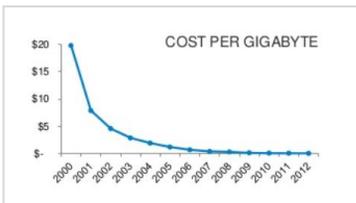




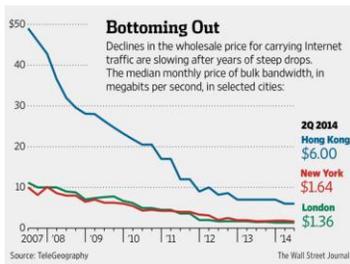
IOT (Internet of things) in mining

Enabling technology costs constantly reducing:

Data storage cost



Connectivity cost



Sensor Tech cost

Technologies

Nanotech (Graphene)

Projected: 80% price drop in production costs between 2014-2020

Technologies

Sensors (3D LIDAR)

\$20,000 (2009) to \$79 (2014) 250x in 5 years

Imagine the real applications of IoT

At a recent event hosted by Decision Inc. Immix, the benefits of IoT were discussed and practical examples and case studies presented.

Opportunities with **Machine Vibration Monitoring** is a practical application in industry today. Vibration Measurements is a big part of the future of Industrial Internet of Things. It allows us to identify anomalies and predict failure. Significant research is done in South Africa and has resulted in the implementation of these devices. This can be done measuring **mechanical vibration** (heartbeat of the machine) or **permanently installed accelerometer** onto systems.

Gearbox diagnostics is another example where continuous condition monitoring is used to detect machine faults for preventative control. IoT devices or sensors are used replacing manual inspections, using novel statistical anomaly detection techniques.

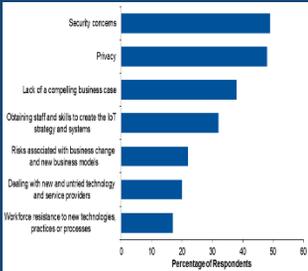
Other examples to avoid catastrophic failures include **Damage Identification** and **Condition monitoring** in rotor blades & other industrial equipment and the impact the environment has on these assets, such as a haul road condition.

Source: Yuri van Geest, Exponential Organizations



IOT (Internet of things) in mining

Inhibitors of IoT adoption:

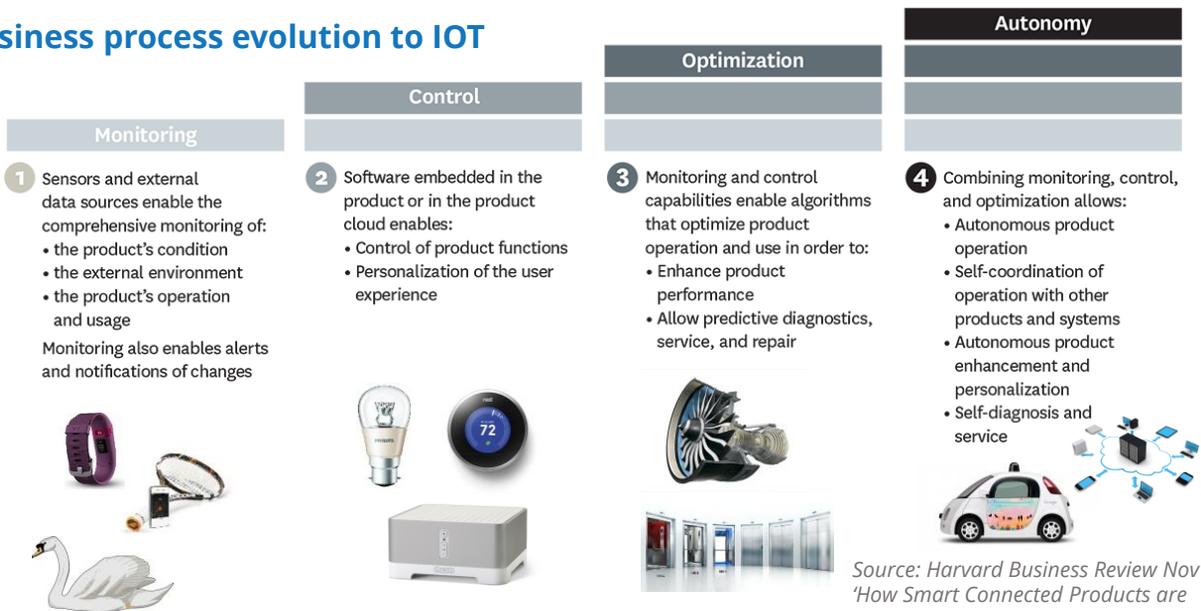


Source: Gartner February 2015

What is IoT?

- The Internet of Things refers to a dramatic development in the internet's function: the fact that, even more than among people, it now enables **communication among physical objects**.
- According to estimation, in 2015, not only did 75 percent of the world's population have access to the internet. So did some **six billion devices**. The fact that there will be a global system of interconnected computer networks, sensors, actuators, and devices all using the internet protocol holds so much potential to change our lives that it is often referred to as the **internet's next generation**.
- For managers, this development creates challenges both long-term and urgent. They need to envision the **valuable new offerings that become possible when the physical world is merged with the virtual world and potentially every physical object can be both intelligent and networked**.
- And, starting now, they must create the organizations and **web-based business** models that can turn these ideas into reality.

Business process evolution to IOT



Source: Harvard Business Review Nov 2014 'How Smart Connected Products are Transforming Competition - Porter & Heppelmann