HOCHTIEF
ENGINEERING

Partnering experience in major infrastructure projects

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Ministerstvo dopravy

ASOCIACE
PRO ROZVOJ
INFRASTRUKTURY

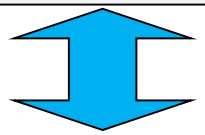
Overview

1. Thesis: Partnership creates better projects
2. Results of the Reform Commission
   - 2.1 General/Pilot projects/Guidelines
   - 2.2 Project Partnering
3. Project partnership experience
   - 3.1 Common reference PPP
   - 3.2 Innovation
   - 3.3 Risk management
   - 3.4 BIM applications
4. Conclusions

1. Thesis: Partnership creates better projects

Known shortfalls of adversarial project approaches:

- Lack of quality in design and construction
- Deficient risk management
- Inefficient resource utilization
- Time-consuming disputes + dependency on court decisions
- Excess costs and schedule deviations
- Project objectives are missed and public discussions



Experience from abroad, from PPP projects and from pilot projects in Germany:

Cooperative partnerships → Better project execution and results for all participants in the process

Reference

- UK: 80 % of public infrastructure NEC partnering
- NL, Scandinavia, Australia
- Private initiatives in building construction
- PPP projects e.g. in Germany and the Netherlands

2. Results of the German Reform Commission

Overview on targets and work methods

Targets

- Cost truth and transparency
- Quality and functionality with stable schedule and costs
- Image of the German construction sector
- Trust of the people into the public sector as project owner
- Acceptance of large scale projects

Schedule

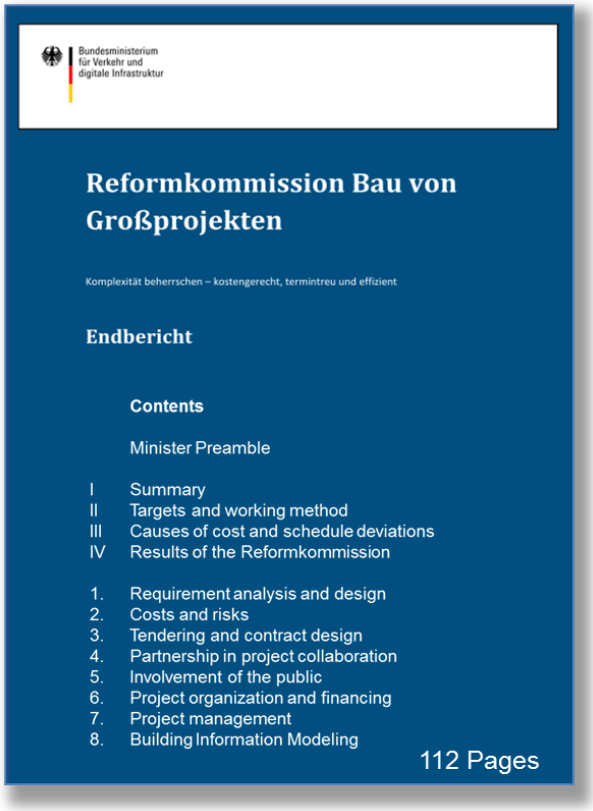
- **7 Sessions**
- **Final Report:** **29. June 2015**

Participants

- 35 experts from industry, science, public bodies and pressure groups
- Scientific guidance: KPMG and Arup

Working Groups

1: Optimized design processes
2: Building Information Modeling (BIM)
3: Project management and control
4: Costs and risks
5: Financing
6: Project Partnering
7: Legal aspects



2. Results of the Reform Commission

Reasons for failing of large scale projects

- Unfounded, too early cost and schedule information
- Unclear scope and targets lead to costly changes
- Too superficial and insufficiently coordinated designs
- Too early starts of tendering and construction
- Contract award to the cheapest but not the best-value bid
- Absence of risk management and risk budget
- Lack of competence with some project participants
- Organizational deficits (responsibilities, processes, controls)
- Lack of transparency in schedule, costs and risks
- Lack of dispute resolution mechanisms / arbitration procedures

Needed: fundamental change of project culture!

10 basic recommendations

2.1 Results of the Reform Commission

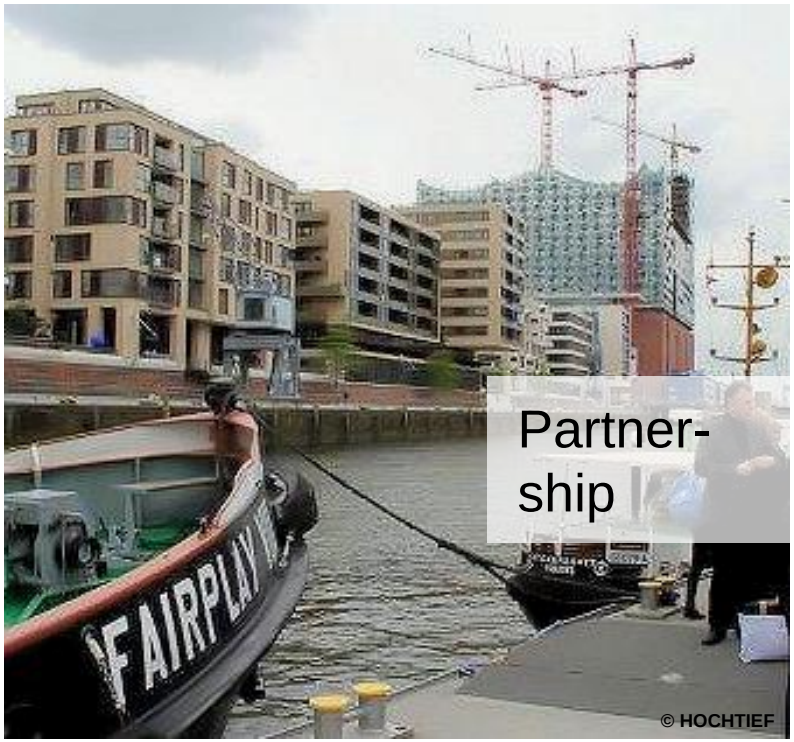
General, layout of the Guidelines 2017, pilot projects

Area	Project Organization	Project Economy	Project Partnership
Recommendations Reform Commission	Clear processes and duties / public competence centers	Risk management and risk-representation in the budget	Contract award to the best-value bidder
	Cooperative planning and design in a team	Mandatory pre-execution value-for-money assessment	Out-of-court settlement of disputes
	Design before construction	More transparency and control	Cooperative project partnership
Modules in **Guidelines** Large Projects	▪ Template Definition of Project Objectives ▪ Guideline Design Process ▪ Template Tender Award Readiness ▪ Checklist Project Organization	▪ Guideline Risk Management ▪ Guideline Procurement Alternatives	▪ Guideline Bid Evaluation ▪ Guideline Competitive Dialogue ▪ Master Contract Project Partnering ▪ Process Order Dispute Resolution
Pilot status Oct 2016	▪ DB: 10 BIM* pilot projects chosen, BIM ready in 2020 ▪ DEGES: 6 BIM pilot projects	▪ 1 pilot at DEGES	▪ BMVI: 6 pilot projects for PP (3x DEGES, 2-4x DB)

*) BIM was the 10th Recommendation

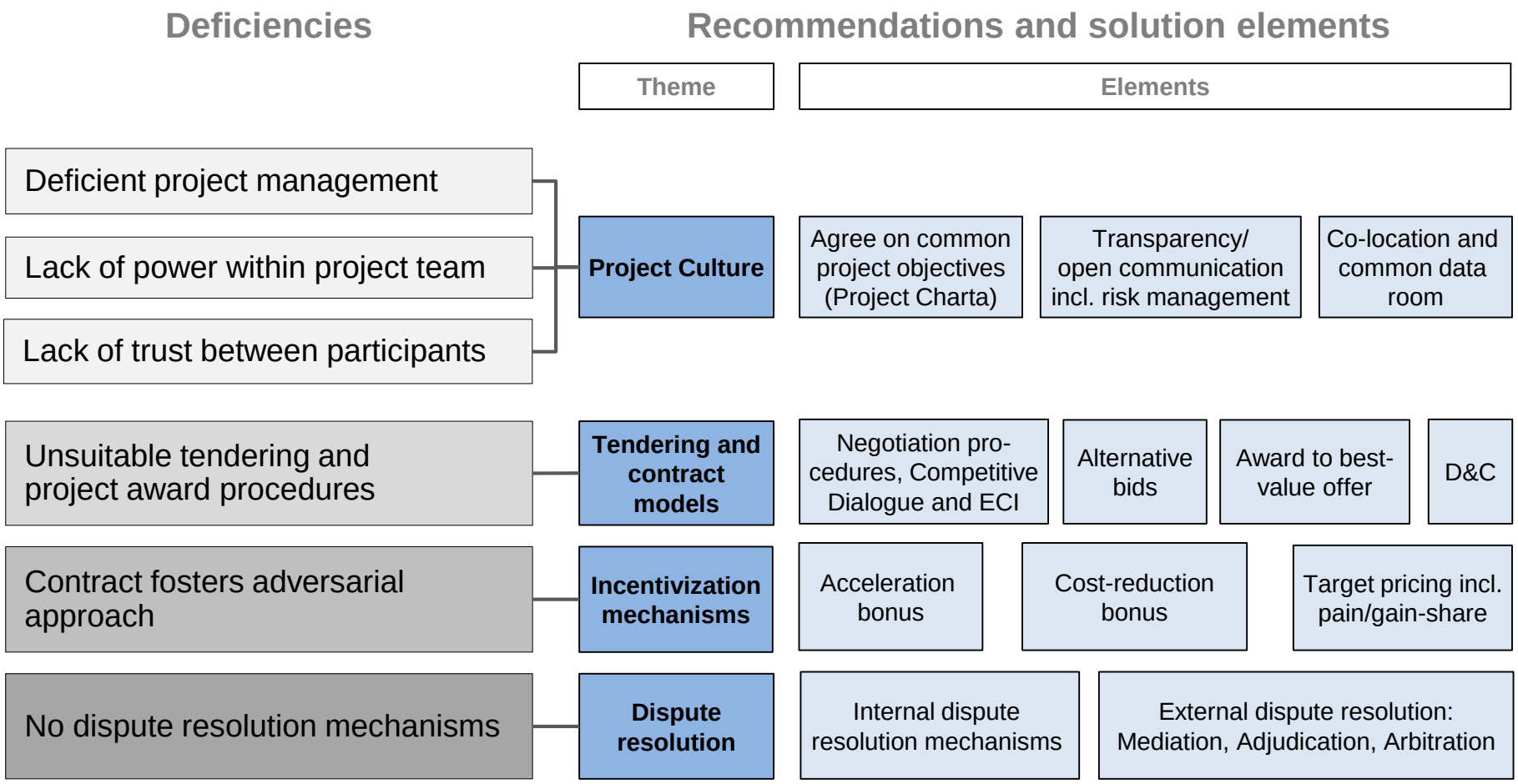
2.2 Project partnering results

Reform Commission
Large Projects



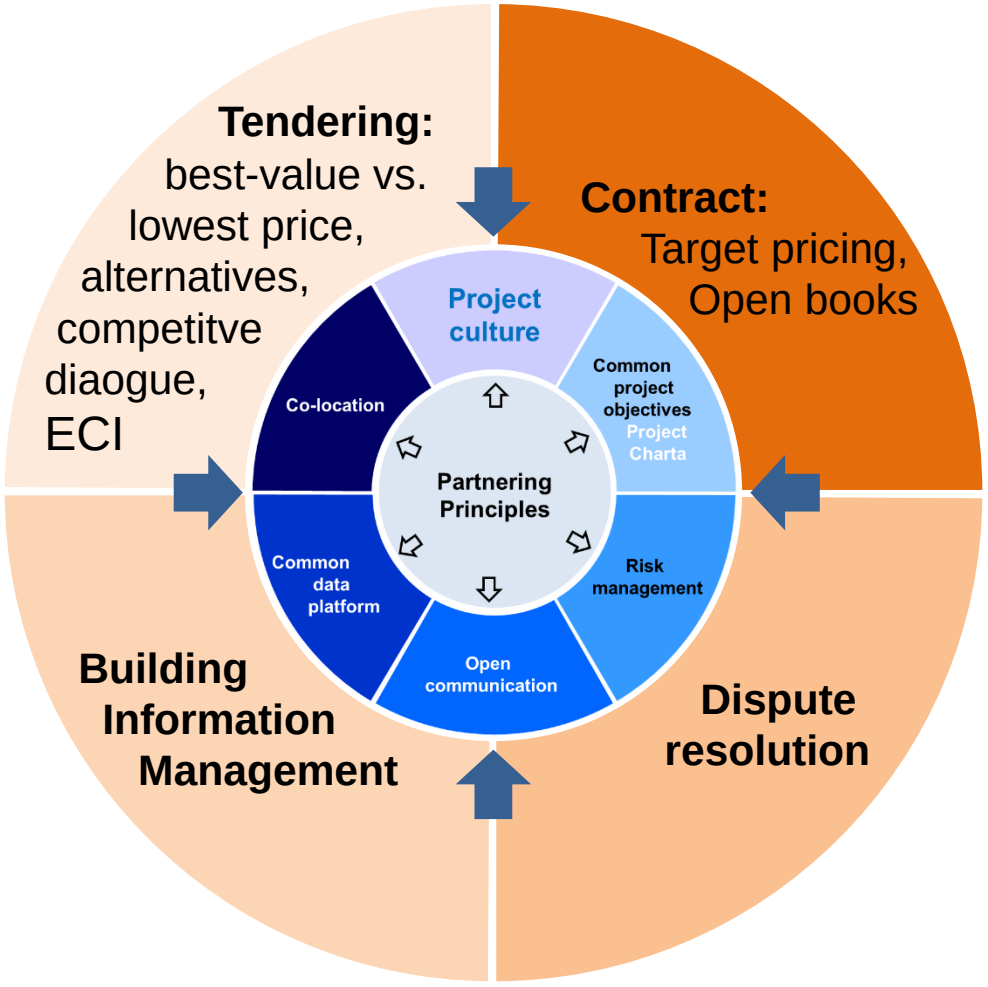
WG „PPZ“
Partnership in Project Execution

2.2 Project partnering results
Recommendations



2.2 Project Partnering results

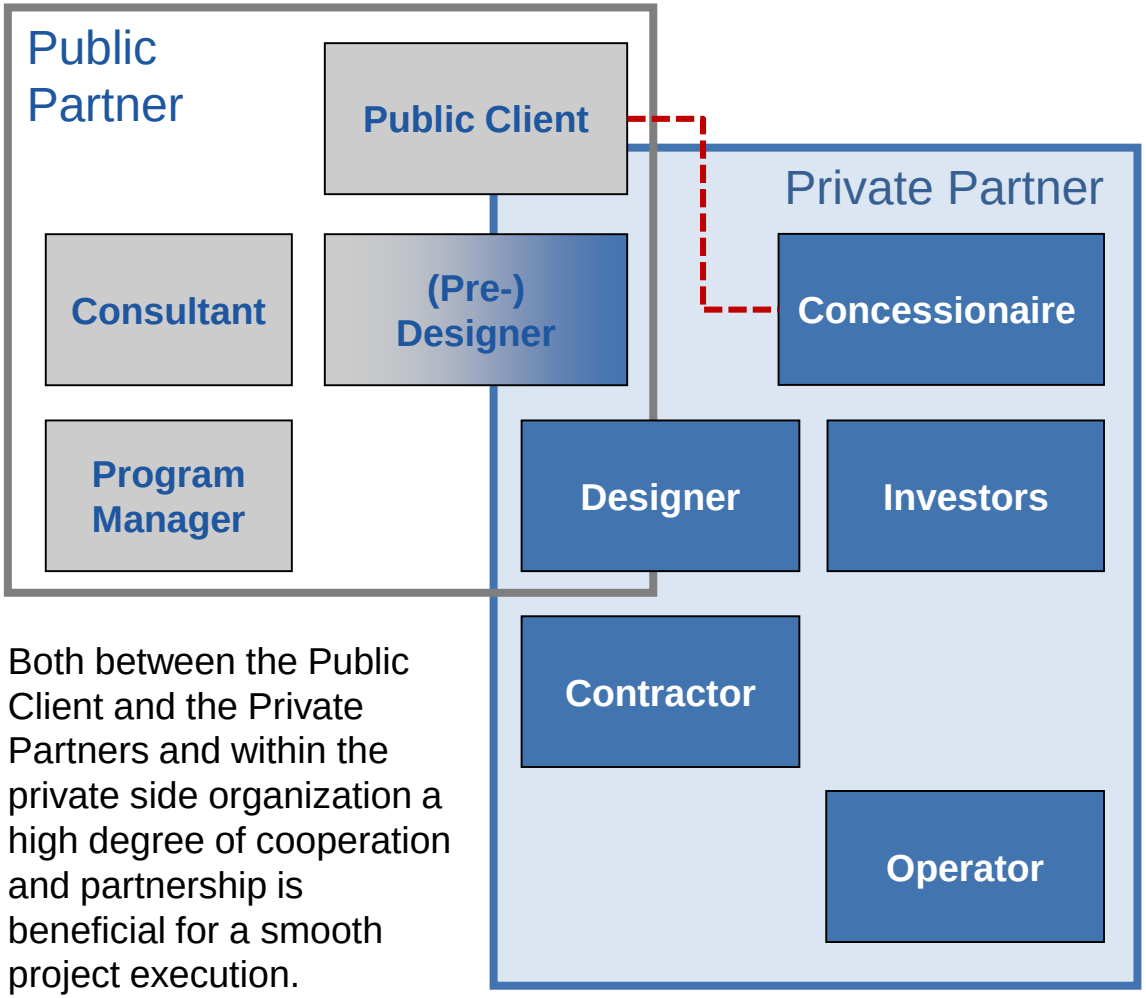
Elements of effective project partnerships



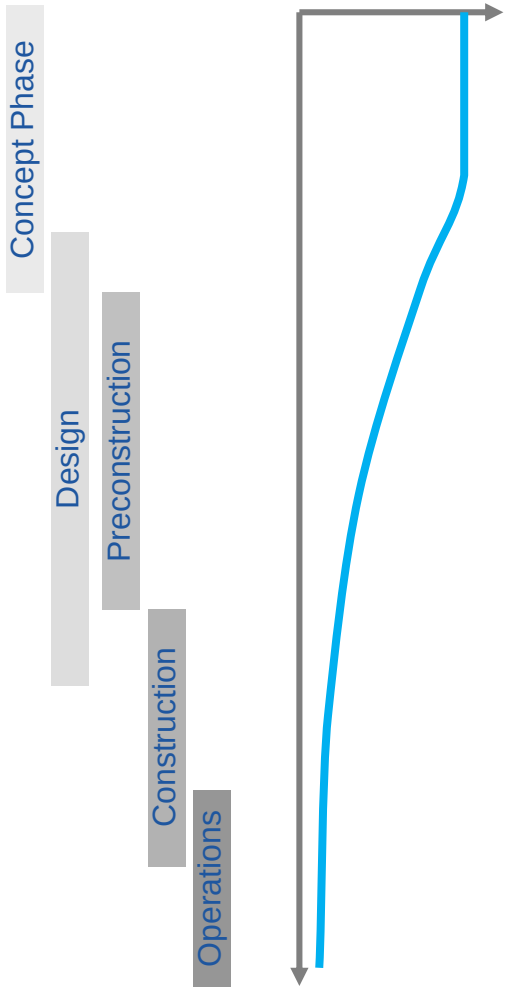
- Partnering principles as inner core
- New partnership project culture
- Instruments of concrete realization of partnering projects and contracts

3. Project partnership experience

3.1 Common reference PPP: Typical project constellation



Both between the Public Client and the Private Partners and within the private side organization a high degree of cooperation and partnership is beneficial for a smooth project execution.



3.1 Common reference PPP

Characteristics and similarity with other partnering projects

- Complexity: Numerous structures, full traffic load, ambitious schedules, D&C
- Short design periods and design simultaneous to construction
- Short construction periods
- Disruption costing, lifecycle aspects in design and operations
- High quality and reliability requirements

BAB A8 Ulm – Augsburg; Foto: HOCHTIEF

Require:

→ Optimized construction methods and processes

→ Value-engineering, optimization and innovation

→ Collaborative risk management

→ Early cooperation of public client, concessionaire, designer and contractor

→ Structured partnership approach

3.1 Common reference PPP

Examples from HOCHTIEF PPP-Motorway projects

- 15 PPP road projects in 8 countries (Europa and Americas)
- PPP Projects require throughgoing optimization of design, construction, operations and maintenance; particularly in early stages to generate benefits for the whole lifecycle
- Broad experience from numerous development and innovation projects (internal and external)
- Three group units cooperate

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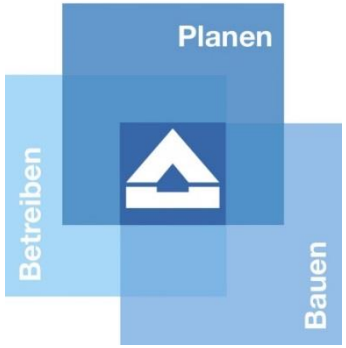
HOCHTIEF PPP SOLUTIONS



HOCHTIEF INFRASTRUCTURE

Following examples from:

- PPP Modell BAB A4 Hörselberge
- PPP Modell BAB A8 Ulm - Augsburg
- PPP in the Netherlands

3.2 Innovation

Project with BASt: „RFID Tags“ Pilot application at BAB A8

- R&D Program Roads BASt: „Intelligent road infrastructure by 3D-Models and RFID-Tags“
- Passive sensors: Connection- and energy-free detection
- Corrosion sensor: Detection of corrosive effects before rebar is reached
- Humidity sensor: Detection of humidity (dry or humid)
- Objective: Potential protection or repair measure could be initiated before damage occurs
- Pilot application at BAB A8, BW 90:
  10 corrosion sensors and 2 humidity sensors
- Cooperative work of all project participants and ministry research unit (BASt)

Placement of RFID tags at rebar

Reading of RFID tags

3.2 Innovation

„Durable bridge caps“, Pilot application at BAB A8

- Idea: Concrete segment bridge cap incl. optimized anchoring
- Advantages:
  - high quality through industrialized production
  - faster installation and change
- Pilot application BW 90 of BAB A8 with ZiE
- Cooperation of all partners
- Caps partially equipped with RFID sensors for monitoring of long time behavior

3.3 Risk management

Anticipatory Risk Management Plan during tendering

Structured exchange between public client and bidder (concessionaire) on the most important risks of the project. Organized as a dialogue:

1. Which important risks has the project owner discovered?
   How will the bidder handle these in case of award?
2. Which 5 most important risks does the bidder see? How can they be mitigated and how will that affect the project realization in respect of schedule and costs?

4.3 Risk Management Plan Outline

Candidates are required to draw up and submit a Risk Management Plan Outline during the First Phase of Dialogue, as a means to demonstrate their understanding of and insight into the risks associated with the Project and their proposals for controlling them.

For each risk belonging to the top 5 Contractor Risks, the Candidate must describe, in the most accurate terms possible, the control measure that it shall take to limit said risk and the impact that the implementation of this control measure shall have on minimising the risk concerned for the Contractor.

→ **Cooperative risk management during project realization is the right choice**!

3.4 BIM applications
PPP Netherlands

Integrated, BIM-based 3D-design:

- Construction method: symmetric concrete cantilever, segment length 4,00 m / 5,00 m
- BIM-suitable 3D-design by HOCHTIEF as part of the CJV (all design phases VO, DO, UO)
- Road design simultaneously to construction requires „interactive coordination“
- Minimum clearance outline as „3D-Solid“ in the building model

3.4 BIM applications

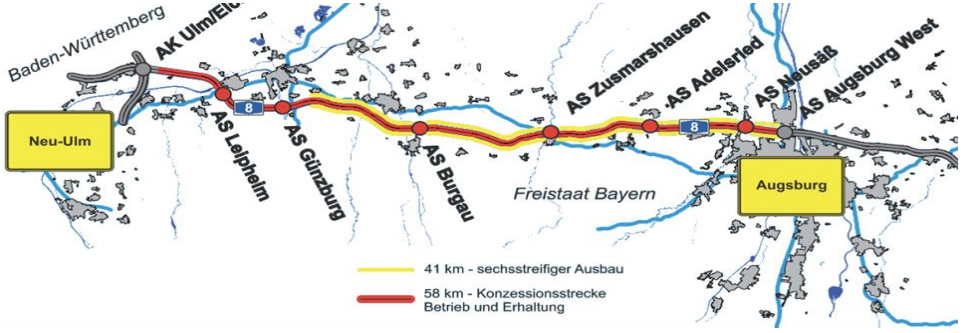
Integrated design processes at high level BIM standard

- All-embracing design management with highly integrated design processes
- BIM-suitable 3D-CAD software
- BIM-based interface management
- Checking and approval processes with project owner (RWS) and external parties via BIM
- All 3 design phases

3.4 BIM applications: Innovation project „BIM in traffic infrastructure“

Concept of an information system for road infrastructure

- R&D Program Roads BASt: „Intelligent road infrastructure by 3D-Models and RFID-Tags“ in 2011/2012
- Objective: Consolidation of the existing, however inhomo-geneous data base
- Development of a concept for integrated data management by HOCHTIEF ViCon under utilization of
  - existing data base
  - RFID measurement data
  - MBDE measurement data
  - et al.
- Exemplary pilot application for a structure at BAB A8



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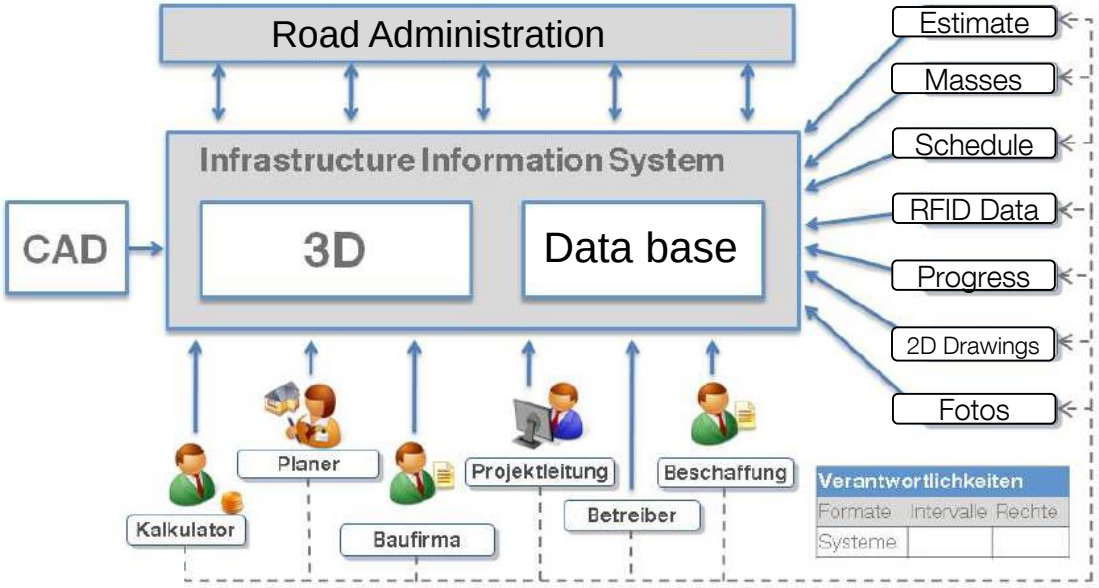
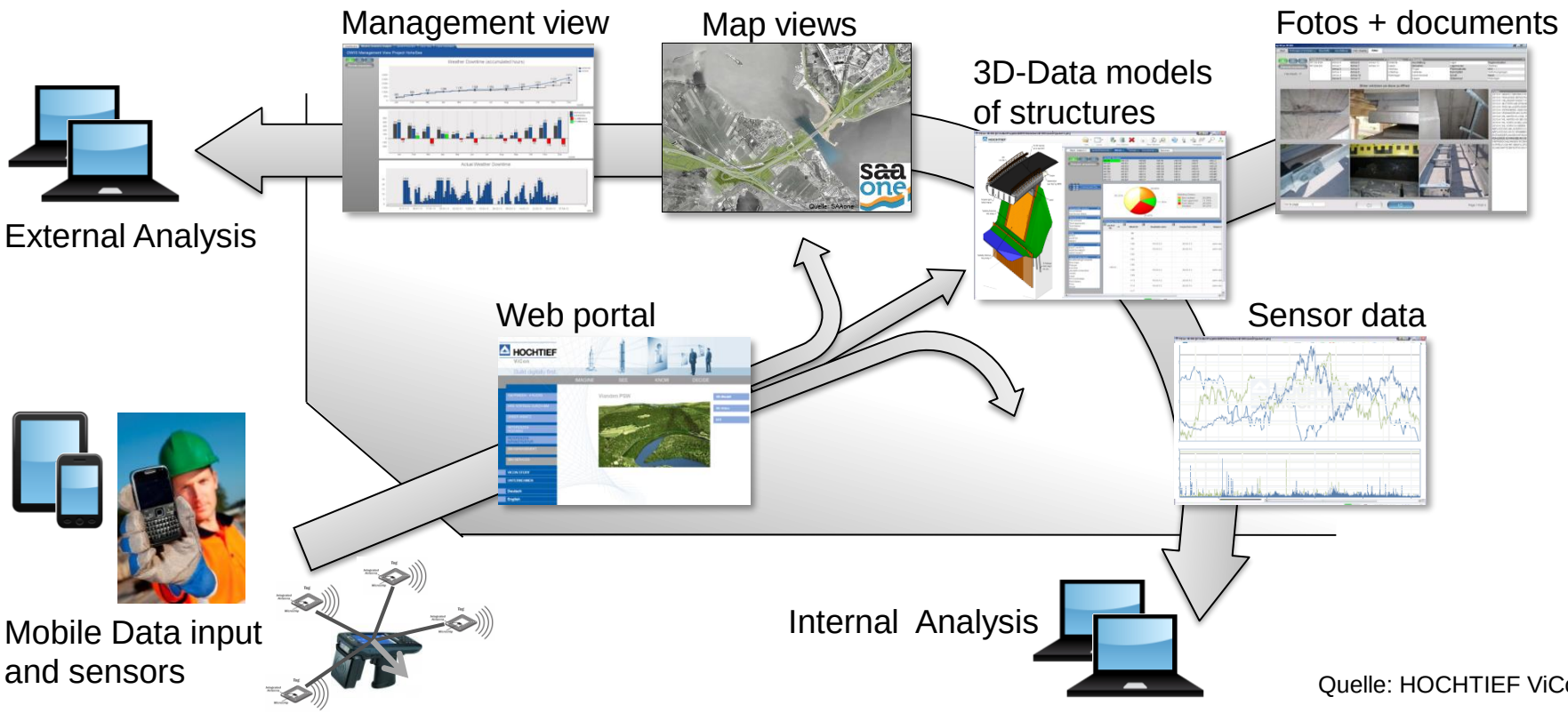


Quelle: HOCHTIEF ViCon

3.4 BIM applications

Further development of the production system „ORIS“

- Web-based project management system
- Control and evaluation of building data for design, construction and operations

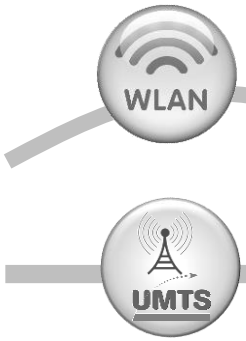


Quelle: HOCHTIEF ViCon

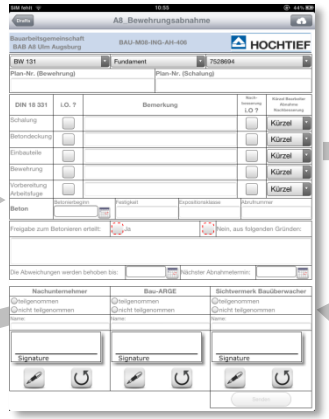
3.4 BIM applications
ORIS for bridges

- Construction: quality assurance, onsite rebar approval, as-built-documentation, etc.
- Operations: e.g. documentation of results from checking of structure according to DIN 1076

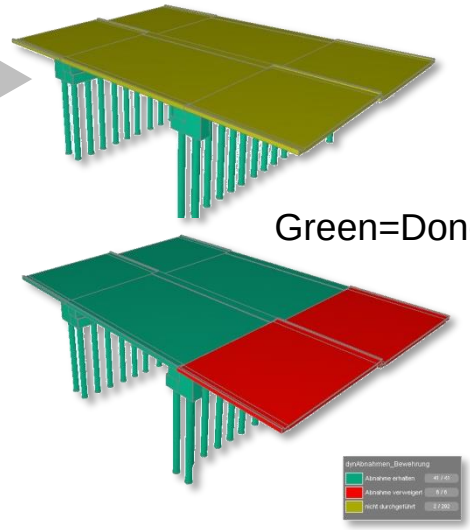
Form-based input
(offline / online)



Form release
and approval



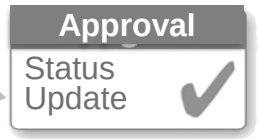
Automatic Updating of status
of rebar approval on site



Green=Done

Prompt via the
portal, Email or
SMS

Workflow



Quelle: HOCHTIEF ViCon

4. Conclusions

Experience from NL,UK and Germany: → recommendations

- PPP secures (defined) **high quality and availability** over a long concession period.
- Other **experience in UK** with ECI Early Contractor Involvement and Partnership Contracts with Target Pricing and Open Book Approach **is positive**.
- Structured process control, particularly via anticipatory **Risk Management Plan** and concurrent **Systems Engineering**, render successful projects.
- General trend to **BIM-based design, process and site support.**
- **Systematic requirement management** support the checking and permitting processes, particularly the dialogue with stakeholders. Alignment of numerous influences on design.
- Interdisciplinary **integrated design team** common and successful in NL and UK. High efforts in communication and coordination but clear results of coordination!
- **Partnering** induces more value engineering and innovation efforts that lead to technical improvements, savings and risk reduction.
- **Partnering** gives better projects: on time, in budget, higher quality, positive media coverage and healthy teams.

Structured – dialogue-based – solution-oriented – in partnership!

Last but not least….

Moritz Leuenberger, then Verkehrsminister Schweiz
at the main breakthrough of the Gotthard-Base Tunnel on 15.10. 2010:

“Something big we dared - **together**.
Something big we created - **together**.

Because we know: The mountain is big. We are small.”