



# THE BROAD DIMENSION

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## IoT and Construction

There are a lot of things connected to the Internet already, from PCs, Macs, laptops, tablets, smart phones, even iPods and smart TVs, but these are not the 'things' that the Internet of Things (IoT) refers to. Those 'things' are more likely to be in the form of sensors and operators.

You are probably using the Internet of Things already. If you have a burglar alarm system in your house that is constantly monitored, it is probably connecting to the monitoring company over the Internet. If you are on vacation and realize you forgot to set up your DVR to record your favorite show, you may be able to remotely connect via the IoT and ensure the show is waiting for you when you get back.



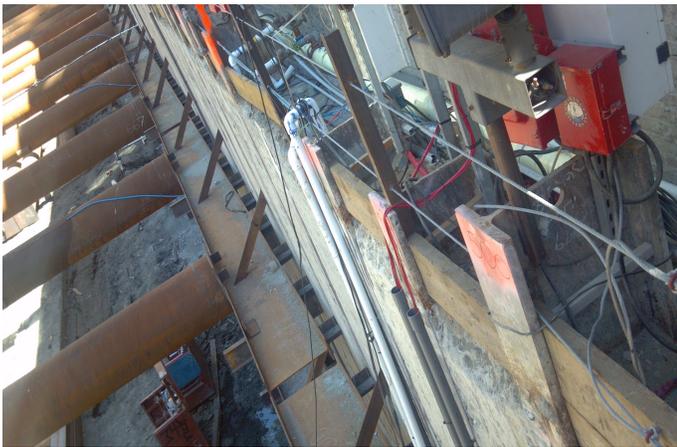
Keeping track of materials and small tools on a construction site has always been a problem, but the IoT envisions almost everything being tagged in some way, so that its location can be tracked. That tracking will also identify

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when materials are running short, providing an automated inventory process.

Large pieces of equipment or plant become uneconomic if they are standing idle, and the IoT would make it easier to monitor usage and ensure that they kept being productive. That monitoring would be automated, with alerts being issued as extended idle periods are noted. Automation of processes is also seen as a use for the IoT, which could increase the safety of sites by keeping people out of harm's way, but would also mean that less people would need to be employed on a construction site. With the current shortage of craftsmen, that may not necessarily be a problem.



Having plant or equipment break down on site can be costly, and the automatic monitoring of equipment, feeding the information back to the supplier and/or owner so that preventive action can be taken beforehand, is another use of the IoT. Your car may already be doing that for you.

Sensors can monitor the condition of bridges and other structures, to show how they are performing under normal conditions or in the event of a natural disaster, such as an earthquake or hurricane, and quickly inform the appropriate authority when preventive or remedial action is necessary. Similar sensors can track and adjust energy usage, ensuring that the building is performing to specification.

It has also been suggested that construction staff could wear a monitor, which could issue alerts if approaching a dangerous area, and feed information directly into the company payroll system. The data could also be used to track the true cost of processes and procedures, improving the construction cost estimating records. Such monitoring naturally gives rise to privacy issues, which extend beyond

the construction site. With your car, dishwasher, HVAC system, and other household objects feeding information to who knows where, you can be sure that marketers will be interested in getting their hands on the information in order to better target goods and services at you. People have already found ways to hack into a computer's Webcam in order to literally see what you are doing, and a proliferation of Internet-connected security cameras, baby monitors, and the like, will only make their job easier.

Security therefore becomes a serious issue, but one that often gets neglected. Many of the gadgets that form the IoT are small and relatively inexpensive, and additional circuitry and coding to address security may not seem worthwhile. But while someone playing remotely with your thermostat might just be annoying, if they can gain remote control of your car while you are driving it, that could be life-threatening to you and anyone around. And the possibility of that occurring has been demonstrated. Just think of the damage someone could inflict by taking remote control of an excavator.

Since more and more products will be containing electronics, that will make the recycling or disposal of the objects more problematic. Also, it could end up making the life cycle of objects shorter, because they may end up being replaced not because they are worn out but because technology has improved and made them old fashioned.

The Internet of Things does offer a lot of exciting possibilities, but as with all new technologies it comes with issues that need to be addressed.

## Net Zero and the Envelope

Achieving Net Zero on a building does, of course, mean an integrated process involving all sections of the building. Reducing the required load by the use of LED lighting and automated lighting control, along with innovative HVAC systems, good insulation and other methods, is always a first step in achieving the goal. Those kinds of techniques can reduce energy requirements by up to about 60% of that used by a traditional building. The next step is providing the



energy needed to meet even this reduced load, and as the buildings become taller, this becomes more of a problem.

Photovoltaic (PV) panels are the normal method of providing power, and the roof is the obvious location for them. However, as buildings get taller, the proportion of roof space gets markedly smaller, and that space may be needed for HVAC and other equipment. The vertical enclosure (exterior walls) of the building provides an additional location for PVs, and for other methods of achieving the Net Zero goal in a cost effective manner. PV panels are available that look attractive enough to be used as actual wall panels, and the performance of wall mounted PV can be around 72% of that of rooftop-mounted ones. You can also get translucent glass that incorporates PV elements. Such glass can be incorporated in windows, storefront or curtain walling, and the efficiency of these systems continues to rise, and the cost premium is coming down.

One way of reducing the energy requirements of a building is to reduce the heat gain from glazing, and this can be achieved while still maintaining the same amount of glazing. Sun shading is one method, and another is the use of EC (electrochromic) glass, an electrically tintable smart glass that can change the amount of light transmittance to meet differing requirements as the Sun progresses across the sky or weather conditions change.

The exterior wall can also incorporate solar water heating. Sun shading structures and areas of spandrel glazing in a curtain wall provide suitable zones for this source of energy production. Another interesting method of providing heating is by use of a Trombe wall. This type of wall has a glass outer layer and an inner layer than can absorb the heat collected in the air gap between them, which heats up

like a greenhouse. That inner wall can then radiate heat into the building even after the sun has stopped beaming down on the wall. Vents at the top and bottom of the wall can also regulate the flow of the heated air into the building as needed.

There are even people developing what they call spray-on solar paint, so the future options for using the exterior closure of a building to generate energy could be endless.



*Thanks to Nick Bagatelos with Bagatelos Architectural Glass Systems for information provided related to this article, including the images.*

## When's the Next Recession?

After seeming to nosedive at the beginning of the year, stocks have (at time of writing in early May) recovered most of the losses, but they still don't seem to know if they want to go up or down. The Dow hit its all-time high of 18,312.39 on May 19, 2015, and has come reasonably close to that a few times since, but never quite got there again.

If you look at the dates that US recessions have occurred since the 1960's, we see them starting in years 1960, 1969, 1973, 1980/81, 1990, 2001, and 2007, so if you believe in cycles and history repeating itself, we are just about due for another recession. Looking at our Bid Index,

we are definitely seeing a similarity with the way bid prices have risen compared to the way they did coming up to the Great Recession. But the situations between then and now have some marked differences. In 2007, prices were pushing higher because the economy was overheating, helped by banks offering loans to almost anyone that asked, and contractors were struggling to meet the ever growing demands of developers. Contractors again are having a problem with meeting demands today, but that is not because demands are that excessive, and certainly not because they are being fueled by easy borrowing. This time it is because so many craftsmen left the industry after the bust that contractors are finding it hard to staff the projects they have.



The Spring 2016 Confindex Report (published by the CFMA) shows that while members of the construction industry generally feel optimistic for 2016, there is more concern with how things will go in 2017. Part of that could be the natural tendency to be concerned regarding events further out in the future, and the feeling that the improving market conditions won't go on forever. But so far the economy hasn't improved enough for the Federal Reserve to fully release the training wheels it fitted to stop the economy falling over completely during the last recession. It has stopped the so-called quantitative easing and made tentative moves at increasing interest rates, but we are certainly not back to normal (whatever that is). The unemployment levels are down to what is normally considered full employment, but many people can still only find part-time work when they would prefer full-time, and there has been very little upward pressure on wages. Outside of the US, we do still find quantitative easing being

employed by some central banks, and we have even seen negative interest rates being used.

It is unclear exactly what is happening in China, but certainly their economy has been slowing. The proportion of US trade that goes to China is not huge, but companies had been looking to that region as an area of potential expansion, and those opportunities are seen to be retreating. Russia continues to struggle under the dual effects of the oil price collapse and the sanctions imposed after its actions in Ukraine. Russia is certainly not the only nation suffering because of oil prices, and while oil has been recovering from its lows, its price is still only a fraction of what it was not long ago. Although US oil production has been decreasing, the global glut of oil supplies continues to increase, so oil prices cannot be expected to recover much more in the near future, and are likely to remain at least as volatile as the Dow Jones index.

The European Union has seen some improvements in growth recently, but they have been slower in recovering than the US, so they still have some catching up to do. Meanwhile, growth projections have been reduced in the US, and certainly the election rhetoric has not been talking-up the economy.

The collapse of the housing market was an early sign ahead of the Great Recession. Back in March 2007, the median price for a new house in the US peaked at \$262,600 before collapsing, yet by November 2015 that median price had climbed back up to \$317,000. But it is interesting to note that in December 2015, a month after the new peak in house prices was seen, the Fed made a small increase in interest rates and the median house price was down to \$297,900 in March this year. That seems to indicate fragility in the market, although by April it had shot up to \$321,100.

In conclusion, this writer would say that although there may be indications to suggest at least the possibility of a shallow recession within the next two to three years, there are too many variables involved to say with any measure of certainty when, how deep, how widespread or how long it could be. On the positive side, consumers tend to be in good financial shape, having learnt from the past recession, and the Architectural Billings Index has just had its first three consecutive months of growth since July 2015.

*Geoff Canham, Editor*