

Potential for innovation in Cost Planning
Back to basics for innovation in Cost Planning
MAS Digitales Bauen
CAS Wertschöpfung und Innovation
Erweiterter Abstrakt

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During the past two years I have been more focused on the possibilities of detailed cost estimates in conjunction with VDC. Over the past few months I have come to realize that this might have been the wrong way to approach things. Instead of focusing on the details, we should first get the basics in order.

My daily business resolves around cost planning. The product of my work does not vary from project to project, and the product delivered at the end of a project is the same with or without VDC. Even though the product might be the same, it is the process that is the variable. Profitability for us is directly linked to time. So, the innovative idea is to research, create and optimize the relevant processes for all or most of the different scenarios that we deal with, this way we can be much more competitive in the market.

1. Introduction

1.1. Background and Purpose

In my current role I cannot enforce modelling rules for external models, I basically have to work with what I get. In most BIM projects that I deal with, BIM is generally being implemented without any compensation from the client, meaning that there is no contractual obligation for the planners to model according to any specific set of specifications. Hopefully in the near future, we would have a set of Swiss wide approved modelling standards as part of every BIM execution plan. But until then I have to focus on and find improvements and solutions for the way things are currently being done.

There are currently no standard process that optimizes the productivity for the following scenarios within my company.

Scenario 1: a Project where I receive an internal model.

Scenario 2: a Project where I receive an external model.

Scenario 3: a Project where I receive no model at all.

In this study I want to research these three scenarios to identify the process possibilities for each one. I am fully aware that I would not be able to solve all of the problems within the current time frame, but the results would definitely form the foundation for further development within the company. Hopefully the results would also serve as an incentive for the company to invest in said process development.

1.2. Methodology:

Scenario 1: By doing little pilot projects I want to find the best solutions and identify the possibilities for using internal models.

Scenario 2: By going back and studying the processes of recent “external model” projects I want to identify the reoccurring useable elements on a high level, and possible points for optimization.

Scenario 3: By using an existing project I want to compare the time required to calculate certain elements by using three different methods. The first method would be a manual quantity take off from 2D drawings. The second method would be to create the model myself and then do a quantity take-off using Solibri. The third method would be to outsource the model and then do a quantity take off as with the second method.

In the end I can compare the three methods to determine which is the most productive. My main goal in the end is to find practical solutions and not just theoretical ones.

2. Scenario 1 - Internal Model

2.1. Model without modelling ruleset

Internal and external models, when modelled without a ruleset, tend to be very similar. It does depend on the experience of the architect, as well as the phase which the project is in. Due to this I decided not just to study an internal “ruleset” model, but also an internal “non-ruleset” model. Which is basically the same project, just firstly modelled without any modelling rulesets, and afterwards modelled with rulesets.

2.1.1. Internal “non ruleset” model

The result of this analysis showed that it is possible to calculate just over 50% of the required cost elements from the model. The rest would have to be done manually. Unfortunately, this does not translate to a 50% time saving due to the time requirement to analyse certain elements and allocating them.

2.1.2. Internal “ruleset” model

After the analysis in 2.1.1, I organized a few meetings with the architect / modeller to discuss and define some modelling guidelines. During these meetings it quickly became clear and confirmed my thoughts about going back to basics. In my mind I was already thinking of 4th level cost planning elements being exported from the model instead of first making sure that we have a functioning ruleset for the 2nd and in some cases 3rd level cost planning elements. From there on we can always expand. But without it, we would always run into the same problems and never reach our goal.

In this analysis, with the tested elements we had a +/- 90% efficiency increase. The reason why it is not 100% is because we still have to do certain checks in order to be sure that these attributes are indeed correct.

2.1.3. The Process

These two exercises allowed me to set up modelling handbooks for doing a rough cost estimate (Grobkostenschätzung), and a cost estimate (Kostenschätzung). The modelling handbook for a detailed cost plan (Kostenvoranschlag) is still a work in progress.

Apart from the modelling rules, I have also set up a controlling system that enables any cost planner to do a quick and easy model check.

3. Scenario 2 - External Models

Working with external models can be a blessing or a curse. Unfortunately, we are normally not in the position where we can influence the model. We must work with what we get. This however results in a lot of unproductive hours combing through the model to see which elements are useable.

Now the big question is, which are the elements that are most likely to be exported correctly from external models. If I can identify those, we will save a considerable amount of time by then just focusing on those elements in the model, instead of combing through every element. In the end we should know which filters to use for which elements in order to optimize the quantity take off process. And not to recreate the wheel each time. So the goal is to study

three external models / projects and find the similarities between them in terms of useable elements.

3.1.1. The results

		Project 1		Project 2		Project 3	
		Yes	Partially	Yes	Partially	Yes	Partially
C	Konstruktion Gebäude						
C1	Fundament	x		x		x	
C2	Wandkonstruktion	x		x		x	
C3	Stützenkonstruktion	x		x		x	
C4	Decken-, Dachkonstruktion	x		x		x	
E	Äussere Wandbekleidung Gebäude						
E1	Äussere Wandbekleidung unter Terrain					x	
E2	Äussere Wandbekleidung über Terrain						
E3	Einbaute, Absturzsicherung zu Aussenwand		x	x			x
F	Bedachung Gebäude						
F1	Dachhaut		x			x	
F2	Einbaute, Absturzsicherung zu Dach			x			
G	Ausbau Gebäude						
G1	Trennwand, Tür, Tor, Fenster		x	x		x	
G2	Bodenbelag	x		x		x	
G3	Wandbekleidung, Stützenbekleidung						x
G4	Deckenbekleidung, Dachbekleidung		x			x	

The above table shows the most useable elements from the three models. Looking at these results in conjunction with the knowledge that I have of each model, I can conclude the following.

- The structural elements are most likely to be modelled correctly and in turn is also the easiest to verify. These elements also require only one or two attributes in order for them to be useable. Most of these attributes are standard when the correct modelling tool is used. For the 3rd level of costing, the modeler would only need to apply one more attribute. For example a correct and descriptive name, or material.
- With the building envelope it is clear that the external cladding is an element that is not useable. This is mainly due to the way the external walls get modelled and exported. The windows and doors are useable elements. However it does get difficult when the architect models the windows with the wall tool. In this case a more detailed analysis and allocation is required.
- The roof cladding should be an easy element to model, and in turn export. However, when the roof is modelled using the multiple layer tool, we get the same problem as with the external cladding. Only when the cladding is modelled separately as a single slab, and named appropriately, the chance exists for it to be useful.
- Internal doors and windows are normally useable. It is the internal claddings that are mostly non-useable due to various reasons. I have found that the best way to calculate the internal cladding would be using the room elements. This method however comes with various risks. A certain amount of time is required to make assumptions and set everything up in excel. But in the end the time saved by using this method is

considerable. The only requirement is that the rooms are modelled and named correctly so that they correspond to the materialisation plan. In summary, the moment that there are no room elements, the cost planner should not even consider alternative methods to calculate the internal cladding than manually measuring them.

4. Scenario 3 – No Model

4.1. Manual quantity take off

The productivity of manual quantity take off is directly linked to the software being used. For example, measuring from a hard copy is extremely inefficient, there are too many steps involved. A better option is measuring using Adobe Acrobat. Here you have the options to add descriptions for each measurement which in turn helps when sorting and allocating the quantities in excel. The best manual method that I have found is using a software called Bluebeam. Tracking the measurements are easy and the software allows you to take more than one quantity from a single measurement.

Result: The time spent doing a manual quantity take off for the project was 1020min. Which translate to 17h, or approximately two full working days.

4.2. Creating a model internally (Costing Department, not Architectural Department)

There are clear benefits of creating a model in the costing department for the use of quantity take offs. We can model exactly for our needs and therefore have none of the problems discussed under section 3. So why are we not doing this already? The simple answer is experience. The saying: “practice makes perfect” cannot be more correct. In order for us to fully benefit, we would need more experience to be able to model quicker. However, in the current company set up, this is not possible.

Nevertheless, I do have some experience in modelling and the LOD for this model was not too high and the project not too complicated.

These results were quite interesting. When compared to the manual quantity take off method, there is only a 6% difference in the productivity. This result alone would be enough to convince me to pursue implementing internal modelling. Because having a model increases the accuracy and optimizes change management. But the 6% is based on myself with my limited experience modelling. So what would this percentage be when an experience modeller does it. Luckily I was able to convince one of the architects to help me prove the benefits of internal modelling. In the end it only took 6h which meant we had a 44% increase in productivity

4.3. Outsourcing the model

I will start of by saying that I had big hopes for the possibility to outsource the models for projects where we do not receive a model, as well for projects where we receive external models. The idea was to set up working relationship with a modeller where the hourly rate

would justify the outsourcing. From the results in section 4.2 I was able to set up a rough time estimation for modelling which is required when outsourcing models.

Outsourcing the model within Switzerland was out of question. For the following reasons, if we proceed on in that direction we can more easily do it internally with our architect department. But even then, the hourly rate would not justify outsourcing.

The next step was looking for modellers in countries with low enough hourly rates. There are numerous websites for freelancers. I followed this route and got in contact with potential candidates. It was when I started looking into the finer points of this process that I realized a few problems. The main reason was the language barrier. Not the communication, because that was in English. But all the project documentation is in German. The goal is to receive a high-level model, this would be impossible if the person cannot understand what the elements are. The risk was not worth it.

I will pursue this option in the future, but it will have to be backed by a considerable investment from the company. Setting up this process will be very beneficial in the long run. But will take considerable time to set up.

5. Management Summary

Scenario 1

The increase in productivity for a “non-ruleset” model versus a “ruleset” model is undeniable with up to 90% increase in efficiency with some elements. With the implementation of the modelling hand-books now part of the architects deliverables we can continue to improve the costing process by researching the 4th and 5th levels of cost planning.

Scenario 2

The useable information from external models are limited, but there are still a reasonable number of useable elements. By focusing the process on these elements, we can eliminate unnecessary time spent on trying to get information from the other unusable elements. The results from this scenario also showed the benefits of communication and influence over the model. More thought should be given to the planning fee percentages between us and the architect. There is definitely potential there.

Scenario 3

At this stage, creating the model within in the costing department instead of doing a manual quantity take off only saves us a small amount of time initially. But by going this route, we will save more time when changes and variations occurs within the project. Furthermore, there is also the accuracy benefit, quantities from the model is more accurate the manual taken off quantities. With experience, we should also increase the time saved when we are able to produce the models quicker.

6. References

The paper was solely based on my personal experiences.