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/Department of the Built Environment

**/Unit Building Physics and Services**

7LY3M0 – Building performance and energy systems simulation

**Week Choose an item..Concept Choose an item.**

*Action*: For many years, it has been said that building performance simulation has huge potential to assist decision-making in the early/conceptual building design phase. If this is indeed true, then why is it still not happening on a wide scale in the building industry? What are the two most important underlying causes and how can they be addressed?

***Student A***:

According to de Souza (2012), building designers regularly have issues with executing, and drawing conclusions from building performance simulations. This is due to two primary culprits. The first is a lack of knowledge about simulation in general and the physics behind the simulations. This prevents them from adequately understanding and analysing simulation results. This lack of understanding also makes it difficult for them to evaluate the effects specific decisions made in the design process have on simulation results. If they started to design something to be visually pleasing, but had the insight in physics to know that what they are designing will be terribly inefficient, they might take steps to ameliorate this. The same happens with simulation. A designer that has a hard time using simulation tools will also be far less likely to even use them. Due to all of this issues with the conceptual design might only be found out at a later design stage, when other engineers start simulating the building. Once issues are embedded in a design that has been presented to the client or won a design competition it can be terribly difficult to fix them.

The second issue mentioned by de Souza is with the building physicists and programmers designing the simulation tools. These tools come with interfaces that are often difficult to use. In an attempt to allow the user to determine every little detail of the structure they are simulating, they end up with overwhelming programs that can be intimidating. This is an issue that is common in the development of computer programs, especially when the same program is worked on for longer periods of time (sometimes decades). The constant addition of new features means programs end up being increasingly complicated.

Programs do not allow for the user to input vague design descriptions, which means that designers have to put in a lot of detail that is undecided as of yet. This can increase the difficulty of determining the effects of certain factors on building performance. Programs need to be realized that help users in gaining an understanding of these relationships.

A large share of high-end architectural projects is awarded through competitions.(Doeling, 2017) These are fast paced, and often followed by expedited concept design stages. Despite this clients will often expect performance statements that are made during these competitions to hold true during later parts of the design process. The issue that arises from this is that these competitions and hurried design stages don’t allow the designers the time to properly evaluate their concepts. As a result they might discover issues and efficiencies belatedly. At this point clients are expecting the designs to be pretty much set in stone, which in turn makes making changes difficult. Subsequently buildings might be built where the designers realized, perhaps delayed but before it is built, that there are glaring inefficiencies in the design.

The first way to tackle this is by stopping the fast pace of engineering competitions. Hurrying architects like that can only hamper them in making buildings more efficient. When time is of the essence it becomes more difficult to incorporate costly simulations and elaborate calculations. Another important manner of addressing this is by increasing the amount of multidisciplinary collaboration in the early stages of building design. All relevant specialties should be involved as much as possible during the conceptual phases. Using their expertise ensures the creation of realistic, feasible concepts. Finally the clients should change what they expect from the architects. Measurable and spatial deliverables should be determined upon and provided to the project owner. Uncertainties and assumptions should also be made clear.

***Student B***:

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***Student A and B***:

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**References**:

Bleil de Souza, C. (2012) Contrasting paradigms of design thinking: The building thermal simulation tool user vs. the building designer. Automation in Construction 22: 112–122.

Doelling, M. (2017) Building performance optimization in early-stage architectural design. Buro Happold blog.