
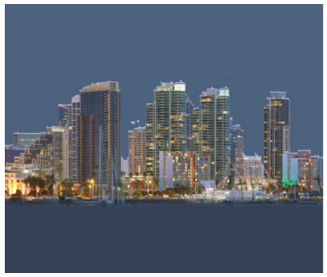

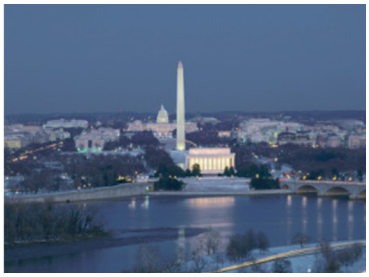

THE BROAD DIMENSION

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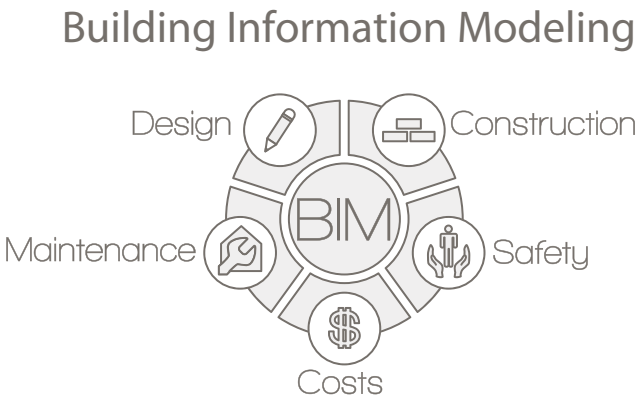
BIM Changing the Construction Industry

BIM was supposed to be the ultimate tool for construction. One model would be used from conceptual design, through the bidding process, then passed to the contractor, and finally it would be handed over to the owner for use in managing the facility. But to date, the reality has largely been different, partly because different BIM applications have often been seen as more appropriate for specific disciplines (e.g. mechanical engineering), and also because of the traditional division between design and construction.



Interoperability between systems is helping to bridge some of these divisions, and not just between actual BIM systems. Methods of facilitating the automatic transfer of data between BIM systems and energy modeling systems are becoming more common, and the use of data mining existing BIMs to benchmark characteristics from previous projects can provide the basis for inputs to the energy model at the earliest stages. The linking of these models allows impacts of changes in orientation, massing,

different materials, etc., to be understood almost instantly, so that informed decisions can be made before the design progresses too far.

Traditionally, the design team has been tasked with the job of producing a design, and bringing that design to a stage where it can be bid. The contractor then comes up with the means and methods for actually constructing the project, and they produce the shop drawings, which then have to be approved by the design team. The level of detail the contractor has to work with is going to be more involved than that to which the design team usually is required to go, and must take into account the sequence of construction required to complete the project. But that process means that the contractors and subcontractors have been bidding on a design that is incomplete, and the RFI (Request for Information) process is used to resolve the issues, which in turn can lead to change orders and added cost to the building owner.

A BIM model can directly produce detail at shop-drawing level, defining how the building will be constructed, including the sequence of operations and what temporary shoring or other methods will be required in the process. Being able to show the construction sequence can identify constructability issues and problems with conflicting work by different trades.

The BIM model can also be used to show the building owner and users what they will be getting, especially when linked to some form of virtual reality (VR). Allowing future users to move through a simulation of the building while it is in design can ensure that it meets everyone's needs adequately. Providing walk- or run-throughs of the building using BIM with VR has also proved useful for establishing emergency evacuation procedures and the like.

The level of detail possible with BIM results in shared risk between the Design Team and the Contractor, and necessitates bringing in the contractor at an early stage in the design to provide the constructability expertise. That type of cooperation has been the goal of IPD (Integrated Project Delivery), where owner, design team, and contractor work together from the early stages of a project and share the risk. The online sharing of the BIM model becomes a major tool for that collaboration, allowing the model to be viewed on PCs, tablets, or whatever device people come up with. This collaboration should also lead to true Value Engineering, which is not just desperate cost cutting.

Such innovative methods of project delivery will require different contractual arrangements that address the sharing of project risk. But the incorporation of construction means and methods into the design process and the additional expertise that is available should result in a smoother construction project that is delivered quicker and more economically.

During construction, the incorporation of data from laser scanning into the model can help in coordinating MEP and other installations, minimizing rework, change orders, and delays. The use of BIM can also make it easier to prefabricate sections of the building, including MEP systems, resulting in speedier erection on site, and cost savings. The use of the BIM model to control computer-aided manufacturing can be implemented in both a factory situation, and on site, e.g. with the BIM model working with GPS data to control an excavator. The BIM can also feed information into the procurement/bidding processes.

Once the building is handed over, the facilities management group can utilize the BIM, recording maintenance information and producing maintenance reports and checklists. Using barcodes on equipment can speed data entry, and provide a method for maintenance personnel to call up the specification and requirements for specific equipment.

The improved coordination that is facilitated by the central BIM model should result in a more efficient and ecologically-friendly building that can be constructed faster and more cost effectively. It should also improve construction safety on site, and help the multiple contractors and subcontractors to work together efficiently. When the building is in use, the BIM model should then assist the facilities management team in keeping the building functioning smoothly.

Jobs and the Future

Technology has been changing our work patterns since farming replaced the hunter-gatherers, and it is almost certain that the hunter-gatherers were not happy with the farmers. The change was damaging their profession and a worker's feeling of self-worth can be tied to their job. A change that affects their work can be seen as an attack on them. The term Luddite is now used for people who resist technological change, and that term dates back to 1811 when the weavers of Britain fought back against the introduction of the mills, which was seen as threatening their jobs.

Work can sometimes be stressful, but it has also been shown to be good for you. The sense of fulfillment and accomplishment that work often provides, has been shown to make people feel better and seems to improve their immune systems. The social interaction, that work also often provides, has been shown to stave off cognitive decline. So it is not surprising that people can become protective of their jobs.

The introduction of personal computers around the 1970s and 80s was seen as threatening jobs, and even the well-known economist, John Maynard Keynes, expected people by now to be dealing with issues of how to manage their leisure time. Instead, since the 1970s, the number of hours worked in the west has been on an upward trend, and 50 hour weeks are now commonplace, not the 15 hours or so that Keynes was forecasting. With cellphones and other mobile technology keeping you in constant contact with your place of employment, some might say they are working 24/7.

Jobs have been developing around technology. While some jobs have been replaced and others changed, new jobs have emerged to service the technology and those using it. Automation of some aspects of production has helped economies to grow, and people have been able to afford more goods and services, creating more jobs.

It has been suggested that almost 50% of current jobs could be replaced by automation over the next 20 years, and the construction industry is certainly not immune to the trend. It is suggested that a lot of onsite labor will be replaced due to increasing offsite prefabrication of portions of a building, largely by automated process. Since it is already becoming difficult to find workers to staff the construction sites, that trend seems to be an advantage, but any change can be stressful with its need for new practices and procedures.

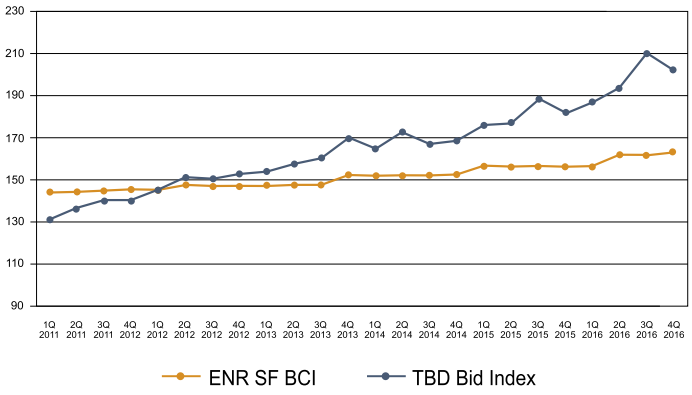
The jobs that are seen as being less affected by technological change are those that involve social contact, and those that utilize imagination and foresight. The exploration of space has become largely the domain of robots, because they are less expensive to transport and maintain, but despite being largely autonomous, the robotic rovers exploring Mars (as an example) still need human operators here on Earth to tell them where to go, what samples to take and analyze, etc., and to troubleshoot issues as they arise. Those same robots also needed a human team to plan, design, and build them.

Technology will continue to change our work patterns, making some jobs obsolete and creating others. And just maybe it will provide us with a bit more leisure time, but if history is anything to go on, that might be unlikely.

Interesting Year Ahead

After two major election surprises (the Brexit vote in the UK, and the US Presidential Election), one might hope the pollsters will be reevaluating what constitutes a representative sample. Of course, the pollsters weren't the only ones misinterpreting the mood of the public. Before the election result, hints that Donald Trump might win would have stock markets dropping, and indications in favor of Hillary Clinton would push them up again. Then, as election night progressed and a Trump win became more certain, the financial headlines were talking of global markets tanking. Next day, markets were soaring and soon the Dow Jones Industrial Average and the S&P 500 were hitting all-time highs, and even the Nasdaq joining in the upward movement but a bit later than the other two.

Bid Index



Part of the market turnaround might have been because there was now a bit more certainty (at least as far as who the next president would be). Mostly, however it is because a Trump presidency is seen as being more business-friendly, with the exception of the high-tech industries. A lot of question marks remain, as to how campaign slogans will translate into legislative action, but let's do a bit of speculating about how the Trump presidency will affect business, and the construction market in particular.

President-elect Trump has spoken critically about Nato, but has also said he is all for it, but with his praise for Putin, there has been a fair amount of concern in Europe. The Brexit vote had already caused problems for the EU, and it will be interesting to watch how Europe develops in the future. Some voices are calling for a more unified political and military structure in some new iteration of the EU.

NAFTA (the North American Free Trade Agreement) has been criticized by Trump, and he doesn't seem too happy with the World Trade Organization either. Tariffs on foreign imports, particularly those from China and Mexico, have been suggested, and fears of a trade war have been raised. Trump has declared that he will not sign the Trans-Pacific Partnership deal, a prospect that China seems to be eyeing with satisfaction, and it could give them an opportunity to increase their influence in the region. Trump has also declared the deal with Iran as being 'the worst deal I think I've ever seen negotiated', but the effects of abandoning it could leave that region in more turmoil than it already is. So overall there is a potential for what could be described as interesting times in the international field.

Developments in the healthcare industry had been largely on hold, awaiting the outcome of the election, and the result has not given much clarity to the industry. Changes to the Affordable Care Act, a.k.a. Obamacare, can definitely be expected, but it seems now that it will be reform rather than abolition. Just what those reforms will be, remains to be seen, but as they become clearer there is likely to be a marked increase in healthcare-related construction projects.

Of more immediate effect for the US market is his plan to reduce taxes and increase spending on infrastructure. The tax cuts should put more spending power in the hands of the public, which, along with the relaxing of regulations, should be oiling the wheels of commerce. That can also mean that inflation could start moving up, and the long talked about interest rate increases will begin in earnest. After seven years of slow but steady expansion, it will be interesting to see what effects a radical change of policy will do. The infrastructure pledge got repeated in his victory speech, and is an idea that also carries support from many Democrats. How such a program will be funded and managed still needs to be worked out, but it looks like one of the election promises that is likely to be met early in his presidency.

A lot of things get said on both sides during the run-up to an election, but the US Constitution contains a series of checks and balances, and the reality is that some form of compromise is almost always needed. How that process works out over the coming year and onwards, is likely to make for interesting times.

Geoff Canham, Editor