# Bavarian research & innovation

ForBAU

Bavarian Research Cooperation "virtual construction site" – digital tools for construction planning and execution of construction work

VIRTUAL CONSTRUCTION PLANNING SAVES TIME & COSTS

The economic recovery has caused a significant increase in sales in the German construction industry. This trend is expected to be continued in the next years. In a globalised market, however, German construction companies are facing international competitors who partly work with lower labour costs. With cost reductions alone, the construction industry will not be able to compete successfully in the long-term. It has rather to establish itself through technical and organizational innovations within the whole construction process.

A significant key success factor to strengthen the competitiveness of the construction industry is to adapt concepts and practices of modern industrial organizations, their production technologies and logistics systems to those of the construction process.

The consistent use of digital tools offers further room for improvement.

Innovation through an integrated approach

The research project aims at collecting data from different phases of a construction project: This leads to virtual landscapes, through which the construction site "comes to life" (4D-information system of the construction site).
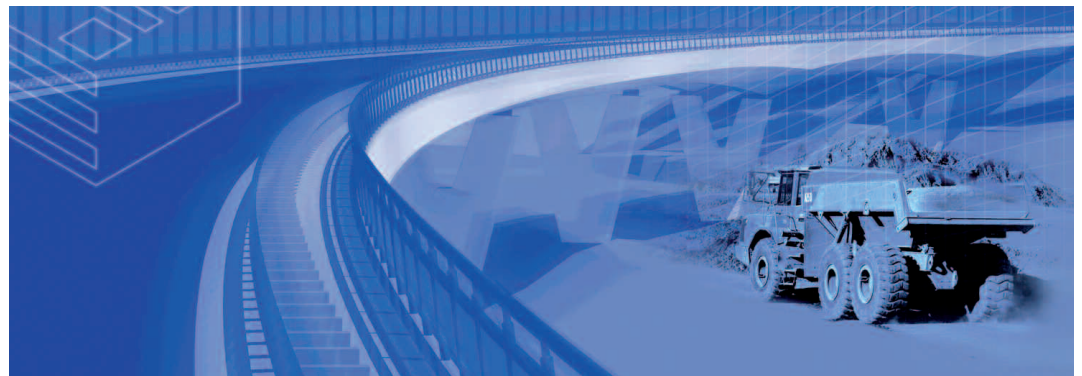
The thus emerging model shall be used and constantly developed over all phases of the project.

In order to manage this, it is necessary to collect data in a central platform, which consists of data from planning, surveying, project planning, accounting and progress of construction work.

Digital tools, such as Product-Data-Management-Systems (PDM-Systems) or process simulations are the basis for an integrated approach.

CAD-models involved in the progress and in the whole lifecycle of a construction project contribute to more transparency in the planning and execution processes to ensure a faster execution of the whole project. Already at an early stage of planning, critical processes can virtually be analyzed by dynamic process simulations and thus help to prevent delays on the real construction site.

Via surveying and automatic identification systems (e.g. RFID) data will be continuously collected during the execution of construction work, which keeps documenting the actual state of the project.

By comparing data with the construction plan, variations can immediately be discovered and counteractive measures can be induced at an early-stage.

The verification of the results with a real construction project is an essential objective of this research project.

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RESEARCH TOPICS:

The Research Cooperation is grouped into four different areas of activity: BAUIT, BAUSIM; BAULOG and BAUIDENT.
BAUIT represents the main component of the Research Cooperation and deals with 3D-modelling of building site, excavation, building plot and construction. The goal is to establish a 4D-information system of the construction site by integrating the models and combining them with the construction schedule.
On the one hand BAUSIM develops methods for the virtual planning of construction processes with the aid of event-driven process simulations that shall examine critical phases beforehand. On the other hand concepts will be elaborated for the controlling of the real-time construction progress concerning capacity, quality and costs.
The third subordinate project is BAULOG, which attempts to connect the key players involved in the construction site at the level of material and information flow. An increase of transparency and flexibility of the value-added chain should be pursued by a Supply Chain Management approach.
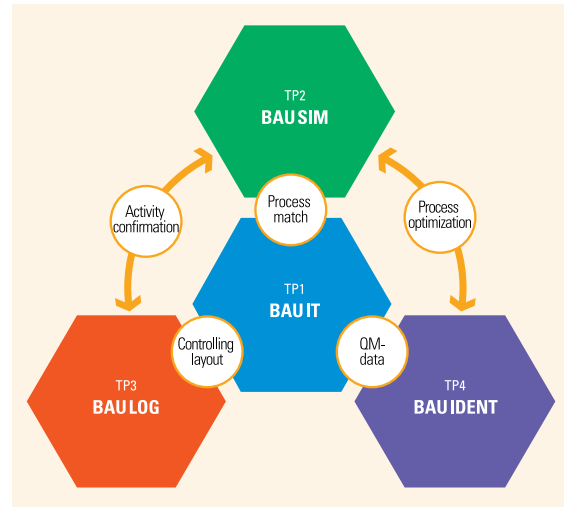The mission of the fourth subordinate project BAUIDENT is to investigate methods for the EDP-based, automated collection of data about the actual state concerning information on capacity and quality at the construction site as well as to integrate them into the central data platform.

ForBAU-Process structure
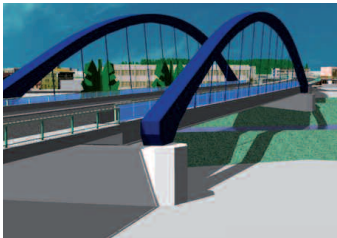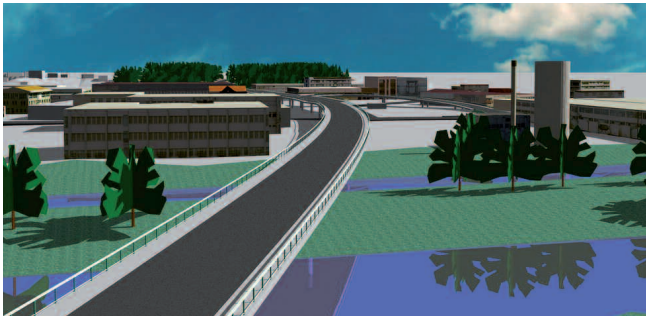
**Computer simulations:
SCHMITT STUMPF FRÜHAUF
UND PARTNER Ingenieur-
gesellschaft im Bauwesen mbH**

Cooperation:
- University of Erlangen-Nuremberg,
  Chair of Business Economics, in particular Logistics,
  Prof. Klaus
- University of Applied Science Regensburg,
  Faculty of Civil Engineering,
  Prof. Euringer, Prof. Stockbauer
- Technical University of Munich,
  Chair of Computation in Engineering,
  Prof. Rank,
  Centre for Geotechnics,
  Prof. Vogt,
  Institute for Material Handling Material Flow Logistics,
  Prof. Günthner
- German Aerospace Centre (DLR),
  Prof. Hirzinger

Economic Applications:
- Central management of data and development of strategies for model-related data storage and their context-related editing for the different user groups of the model
- Continuous 3D-modelling of the building and the construction site by using the model data in a data base management system throughout all process phases
- Dynamic simulation of the project processes at an early planning stage to validate the static project plans
- Integrated optimization of process flows at construction sites with consideration of integrating subcontractors

Industrial Partners:
AEE (aircraft electronic engineering) GmbH
Angermeier Ingenieure GmbH
Ascending Technologies GmbH
Autodesk GmbH
axionet GmbH
Bauer Maschinen GmbH
Bauer Spezialtiefbau GmbH
baulogis GmbH, Bissantz & Company GmbH
Bundesverband der Deutschen Transportbetonindustrie e.V.
Computer Institut Bamberg
DC-Software Doster & Christmann GmbH
Eberth Bau
Ed Züblin AG
FIDES Beratungs- und Vertriebs-GmbH
Hamm AG
Ingenieurbüro Christofori & Partner
Liebherr-Werk Bischofshofen GmbH
Max Bögl Bauservice GmbH & Co. KG
OBERMEYER PLANEN + BERATEN GmbH
PPI Informatik
Raab Karcher Baustoffe GmbH
Remote Sensing Solutions GmbH
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Ingenieurgesellschaft im Bauwesen mbH
sfirion AG
Siemens Product Lifecycle Management Software (DE) GmbH
Siller Thomas
Silverstroke AG
Sinning Vermessungsbedarf GmbH
SOFiSTiK AG
TOPCON Deutschland GmbH
Zapf GmbH