

Foreword

We are in the early stages of a transformation in the facilities industry that will profoundly change the way humankind views and interacts with their built environment. This change, which is being triggered by building information modeling, will allow people to experience their built environment virtually through simulation prior to its physical manifestation. Building information modeling will allow building occupants to appreciate fully how a space will work prior to its actual construction so that they can be as productive as possible once it is built. When a facility is completed using building information modeling, it will also be optimized in its use of materials and energy, and minimize its negative affect on the environment. The facility will be in harmony with all aspects of its internal and external environment. Yet, today, far less than half of practitioners are even aware that this change is coming and even fewer facility users and owners are aware of the opportunity. We are only just beginning to get our message refined to a point where we are communicating to the practitioner and customer alike as to what is occurring, what is at stake, and the ultimate positive affects building information modeling can have on society.

Most of our effort to date has been involved with development of the massive technical foundation that the building information modeling transformation will require to succeed. The technologies converging to make all this possible are not just in the architecture, engineer, contractor, owner, operator (AECOO) community. They also include the internet; social networking such as email, LinkedIn, Facebook, and Twitter; high-speed computing; cloud computing; service-oriented architectures; vast amounts of inexpensive storage; three-dimensional (3D) graphics; and many other supporting tools and standards. But realistically, most people do not get involved with, or do not want to get involved with, the underlying technology.

At the Congress on the Future of Engineering Software (COFES) two years ago, a presenter held up an Apple iPod® in front of the audience and asked the audience what was inside the iPod®. Being a room full of engineers, the answers included flash memory, microprocessors, touchpad, video screen, etc. The speaker responded, “No! Music is what is inside an iPod®!” To the customer and consumer of the product, there is only music inside. Often we get captivated with how something works and not what the intended function is. I believe that we are in the same situation with building information modeling. While we are focused on collaboration, interoperability, and technology, all that the customer really wants is to have sustainable facilities delivered on time and on budget, that use as little energy as possible, and are easily maintained at a low lifecycle cost because it is less expensive for them. Nevertheless, if the customer is going to realize this dream, someone needs to work out the details, because, as everyone knows, the devil is in the details.

This book represents a step forward in documenting and communicating the business processes we need to implement building information modeling at the technical level. It is targeted at the practitioner

and technocrat who must understand what is needed to deliver the customer's dreams. If this documentation process does not occur, then the body of knowledge will not expand and we will be destined to more duplication of effort and little forward progress. To support this effort on a larger scale, the buildingSMART alliance is working to provide a clearinghouse for all research and development affecting the business transformation of the facilities industry. We are grateful to the authors of this compendium, which represent some of the most notable concepts and technologies from around the world, for doing their part to organize and coordinate a vast chunk of that information.

Sadly, despite this explosion of technology, thus far we are producing some rather poor facilities with a notable decline in sustainability in the past fifty years. We are also using much the same approach that we have used for the past several hundred years. We need to ensure that we do not simply add another layer of technology on an existing process. This is truly an opportunity for change, but it will not be realized if we do not have strong leadership to lift us out of the way we have always done business.

Given the scope of change that we envision, it is no wonder it is taking some time to accomplish. Even small change never comes easily. It is my belief that the true transformation will likely take a several generations to fully be incorporated into the way we do business. First, we have to overcome a lack of knowledge and understanding of the effort, as well as a fear of the unknown; and then allow enough time for interoperable application tools to mature and work together more effectively. Next, we need to educate an entire new generation of practitioners who can work together more cooperatively and collaboratively than the previous generations. I am envisioning a time when information is truly only created once and then re-used throughout the entire facility life cycle.

However, technology is only a manifestation of human creativity to solve problems once they have been identified as being problems. The process of reaching the manifestation of a solution conceived as a computer-based tool typically takes five years or more to accomplish. Therefore, we are currently dealing with new tools to solve old problems that were identified years ago.

The process seems to go something like this. Someone has a vision of how things could be better and documents the idea (Many of those visions are in this book). The vision is presented to someone who thinks that it might have some value. Then a company develops a software tool to deliver the idea or at least their interpretation of the idea. In many cases, the first product may only be a prototype or a concept that needs further research and development. Yet, even if the prototype is innovative, only a few of them are ever typically sold at this stage. There are a few exceptions to this where the initial product takes off and sells millions of copies. However, more often it takes far longer to reach a critical mass, if ever. Some examples of this are found in products like the radio, which took 38 years to sell 50 million items; the television, which took 13 years; Internet, 4 years; iPod, 3 years; and it only took Facebook 2 years to have 50 million users!

We need to learn from experience and converge information from many segments of society so as not to reinvent things. We are certainly learning from the information technology community, but we must also learn improved leadership and management skills, if we are going to succeed. We must have strong leadership in place to make this work.

Sadly, most segments of our industry remain focused on optimizing their own stovepipe, or as I have heard it said, 'creating cylinders of excellence.' Unless we can act as a complete industry then we will fail to take advantage of the opportunity in front of us. Will the leadership come from within or from outside? This is not to say there are not some strong leaders in place, it is just that they are not quite collaborating at the level required to optimize the transformation event. This needs to be one of the primary focus areas of the Alliance. We need to expand the base of leadership as well as develop the product.

In the European community, I recently heard a term, the “Lions Committee.” This is a committee made of the most powerful people in a facet of the industry. We need a “Lions Committee” for all aspects of the facilities community. Currently some users are voicing their frustration with how the facilities community delivers facilities. I believe there are many more silent folks who are just as frustrated with project delays and cost overruns that have not found a forum to jointly voice those frustrations.

This book dedicates a section to standards. If we look, we will find that at the base of every one of the massive transformation successes we have seen over the past few years has strong standards as the foundation. Standards should be foundational. They are not as successful if you implement them when you reach the top of an issue. For example, there is no one standard web page, standard email application, standard cell phone, standard global positioning appliance or standard music player, but there sure are open international standards that address the internet, email, cell phone, GPS, and MP3 players. Yet, each manufacturer is free to deliver all kinds of innovative bells, whistles, colors and shapes in the products they sell to the customer.

We must have that same level of standardization in our industry also. If one practitioner is going to use information from another, then they need to have confidence in what it is, how it was created, and how it is managed and protected until it is received by them. Data is the base of building information modeling; data that is used for planning, design, construction, fabrication, operations, maintenance, and sustainment by everyone involved. Hence, the focus on the international standard industry foundation classes (IFC). If we cannot rally around this and make it work for everyone, then we will fail. Nonetheless, IFC research and development is currently underfunded and the product is still underutilized. This is still another example of how our community and those supporting it are not working together in its best interest, but are too focused on capturing a small part of an even smaller market for themselves. If the market is expanded through the adoption of standards, there will be plenty to go around, everyone will flourish, and the industry transformation will be realized.

Of the many application issues it addresses, one aspect presented in the book, which needs separate focus, is the use of spatial information. Sadly, spatial relationships are a significantly overlooked facet of the solution we are seeking. Essentially, every piece of data has a spatial aspect. Quite possibly, the only exception is money, but even that has spatial aspects, as it is associated with projects, or distributed through banks or ATMs, which have locational importance. Spatial aspects of information and, especially, information about an object provide an exceptional filing system since location, like time, only allows one object to occupy a space or happen concurrently. You can use a mapping program to understand how one object relates to another spatially, but you may need to get fairly granular to view the results. Look to one of the many mapping programs on the internet to see an example of this. If you are zoomed out and ask for hotels in a certain city near a location, you will see that there are many, and it is not so easy to tell which is the closest. You need to zoom in to a street level before you see where each is. You can also see a tabular report of distance from the location as well as how much they cost and peoples’ ratings of the hotels.

We need not lose sight of information normalization either, as information must only exist in one location at a point in time. Normalization will ensure that we only enter data one time in a database. This again invokes the value of location along with time. In addition, not every instance of an object needs to carry all the information about the object; it just needs the information that is unique to that instance of the object. For example, a specific object’s maintenance schedule, not the prescribed preventative maintenance schedule, should be stored with the object. Only the maintenance that has taken place on that particular object is important to that object. You can see from this discussion that a shared infor-

mation network needs to be established and sustained. It should also be noted that sustainment is not a separate task, but part of a task. If you use the information to do the job, then it is self-maintaining. An example of this is the travel program where you select the seat for your next flight. When you select the seat, you are updating the database. Someone does not have to take your information and take another step to load the information. The same is true when one of the overnight carriers delivers a package to you. When the driver scans the box, he or she is updating the database and you are instantly able to see that update. This capability exists in many areas, it is just not in our industry quite yet.

Of course, the database technology described in the previous paragraph has not always been available; in fact, it is a rather recent development. Consider what went into delivering the capability to provide real-time tracking of your package, which is now widespread and used by millions worldwide. There are actually many technologies that had to be developed to make it happen, such as wireless, handheld computers; bar codes; etc. Then some innovative entrepreneur had to combine all of them into a configuration that would give you the capability to check your package online. It did not happen all at once nor was it perfect the first day it rolled out. This same type of innovation is beginning to occur in the facilities industry and we need to encourage its growth, accept the positive change, and embrace what it will bring to practitioners as well as our customers. This change in some cases will come rapidly and potentially disruptively, but it must come.

Many of these advancements will come from fresh eyes looking at old problems. Awakening those fresh looks at the issues will come from education. While training someone on how to use a tool that exists and ensuring proficiency in the use of the tool is critical for profitability today, it is education and the awakening innovation that will truly transform the industry. Here again we have a problem. Because our industry is not investing in research and development, many of the bright minds are turning to other better-funded investigations. I know of many Ph.D candidates who have chosen other fields because of two things: lack of funding for their graduate work and the lack of metrics to expand the body of knowledge. It is somewhat a Catch-22 situation. For, if the students are not doing the research and generating the results, then others cannot build on their results. We need to focus a significant amount of effort to ensure our education programs can turn out the innovative minds to apply the new ideas that will help transform the industry. Of course, we also need the visionary leadership to hire those folks and invest in their futures that will support not only those companies but benefit the entire industry.

I am also coming to believe that one of the best tools we have to document progress is the case study of facilities that have already been completed. However, we need to set up a structure so that we can actually obtain the valuable information contained within those projects. They are not just things of beauty but are truly sources of metrics to measure progress. Just as a stopwatch is used to measure the improvement of an athlete so should we use the metrics we keep on our facilities to measure progress. If we have no metrics then we cannot measure improvement. We do have some metrics in place, but we are not using them as evaluative tools effectively. You would not consider buying a car without knowing at least how many miles per gallon it was rated to achieve, though that may not be your only criteria. Ideally, it should be the same with a facility, but currently most of the performance data is not even known. We buy facilities and residences with no idea of how well they perform. While LEED certification, is a huge step forward in the right direction we still have a ways to go until we optimize any approach. Therefore, as we begin to collect case study information, we need to include its LEED rating. But what other performance criteria will we need to collect so that we can measure improvement? This and future books will begin to answer that question.

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We have much work to do. Progress is slow, but progress is truly being made. This book represents yet another line in the sand marking the increasing body of knowledge that will move a whole industry ahead. I hope that reading it will spark the innovation in you to carry the torch forward.

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