Model-based construction cost planning - process integration using the example of Autodesk Revit and RIB ITWO

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ABSTRACT: At ATP architekten und ingenieure, cost determination will be model-oriented and created with RIB iTWO in the future. In order for this to be implemented, a process optimisation of construction and cost planning must take place. Using the Kaizen method, a workshop is held with people who are part of the process. The current work processes are analysed, discussed and action areas are determined that need to be worked on so that the workflow can run in a model-oriented way. The new processes of the cost framework and cost calculation/estimation are presented and carried out using an example in Revit and iTWO.

KEYWORDS: Cost management, cost planning, BIM, process optimisation, Autodesk Revit, RIB iTWO

1   INTRODUCTION

The economic efficiency of construction projects has a great influence on the success of the project. In order for these to be recorded in costs and compared with each other, it is important to create a consistent cost management system. [1]
At ATP architekten und ingenieure, cost calculations in all planning phases are to be carried out in a model-oriented manner and with RIB iTWO. To implement a model-oriented working method, the construction and cost-planning processes must be optimised. Based on the current workflows, an in-house workshop is creating a new, process-optimised procedure.

2   MAIN BODY

2.1   Construction planning

The construction process consists of construction planning and construction execution. [2] Precisely defined services must be provided in each phase of the project. In Germany, these are regulated in the HOAI, in Austria in the Leistungsmodell Objektplanung - Architekt, and in both cases comprise nine service phases. [3] [4]

2.2   Cost management

Cost management is a part of construction planning and consists of cost planning and control. The cost calculation is an advance calculation of the costs that will be incurred. The aim of this is to be able to compare the costs in each phase. [5]
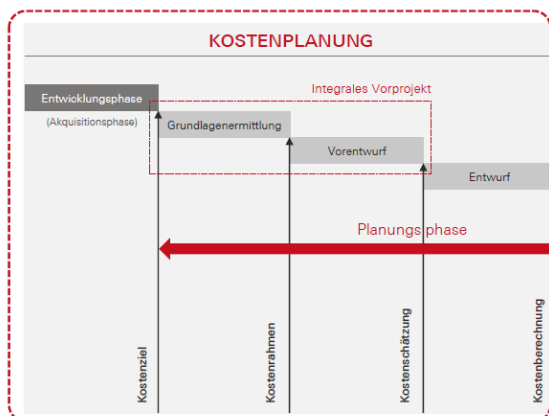

Figure 2-1: Cost planning procedure

In both Germany and Austria, costs are determined at different depths depending on the planning phase, ranging from the first level (cost framework) to the third level (cost calculation).

2.3   Process management

In general, a process describes an ordered sequence of actions that produce an output through a defined input. [6]
The task of process management is to control, lead and optimise processes. Process optimisation is therefore an important component. It scrutinises the current processes and improves the procedures. [7]
In order for changes to become established in a company in the long term, certain conditions must be in place, e.g., a good culture of error and respectful interaction with each other. One of the most important points for successful implementation is the involvement of the employees who carry out the work. In process optimisation using the Kaizen method, the employees are involved in the form of a workshop. [7]

2.4   Preparation of the process optimisation [7]

To ensure that optimisation is structured and organised, the process is divided into three phases:
Phase 1: Determining the improvement priorities
Phase 2: Implementing the individual improvement projects
Phase 2.1: Complete baseline and objectives
Phase 2.2: Record and analyse basics
Phase 2.3: Develop and implement improvements
Phase 2.4: Check implementation
Phase 3: Overall measurement of effectiveness

Tools can be used to support and visually represent the improvement plans. Some of these tools are the fact sheet, process mapping and brainstorming.
The optimisation takes place in the form of the Kaizen method. This provides for a step-by-step optimisation of the processes. In this process, the change measure is developed with a team in a workshop.

2.5   Process optimisation workshop

In an internal workshop, the process optimisation is worked on with people who are involved in the processes. The workshop is divided into the following four points:
1. discuss the initial situation + discussion of the profile
2. analyse the current situation
3. determine fields of action
4. work on fields of action

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The workshop is divided into the cost framework and the cost calculation/estimation.

While analysing the current situation, areas for action have emerged that need to be resolved so that a model-oriented cost calculation can be carried out.

2.5.1 Fields of action Determine and process cost framework

The following fields of action emerged from the workshop:

Fields of action	Description
Lack of coordination	Not clearly defined use of attributes and parameters in Revit, resulting in loss of information.
Using programme types to visualise the model	No use of Revit models at the time of the basic evaluation
Quantity take-off for the cost calculation	Manual determination of GFA/GRV

Table 2-1: Determine fields of action of the cost framework

The discussion of the fields of action produced the following solutions:

Fields of action	Solutions
Lack of coordination	For each department own attributes for filling. For cost calculation: create drag & drop selection options
Using programme types to visualise the model	Create simple area plans with defined heights in Revit
Quantity take-off for the cost calculation	Modelled areas and volumes can be evaluated in iTWO

Table 2-2: Edit fields of action of the cost framework

2.5.2 Determine and process fields of action Cost calculation/estimation

The following fields of action emerged from the workshop:

Fields of action	Description
Model qualities	Adherence to the ATP modelling guideline is decisive for the quality of the model
Dealing with non-modelled elements	Non-modelled elements that may nevertheless have a cost relevance, e.g., soil excavation and backfill
Additional effort on the part of construction planning	The insertion of information such as building components etc. results in additional work on the part of the construction planner

Table 2-3: Determine fields of action for cost calculation

The discussion of the fields of action produced the following solutions:

Fields of action	Solutions
Model qualities	BIM workshop before setting up the model, regular modelling jour fixes
Dealing with non-modelled elements	If modelled, then also determine Revit component lists or on 2D plans manually and enter manually into iTWO
Additional effort on the part of construction planning	Hours of redistribution in favour of architecture

Table 2-4: Edit fields of action of the cost calculation

3   CONCLUSION

With the application of the Kaizen method, a workflow for construction and cost planning could be developed in the course of process optimisation.

Implementation depends largely on the quality of the model. In order to ensure this, a BIM workshop should take place before the start of each project, in which all departments explain the necessity of their parameters and attributes. This creates an understanding of the additional work on the part of the modellers. Similarly, regular modelling jour fixes can highlight positive modelling practices and share experiences.

The additional effort on the part of the modellers should also be taken into account. After all, time is needed to enter all the information from AVA, PSI and the CO_2 tool, and this should be reflected in the distribution of hours in favour of the architecture.

With the changeover to a new programme, already established work processes are lost, which is why there will be additional time expenditure on the part of PSI at the beginning. Recurring processes and predefined assignments can reduce the time required and increase the efficiency of the cost calculation.

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