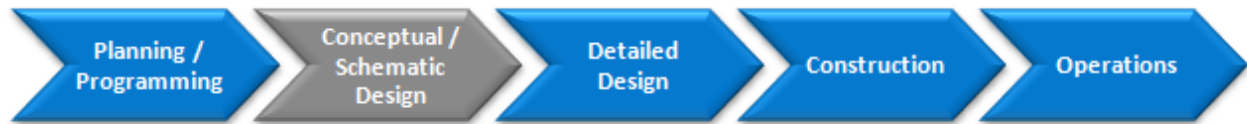


## “Intelligent 3D Modeling” with SketchUp and Affinity

Google™ SketchUp Pro is an invaluable tool for architects. It provides an intuitive, yet comprehensive, 3D design tool that enables architects and designers to experiment with both building interior and exterior designs.

[Trelligence, Inc.](#) is a software company in Houston, Texas that has created a software product, Trelligence Affinity™ that focuses on the early stages of the building workflow. Many Affinity users are also dedicated SketchUp Pro users. As the Trelligence staff worked with customers, we began to see a number of opportunities to dramatically improve the overall building lifecycle by using Affinity to extend the use of SketchUp designs throughout the entire process.

To understand how we leveraged these opportunities, let’s take a look at the classic elements of the building lifecycle workflow:

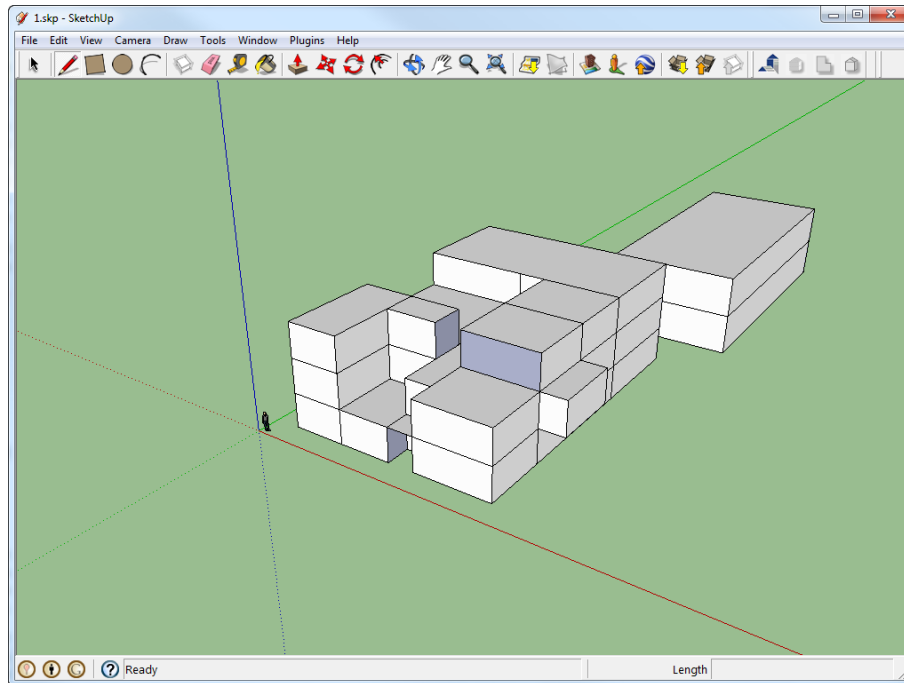


*This is a basic view of the building lifecycle phases.*

For most architects, SketchUp Pro has traditionally been used as a visualization and presentation tool in the *conceptual/schematic design phase* of the building lifecycle (the gray block in the diagram above). The great strengths of SketchUp are its ease of use and its breadth of functionality – it fits well into the mindset and preferred way of working for most architects. The problem has been that the SketchUp Pro models have, more often than not, existed outside the data and automation flow of the overall building process. Yes, the diagrams themselves could be stored in a file and viewed; however, two big issues remained for the building project team.

First, there was no systematic way to ensure that the SketchUp Pro models incorporated the rich intelligence about the design created in the *early planning/programming phase*. And, second, there was no way to ensure that the concepts created through the SketchUp models remained intact as the design was passed on to the various BIM/CAD tools in the later *detailed design phase*. What was needed was an “intelligent 3D modeling” process that ensured that all the data behind the SketchUp model was maintained throughout the building workflow. That’s the process we built using SketchUp and Affinity!

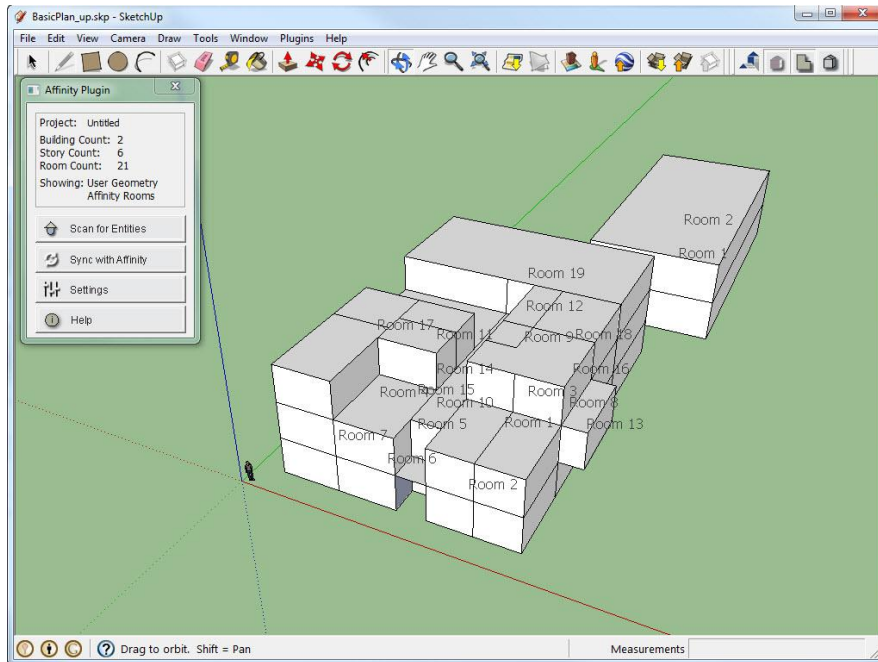
To get a sense of how naturally this intelligent 3D modeling works, let’s walk through an example. Here is a basic conceptual model of a building created in SketchUp Pro:



*This is a SketchUp conceptual design model.*

This model, developed quickly and easily within SketchUp Pro, is typical of the type of conceptual design work performed by architects in order to nail down early ideas of the building layout. But at this point, this model is a visualization only – the model can be viewed, of course, but the “data” behind the model is not directly accessible by other tools.

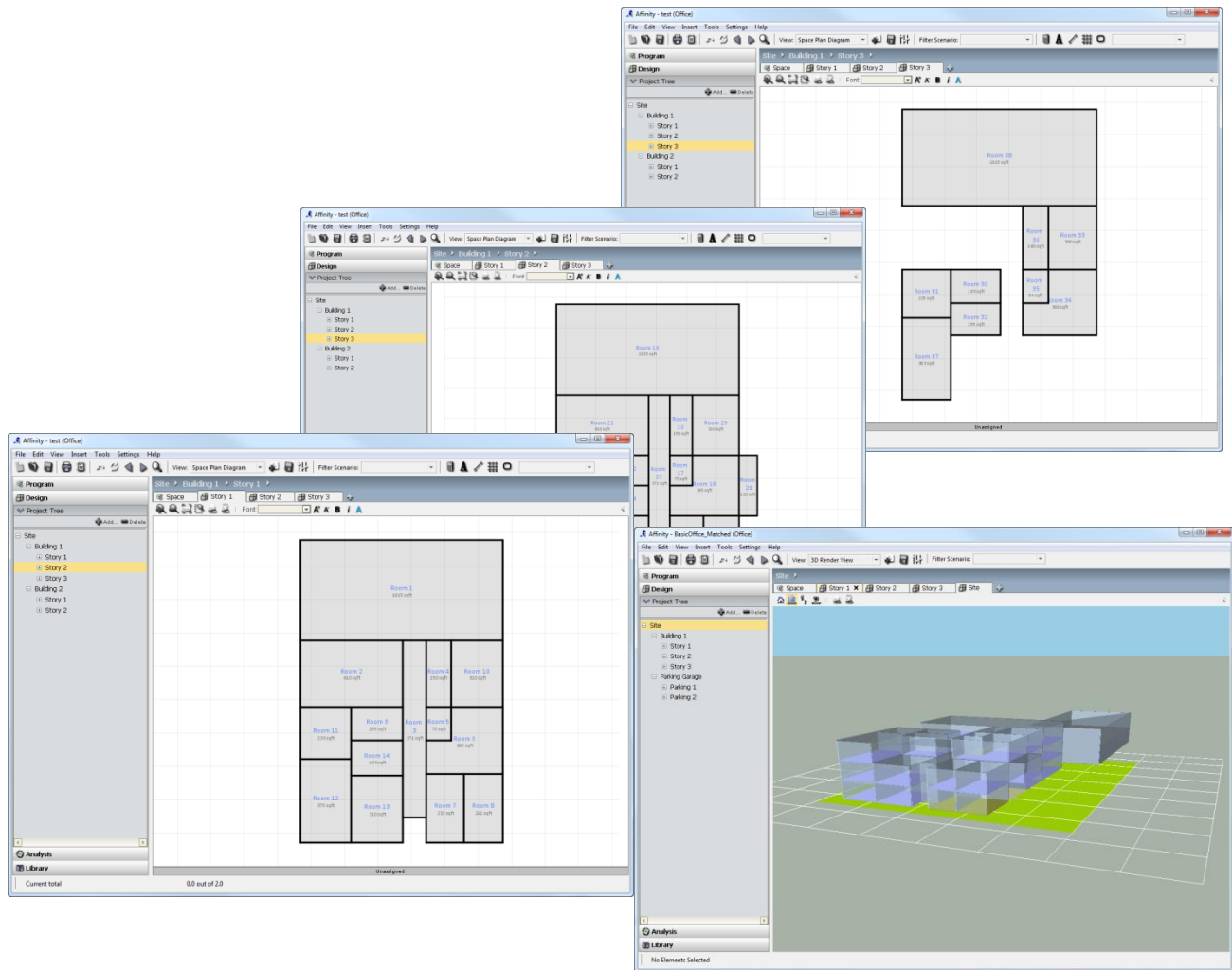
Using the Affinity plug-in from within SketchUp Pro, the SketchUp model can be “scanned” by Affinity to create an initial visual – and data -- imprint of how the model is divided into levels, rooms, and objects within rooms. The scan is an automatic process that occurs at the push of the “Scan” button. Any rooms that are not captured by the automatic scan (typically because of some missing detail in the conceptual model) can easily be created by the plug-in using a “mark and create” process, still from within SketchUp. Here is what the conceptual model looks like after being scanned by the Affinity plug-in:



***This is the “scanned” SketchUp conceptual design model.***

So, with relative ease, the architect has created a conceptual building design with some initial ideas about levels, rooms, and objects. And if the architect now loads this scanned model into Affinity, again using functions provided by the Affinity plug-in, all the data behind this model will be captured in the Affinity repository for continued use by the building project team!

Here is what the scanned model looks like within Affinity from a 3D view as well as 2D space layout views of each of the three floors (a few of the views available in Affinity):

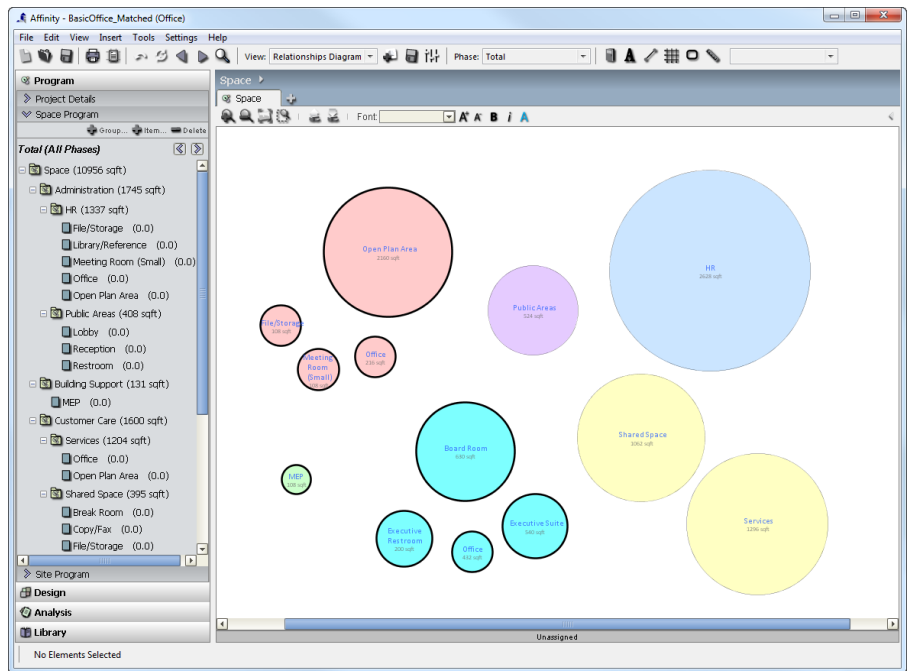


*These are Affinity views of the “scanned” SketchUp model.*

Now that the SketchUp Pro conceptual model has been loaded into Affinity, the project team can use Affinity to perform a number of analyses on the model. For example, a key task of the project team is to continually verify that the evolving design matches the detailed requirements that their client has set for the building. This task is straightforward in Affinity.

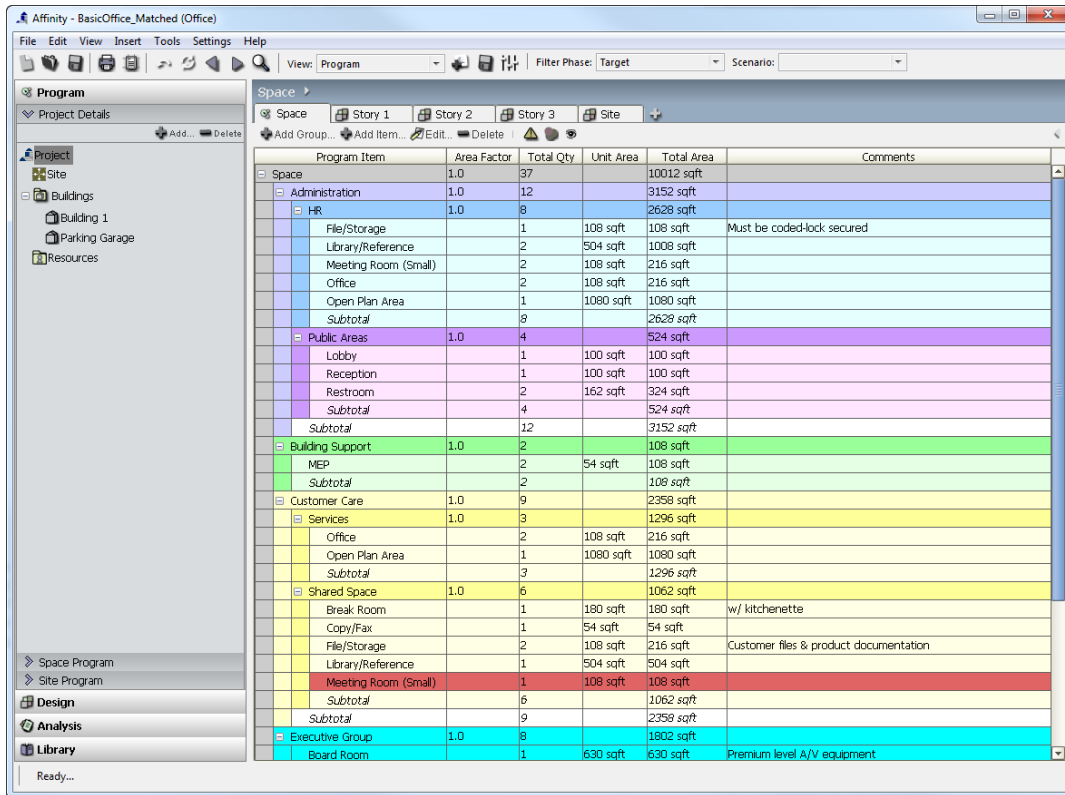
First, by way of background, Affinity makes it easy for the project team to create and maintain an *architectural program* -- the program contains all the requirements for the building design. These requirements can (and should) describe the functional specifications of the building, as well as various spatial and technical specifications. The programming stage is where the core “intelligence” of the building is defined -- unless the programming step is performed well, the building, however visually elegant, will not perform the function for which it is meant. There are lots of ways within Affinity to view program information – here are examples of a spreadsheet-type view and a bubble-diagram view of the program associated with the building we designed in SketchUp Pro:

Program Item	Area Factor	Total Qty	Unit Area	Total Area	Comments
Space	1.0	37		10012 sqft	
Administration	1.0	12		3152 sqft	
HR	1.0	8		2628 sqft	
File/Storage		1	108 sqft	108 sqft	Must be coded-lock secured
Library/Reference		2	504 sqft	1008 sqft	
Meeting Room (Small)		2	108 sqft	216 sqft	
Office		2	108 sqft	216 sqft	
Open Plan Area		1	1080 sqft	1080 sqft	
Subtotal		8		2628 sqft	
Public Areas	1.0	4		524 sqft	
Lobby		1	100 sqft	100 sqft	
Reception		1	100 sqft	100 sqft	
Restroom		2	162 sqft	324 sqft	
Subtotal		4		524 sqft	
Subtotal		12		3152 sqft	
Building Support	1.0	2		108 sqft	
MEP		2	54 sqft	108 sqft	
Subtotal		2		108 sqft	
Customer Care	1.0	9		2358 sqft	
Services	1.0	3		1296 sqft	
Office		2	108 sqft	216 sqft	
Open Plan Area		1	1080 sqft	1080 sqft	
Subtotal		3		1296 sqft	
Shared Space	1.0	6		1062 sqft	
Break Room		1	100 sqft	100 sqft	w/ kitchenette
Copy/Fax		1	54 sqft	54 sqft	
File/Storage		2	108 sqft	216 sqft	Customer files & product documentation
Library/Reference		1	504 sqft	504 sqft	
Meeting Room (Small)		1	108 sqft	108 sqft	
Subtotal		6		1062 sqft	
Subtotal		9		2358 sqft	
Executive	1.0	8		1802 sqft	
Board Room		1	630 sqft	630 sqft	Premium level A/V equipment



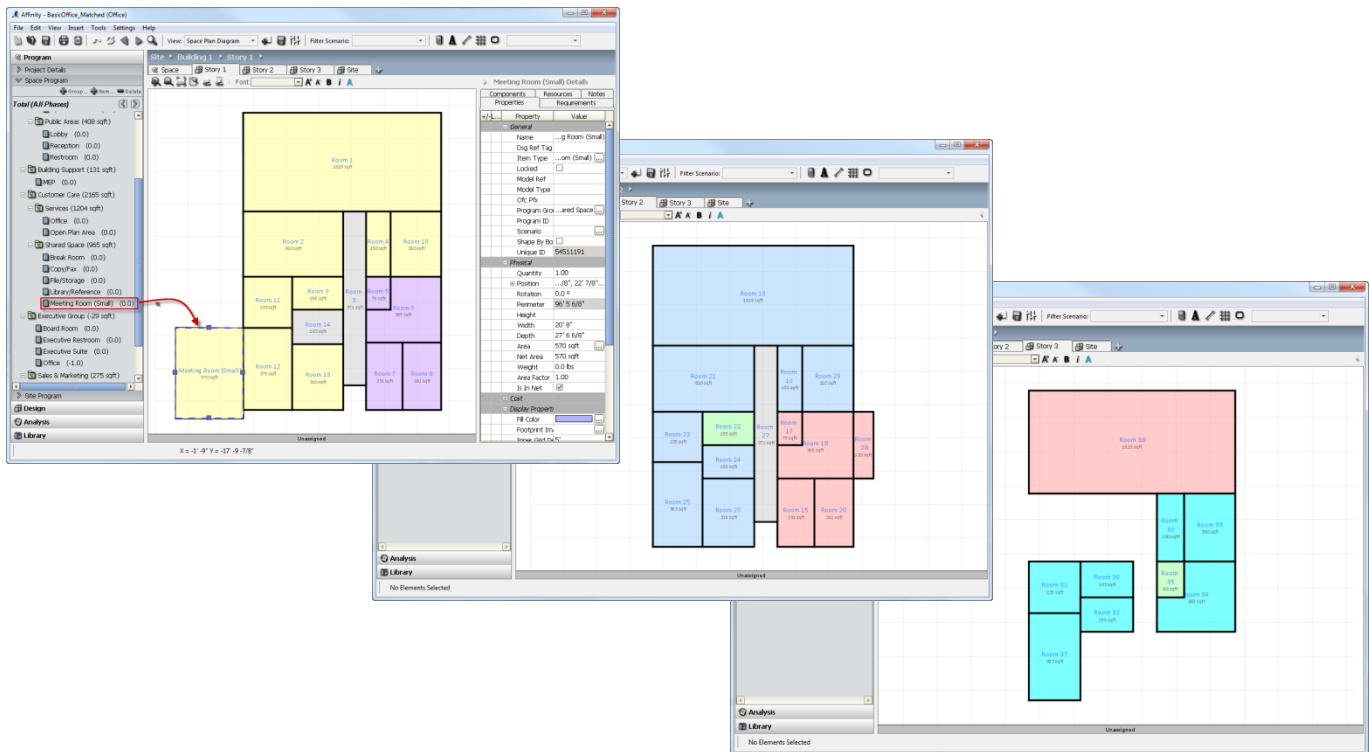
**These are views of architectural program data.**

So how does the quick conceptual design we created in SketchUp Pro compare to the program requirements for the building? Now that we have “scanned” the SketchUp model, we can compare it directly against the program at any time. And we can view the results of that comparison in many ways – here is a simple actual (design) versus planned (program) view:



***This is a comparison of the SketchUp model against requirements.***

Note that the comparison tells us that there is a requirement in the program for an additional room that is missing in the design – this is indicated by the item line in the program highlighted in red. Using the Affinity tools, the architect can simply drag and drop this additional room from the program into the design to bring the design into compliance with the program requirements. Here is a 2D view of the space layouts for each floor – note that an additional room has been added to the first floor:

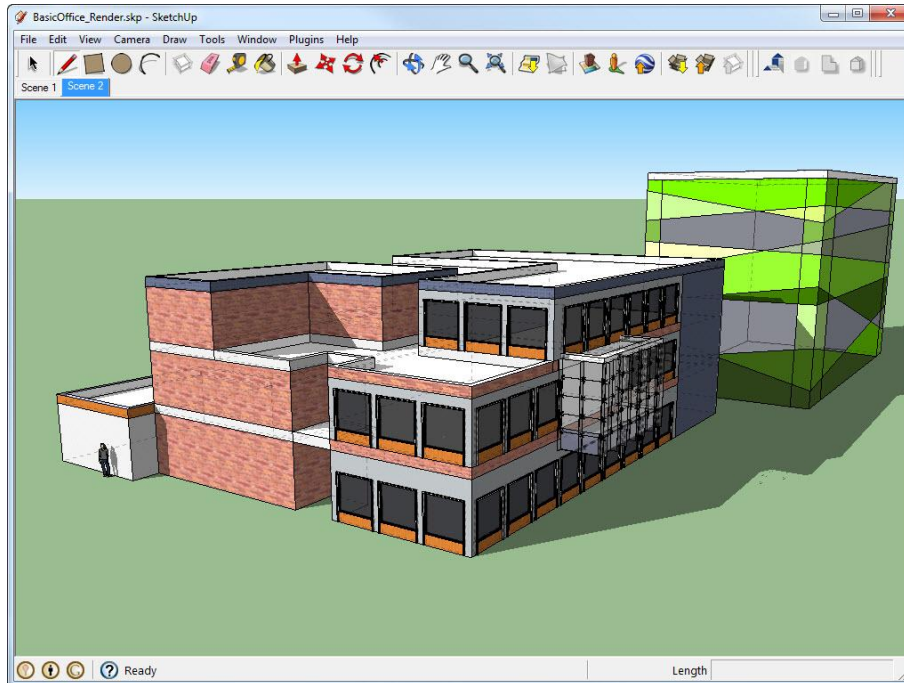


***This design now matches the program.***

Significantly, in addition to the program-to-design analysis, the model can be used to perform a number of other valuable analyses, such as sustainability and cost, early in the building lifecycle where the impact of such analyses is greatest. Indeed, using Affinity’s bi-directional integration with SketchUp Pro, the model can be moved back and forth between Affinity and SketchUp with ease. Models can be easily modified in SketchUp and then loaded back into Affinity where the user can continue to use Affinity’s capabilities to further manipulate and analyze the design. And this process can be repeated through any number of iterations and for any number of design scenarios, giving the architect the freedom to experiment with and analyze various design possibilities. We will cover this topic in more detail in a future post, but the big take-away is that this process can yield huge savings in time and costs as critical decisions are nailed down very early in the design process!

In the flow that we have been discussing, the design process started in SketchUp Pro and then later included Affinity. But, because the Affinity plug-in to SketchUp Pro is entirely bi-directional, this process could also have started in Affinity. For example, the Affinity 2D tools could have been used to create a schematic design (based on program requirements) and that initial design could then have been loaded into SketchUp for 3D manipulation. But regardless of how the project team uses the combined tools, the strength of the integration is that the elegant visualization models of SketchUp are now backed up by all the data intelligence contained within Affinity!

Let’s get back to the example SketchUp Pro model that we scanned and loaded into Affinity. Now that we have compared the model to the program requirements and made a few modifications to the model in Affinity, it is time to move the model back into SketchUp for formal rendering. The SketchUp tools, of course, provide powerful and easy-to-use rendering capabilities. Here is a view of the rendered SketchUp design:



*This is a rendered version of the SketchUp model.*

For SketchUp Pro users, one of the strengths of the integration of SketchUp and Affinity is that it more tightly links the SketchUp output into the overall building design workflow. Because the SketchUp design is incorporated into the Affinity design, all the design information is captured within the Affinity repository and is therefore available as needed. And the integration does not end at the schematic design phase!

Affinity also provides robust integrations with other BIM/CAD tools. This means that the SketchUp Pro design model can be passed on to other production design tools via the Affinity interfaces. This fully integrates the SketchUp output into the workflow of the project team, regardless of the variety of tools used by the team. And because the intelligence behind the SketchUp design is available in the Affinity repository, it remains accessible throughout the building lifecycle – it can, for example, be retrieved and re-used by the facilities management team during any future renovations or re-designs.

This brief video illustrates the SketchUp Pro / Affinity integration in action:

### *The SketchUp and Affinity integration in action.*

An important impact of the SketchUp Pro / Affinity combination is that it effectively “moves the design forward”. By combining the intuitive free-form design strengths of SketchUp with the rigorous planning

and schematic design capabilities of Affinity, planners and architects can make the lion's share of the critical design decisions earlier in the building workflow process. This provides a huge savings in the overall time and cost of the project. And the fact that the design and its associated data is available for use and re-use throughout the building's lifecycle ensures that the intelligence behind the SketchUp design is never lost which, in turn, means additional efficiencies downstream.

That's true "intelligent 3D modeling" with SketchUp Pro and Affinity!