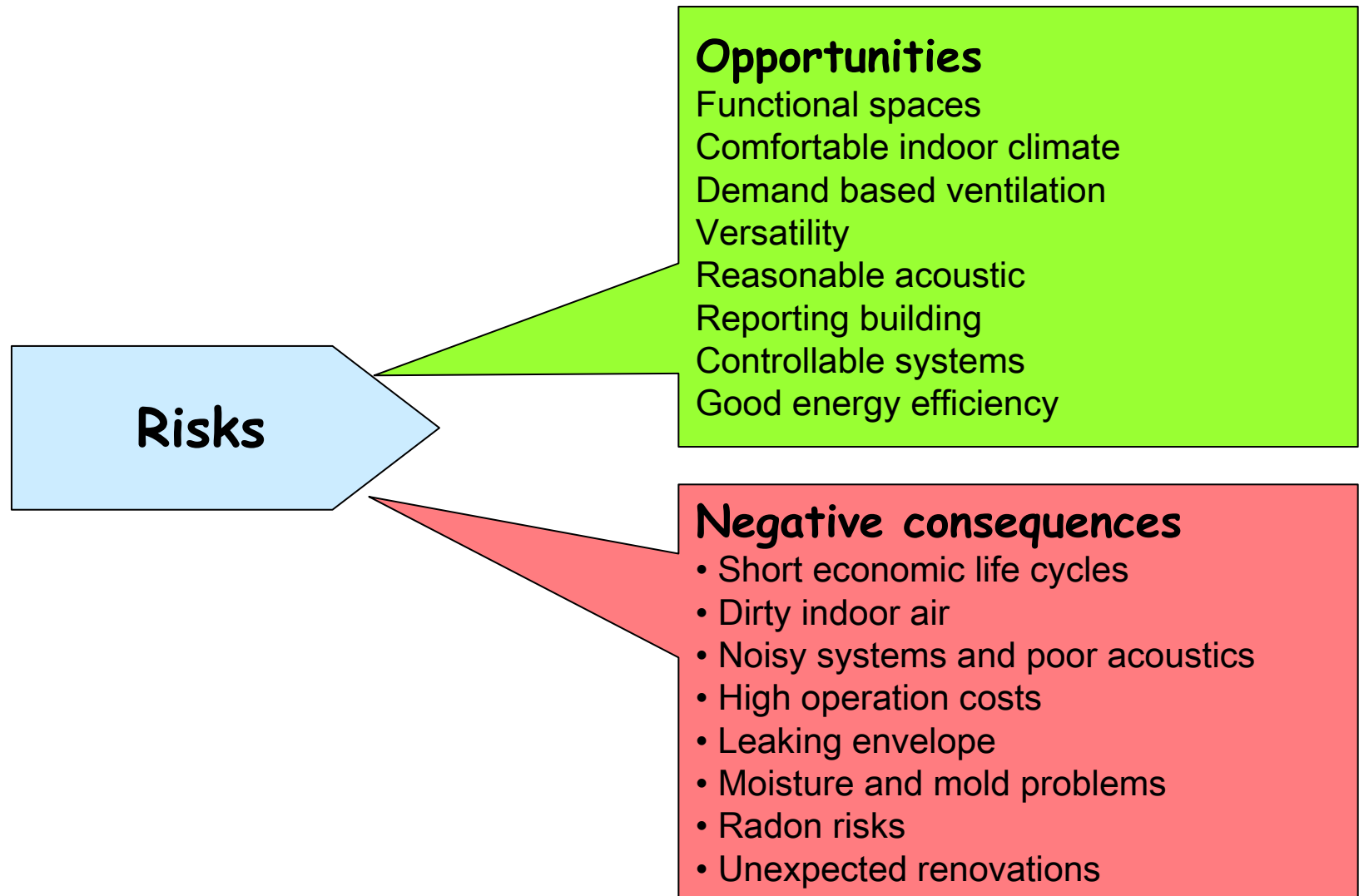
Checklists for commissioning manager



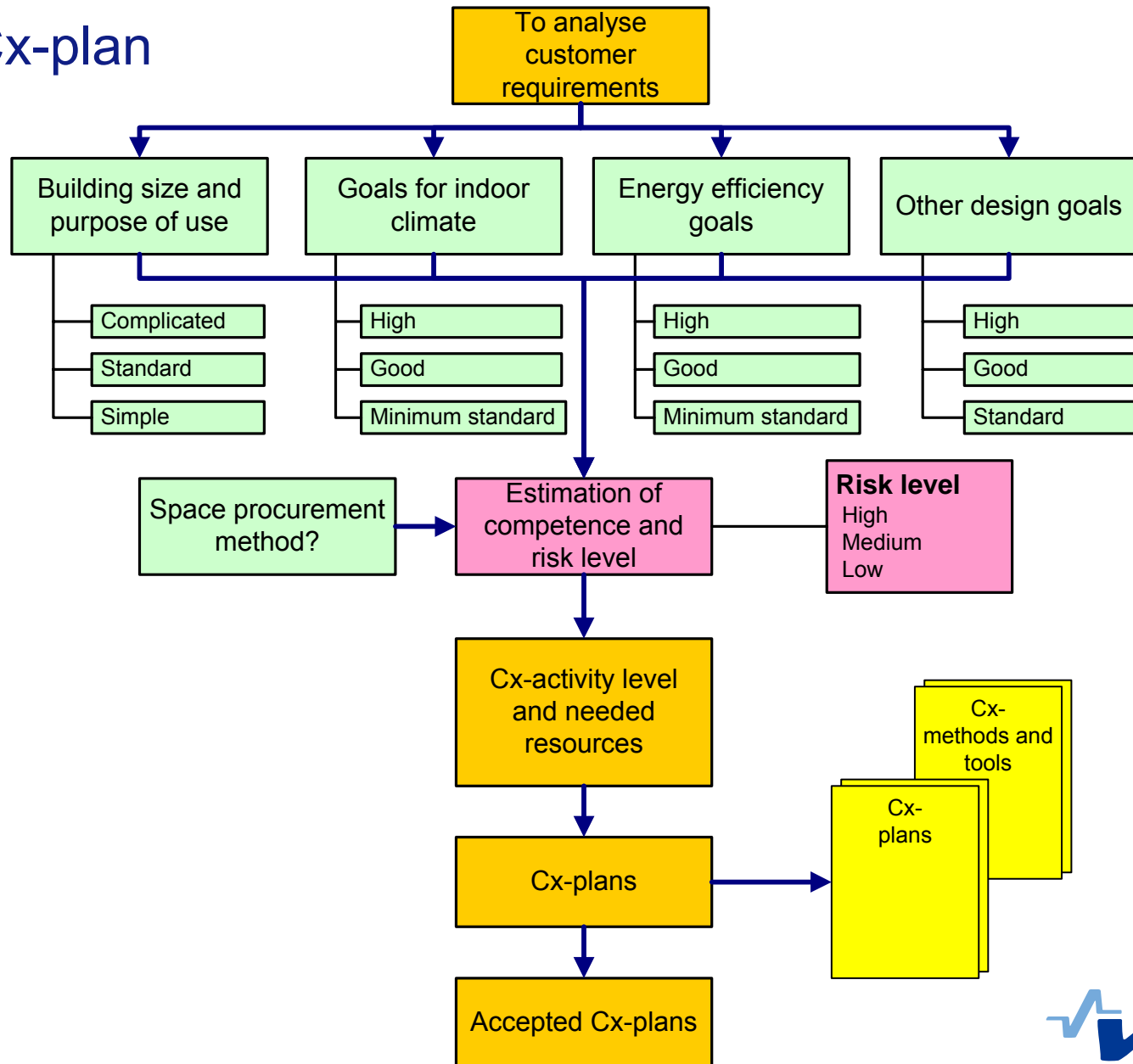
Influencing building performance and energy efficiency



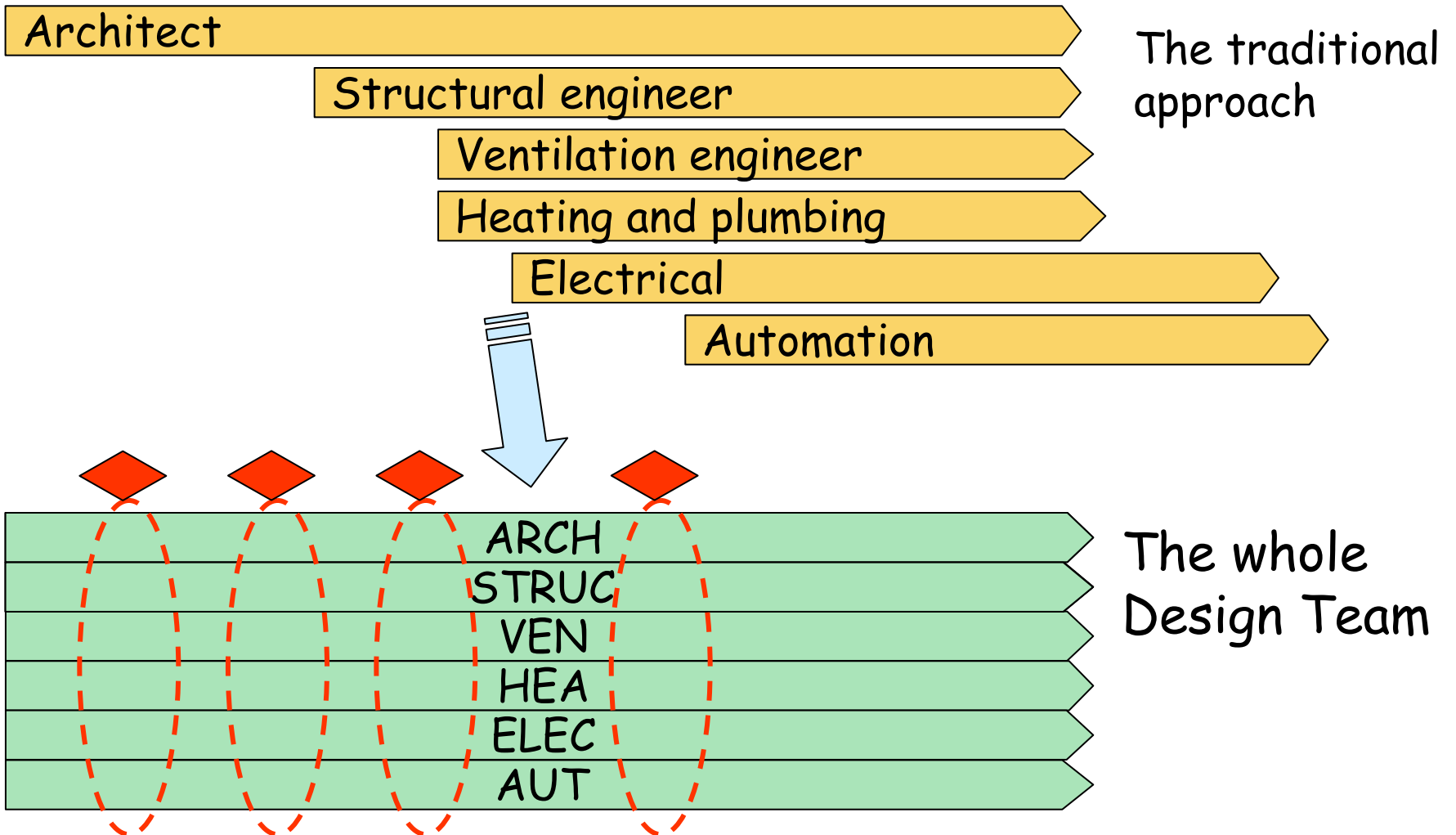
Risk range – positive and negative



To set up a Cx-plan



To start design team as a whole



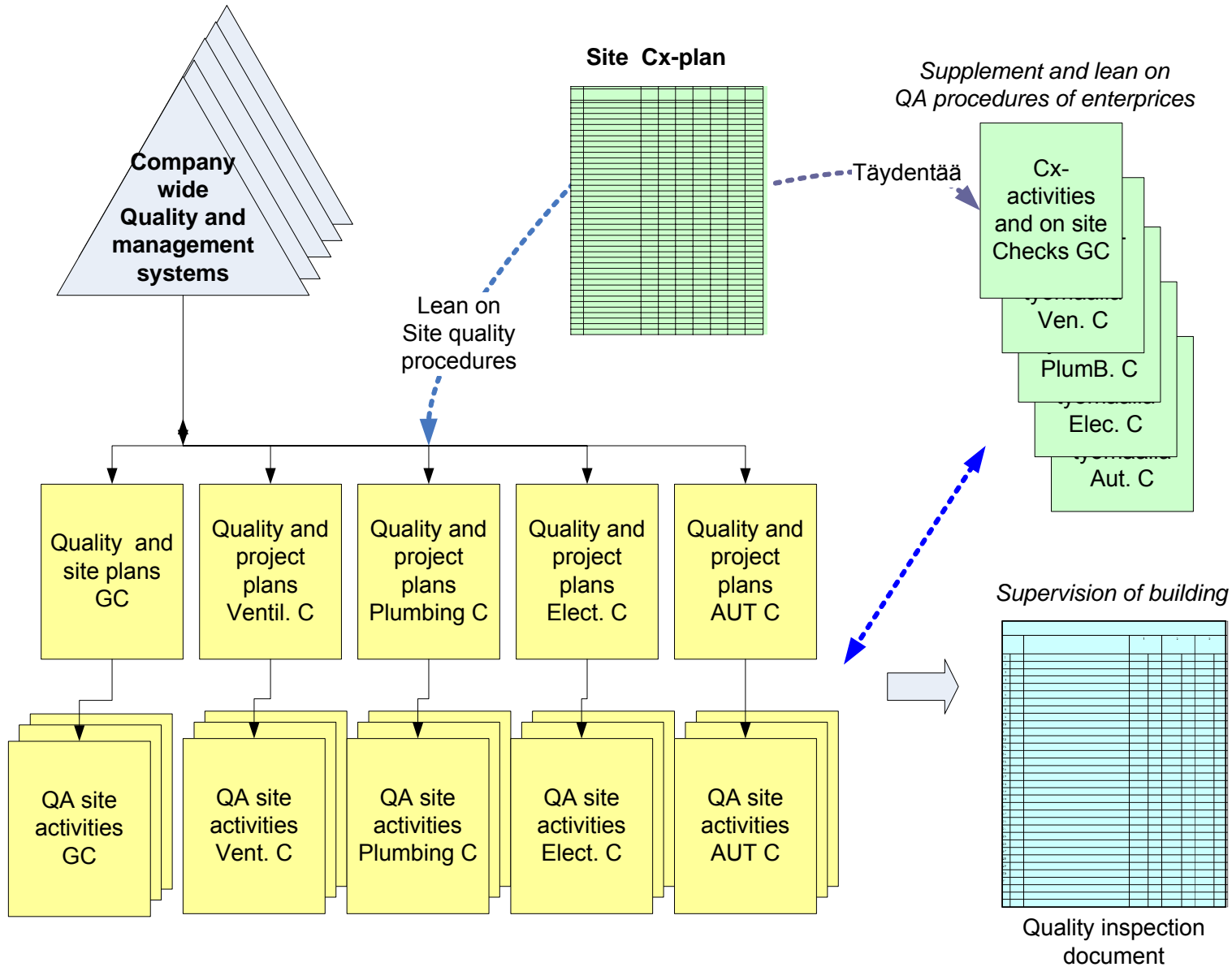
Options for Cx team

Cx manager ◆ Strong role ● Participation ○	Small DBB project	DBB project	DBB project	Design & Build project	Design & Build project	DBOM project
Principal designer	●	◆	●	●	●	●
Independent Cx consult (ToVa)				◆	○	○
Owner's agent	●	○	◆	○	○	○
General contractor's agent	○	○	○	○	◆	●
HVAC designer	◆	●	●	●	●	●
Electrical designer	○	○	○	○	○	○
Construction designer	○	○	○	○	○	○
Automation designer	●	●	●	●	●	●
FM service engineer		●	●			◆
Supervisor	○	○	○	○	○	○
HEPAC contractor	○	○	○	○	○	○

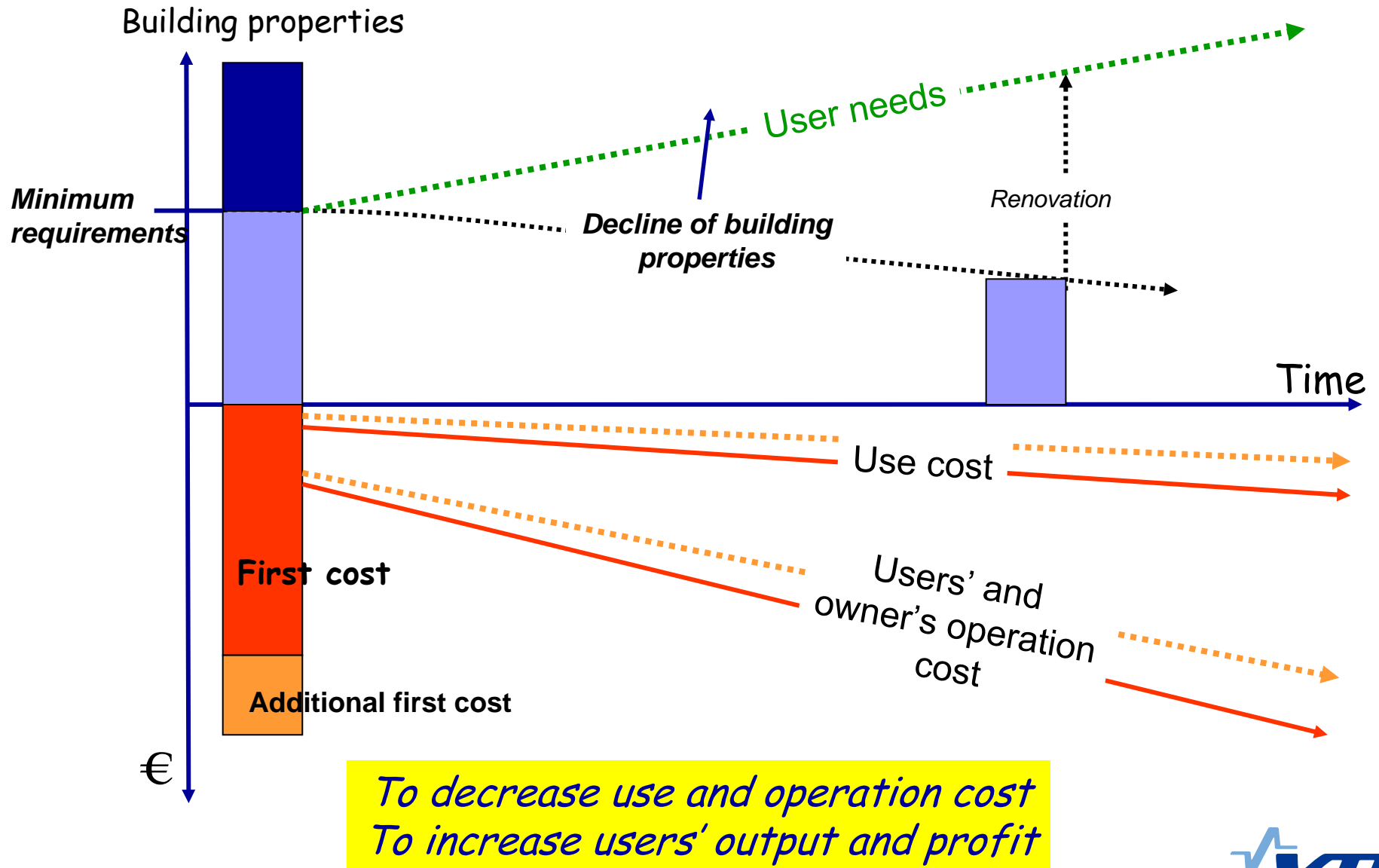
Task responsibility matrix for design phase (example)

	Cx manger	Principal designer	ARCH	HVAC Design	Electr. design	Autom. design	Owner's agent	Project Manager C.
1 Cx planning and management								
• Cx planning	◆							
• To check and comment Cx plans	◆	X					X	
• Cx meetings	◆	X						
• Cx activity control	◆	X					X	
2 Cx design reviews								
• To check design solutions	◆	◆						
• Corrective actions		X	X	X	X	X	X	
3 Documentation of design goals								
• Format for design goals	◆	◆						
• Design goals for building systems		X	X	X	X	X	X	
• Plans for O&M manuals	◆	X		X	X	X	X	
• To check and accept design goals	◆	◆	X				X	
• Corrective actions			X	X	X	X		
4 Cx plans for site process								
• Cx site plan	◆			x	x	x		X

Cx ↔ quality assurance procedures



Cx goals and value for money



Principles for Cx-activities

- **Cx manager**
 - Is responsible for implementation of indoor climate and energy efficiency goals
 - Plans goals and tasks for Cx process
 - Checks together with principal designer owner's goals and design goals
 - In large projects Cx team may be constructed of several professionals
 - In small and simple projects Cx manger could be for example HVAC designer
- **To start the whole design team before design phase**
- **System integration**
 - The same building systems produce good indoor climate and energy efficiency
 - The key goal is to integrate different systems during different projects phases that they co-operate well and reliably
- **To start early**
 - Schematic design: energy calculations and indoor climate design
 - Design phase: O&M manuals
 - Plans for metering and power distribution network hierarchy
 - Building automation side by side with the other design disciplines
 - Plans for functional performance testing and balancing
- **Indoor and energy efficiency goals**
 - Include this goals into all design and contract documents

Thank You!

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