IGS GeboJagema

Smart asset management

Monitoring the performance of your mould, anytime, anywhere

By Hans Arts, Head of Sales & Marketing, IGS GeboJagema, July 2017

From Precision to Perfection

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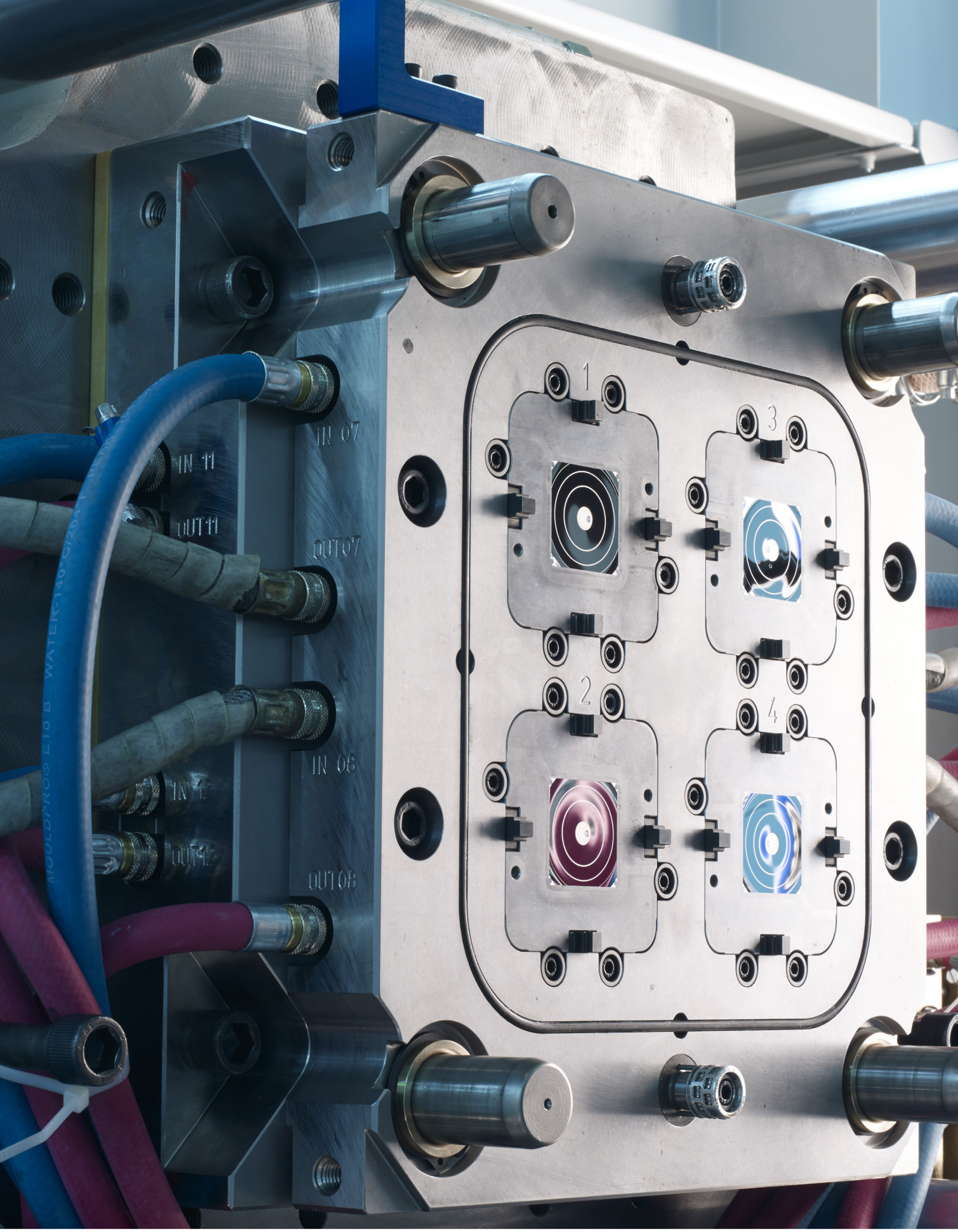
Our world is becoming smarter every day. Think thermostats that heat up our homes when our car tells it we're almost there. Factory machines communicating with each other to optimise production processes. Fridges ordering groceries that we've almost run out of. The Internet of Things (IoT) will revolutionise how we work and how we live. More and more 'things' are being connected to the cloud, enabling them to communicate with other devices and allowing for powerful data analytics. Estimates anticipate over 100 billion connected IoT devices by 2025, along with an $11 trillion impact on the global economy. It raises an inevitable question: does it make sense to connect your mould to the Internet as well? And if so, what are the challenges on the road to smart moulds?

The most obvious advantage of smart moulding is the ability to monitor the performance of your moulds anytime and anywhere. It will open up a range of possibilities that will radically change the way the business works. For one, preventative maintenance will be replaced by predictive maintenance. At the very least, this will allow mould makers to extend warranty periods. But we can also imagine a future in which contract manufacturers or original equipment manufacturers lease the moulding tool from the mould maker in a price per unit of output-model, saving the manufacturers from a cost-intensive upfront investment. To reach that future, smart moulding will have to overcome a number of challenges. But despite the hurdles, everybody is convinced that this development is unstoppable.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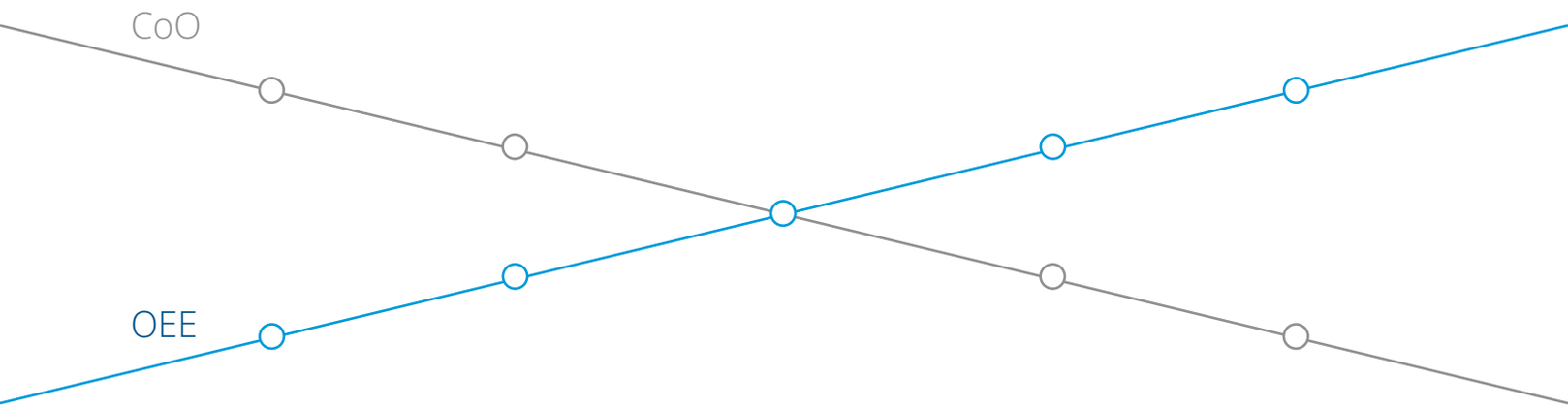


The Possibilities of Smart Injection Moulds

Imagine a world where injection moulds are packed with smart sensors that measure a range of important dynamics that tell everything about the status of both the mould itself and the moulding process. The small, integrated sensors gather real-time information on cycle-times, number of shots, mould and melt temperatures, cavity pressures and water flow rates. With pressure sensors in the corners of the mould, the sensors quantify the pressure distribution of the injection moulding machine over the mould surface. Sensitive vibration sensors detect mould wear on moving or guiding parts. And with the available encoders on the servo systems in the mould, users will be in full control of torsional forces and response times.

This integrated system sends the data to a customer monitoring app, where dedicated logarithms translate the data into easy and clear graphics that present all the important service indicators. This allows you to monitor the performance of the mould, the process changes, as well as the quality of the moulded products and the need for maintenance. The software will recommend the optimal times for maintenance activities and alert users in case of quality drops, output issues and other process challenges. This will boost the Overall Equipment Effectiveness (OEE) and reduce the cost of ownership drastically.

But we can even go beyond these fairly obvious indicators. How about measuring the total amount of available venting per cavity? Or keeping track of the exact chemical composition of the resin used for each shot, over and over again? This second level of indicators will lead to a virtual treasure trove of data allowing the user to optimize the process settings down to the smallest detail. The result: perfect part quality, the minutest shot-to-shot variations and unprecedented improvements in yield performance.

Keeping track of your moulds on the go is our view on the future through Smart Injection Moulds

The Challenges for the Internet of Things and Smart Moulding

So far the good news, but what about the challenges? Almost every new idea, invention or innovation has a bumpy road ahead of it and smart moulding and the Internet of Things are no exception. To realize their full potential, they will have to overcome a number of significant challenges related to security, the law, global standardization and development costs.

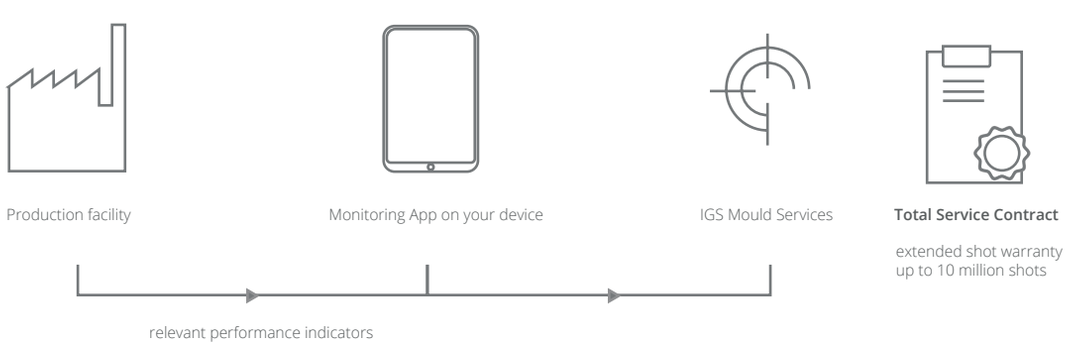
Challenge #1: Security

As news headlines remind us, devices that are connected to the internet have to deal with the risks of hacking and require careful attention be paid to data security. Trust and reliability are critical for the adoption of smart moulding. Users need to trust that the devices, applications and connections are both secure and stable. They need to know that their data and information is safe and their production processes are reliable. If customers feel their environment fails to meet these standards, trust erodes and causes a reluctance to implement or use the new smart moulding program.

Challenge #2: Liability

IoT devices raise thought-provoking legal liability questions. A fundamental question for smart moulding is: who is responsible when the machine is damaged or a person is harmed as a result of a smart mould's action or recommendation? The answer is most likely complicated and in many cases, the case law to support a particular position is still limited. Smart moulds operate in a more complex way than a simple stand-alone mould, which will raise more complex liability scenarios that require consideration.

Know the exact right moment to plan maintenance



Challenge #3: Global Standardization

To facilitate open communication between all devices, the large-scale implementation of smart technology will require global standards. Whether the IoT achieves its full potential for users and industry, largely depends on the adoption of open, widely available standards in favour of proprietary technical implementations. It will drive innovation, increase economic opportunities and lead to greater consumer benefits. Though it is unclear if full interoperability across products and services is always necessary or even possible, users might hesitate to purchase smart moulds and its related services if the devices are difficult to integrate and raise concerns of vendor lock-in.

An open environment does of course present challenges of its own. Smart moulds can potentially connect and interact with other IoT devices, such as the assembly line or injection moulding machines, in untested and unforeseen ways. As interoperability of devices increases, it becomes more and more difficult for the manufacturer of smart moulds to account for all potentially harmful scenarios before deploying the smart moulding devices.

Challenge #4: Development Costs

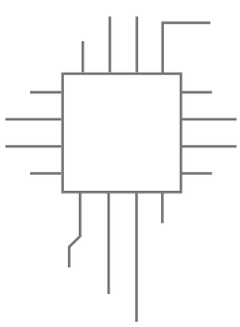
The development of smart devices requires significant investments in multiple areas:

1. Hardware: The mould enhanced with embedded systems and smart sensors

2. Infrastructure: The software in the cloud or on a corporate server that receives, analyses and stores sensor data

3. Apps: Applications for smartphones, tablets and desktops that connect the mould to the infrastructure and enable customers to manage their smart device

So how do the development costs break down over these areas? Various studies show that the price of building the device itself (i.e. the hardware) tends to make up 70 to 80 percent of the total development costs of an IoT device.



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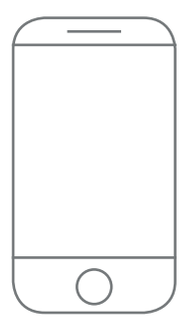

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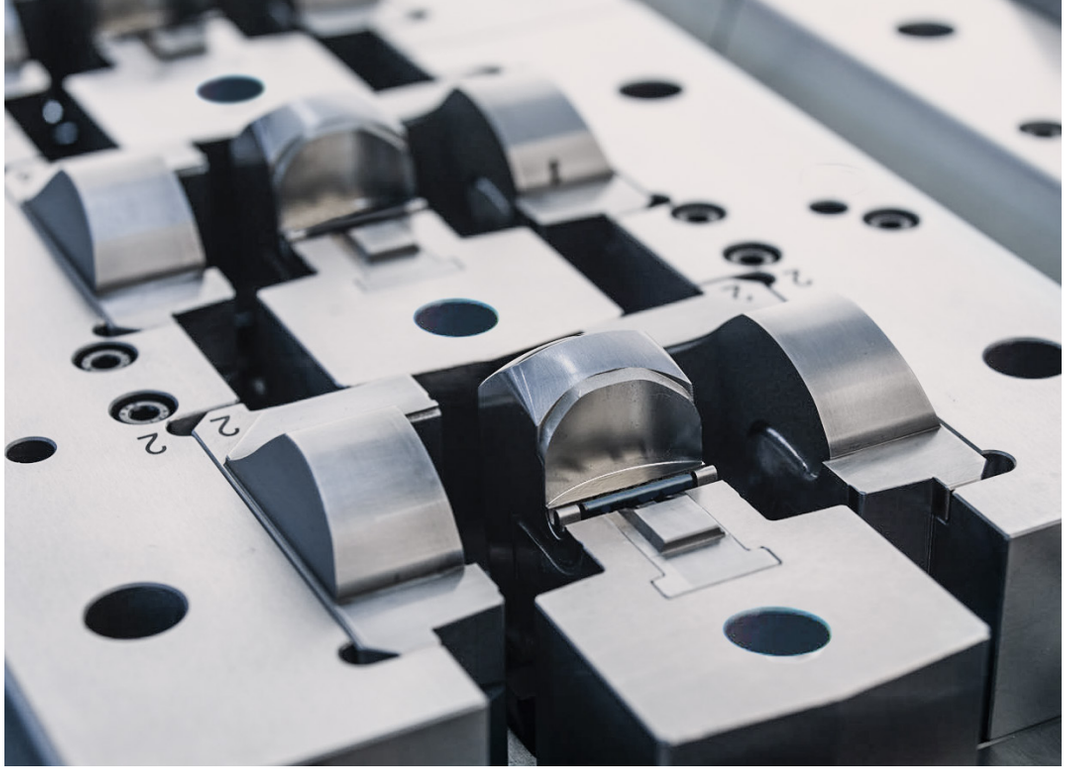
In the case of smart moulds, the majority of the costs are for the mould itself and only a small percentage is required for the electronics, such as the sensors. It is the complex support system, the infrastructure, that makes entering the IoT market expensive. Take predictive maintenance. The sensors in the smart mould allow customers to monitor equipment performance and prevent failures. You need a mobile app to generate alert notifications whenever sensors register abnormal behaviour. You also need a desktop application to send technicians to the field and to order replacement parts. Considerable upfront investments are required to develop and implement these sophisticated systems.

While building the device and setting up the infrastructure would be quite expensive, the dedicated mobile application could be very simple. For our customer to monitor the mould, the gadget's sensors would need to track the functionality of the tool and visualize the sensor readings in real time. Say we want to build an iOS application that produces high-quality visuals in real time and is wrapped in a native container. To name some ballpark figures, such an app would take about 300 hours to develop and cost ten to fifteen thousand euro.



Conclusion

Smart moulding has been on our minds for years. The recent development of key technologies and a number of market trends have made this idea more and more feasible. The future of smart moulding looks promising and we expect it to revolutionise the way we work.

Still, a number of challenges need to be overcome to reach this bright future. Challenges in the areas of security, the law, standardization and development costs need to be tackled in order to reduce risks and maximize benefits. But one thing is certain. The Internet of Things is arriving right now and is unstoppable. The same goes for smart moulding.

The question is: who will initiate, develop, finance and unroll this new technology? How will this technology turn into a mature and economically viable system? In our view, this will most likely need to be a joint effort of involved stakeholders, such as the contract manufacturer, the tool maker, software developers and the supplier of sensor systems.

It seems sensible that the supplier of sensor systems would take the initiative to bring these companies together. After all, they are able to generate a global smart moulding standard that can be implemented by different mould makers and used in the production environment of different system suppliers. Which global measurement technology company will pick up the gauntlet? Kistler, RJG or another innovative driven entrepreneur?

Sources

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- 7 Big Problems with the Internet of Things, by David Roe, published March 19th, 2014
- Internet of Things: How Much Does it Cost to Build IoT Solution, by Andrei Klubnikin, October 21, 2016

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