

Innovate Design Develop | Create Value

# Where's the value in IIoT?

**22<sup>nd</sup> September 2017**

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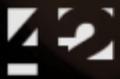
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# What I plan to cover

- Introduction
- 10 ways the technology and the value are inextricably linked
- Some case studies



### Interactive products

- Innovative mechanisms
- Functional packaging
- Human interaction



### Advanced systems

- Complex electromechanical systems
- Sensing, control and algorithms
- Connected devices**



### Manufacturing innovation

- Novel process development
- Design for manufacture
- Process automation



### Fluid and thermal management

- Liquids, gases & powders
- Heating and cooling
- Energy efficiency





## IoT / IIoT / Industry 4.0

- Devices other than computers and smartphones that are connected directly or indirectly to the internet
- *Generally* representing a new flow of information from the user to the vendor, or from the shop floor to the enterprise level software system, or from patient to the HCP
- Which may help with
  - Monitoring behaviour or usage (for billing, or regulatory compliance)
  - Early detection of problems or anomalies
  - Providing a better, more responsive service
  - Gaining new insights (possibly with machine learning)
  - Alternate business model (X aaS)

# 1. Be clear what the business model is

It's all about the value of having the data :

- What claims are you making?
  - What insights will the data provide
  - How accurate, complete, consistent and timely will the data be
  - How much work will the user need to do to get value from the data
- Are you sure you know what your customer will get most value from in the data? Have you asked?

*Example : “We know what insurance companies want”*

And also:

- What will you offer regarding data ownership?

# 1. Be clear what the business model is

- Who's going to pay?
- What are they getting for the money?
- How will they buy it?
- Will they buy the equipment or rent a service?
- B2B or B2C? *Industrial expectations are higher*
- What warranty?
- What SLA?
- Installation, troubleshooting, service and repair?
- What is the total lifecycle of the product

## 2. System design depends on business model

- Where will the data reside and be processed?
- How many devices, how many users per “account”?
- Will the end user interact with data, and how – cloud portal?
- Is the device always connected ? If not,
  - How long will data need to be gathered between communications
  - How accurately will data need to be timestamped

*Example : “Now wash your hands please”*

Storyboard the whole lifecycle.

### 3. Security – Part of the value proposition

- Risk assessment :
  - What is the worst case security mistake you could make?
  - Do you know what the data is worth to the wrong person?
  - You are now part of your customers' "attack surface".
- Secure communications:
  - Out of band verification for initial set-up
  - Entropy
  - Don't try to invent a new security protocol
- Industry specific data regulations (e.g. medical – HIPAA)
- You **will** be required to issue security updates for connected devices if flaws are discovered

# Security story – the Ring Video Doorbell

**Never miss  
a visitor.**

With Ring, you're always home.



## 3. Security

Just some of the things you'll need to worry about

- User authentication
- User administration
- Password management (e.g. lost passwords)
- Policy administration
- Tiers of access
- Device authentication
- License management
- Security related event logging
- Security reporting
- *Interacting with your customers' existing IT systems*

Is this your core competence?

## 4. Cost of the wrong power model

- Understanding **actual** use patterns is key
- Prove early on all assumptions about current
  - Running sensors
  - Data transmission (including end effects)
  - Beacon broadcasting
  - Computation
  - Writing to Flash memory
- Long (battery) life depends on sleeping a lot. Prove the architecture (reference implementations)
- Trade-off between computation and data transmission
- Consider secondary / primary / fixed battery options
- *Changing a battery costs more than just the new battery*

## 5. Get the sensor technology right

- Required accuracy
- Tolerances and drift
- Calibration in manufacture?
  - Manufacture cost & time implication
  - Use case required in firmware
  - Power required at manufacture time
- “Sanity check”
  - **How much accuracy is worth how much money?**
  - **Gather real data with representative sensors early**
  - Prove you can extract the promised insights
  - There’s no such thing as an “outlier” in early data

## 6. Be realistic about the comms technology

- Connectivity in a quiet lab may be deceptively rapid and responsive
- Max data speeds may not always be available
  - Smart phone BLE bandwidth can depend on Wi-Fi usage
  - Smart phone BLE bandwidth may vary in the background
- Available technologies may change over lifetime of device
  - In the US, 2G will be mostly switched off by end 2017
  - 3G could be partially gone in Europe by 2020
  - Other technologies (eg SigFox, LoRa, NB IoT 4G) may offer alternative
  - BLE 5 supports mesh networking, so can potentially cover whole warehouse or hospital ward from a single gateway device
- Your SLA is dependent on your weakest link

## 7. The data's not home until it's in the cloud

- **3G/4G/LoRa/SigFox**
  - High power consumption for a battery operated device
  - Licensing, approvals
  - Reception may not be available in target location (region or building)
- **BLE Communication via tablet or smartphone**
  - “Thing” can be relatively simple
  - Secure internet comms code taken care of by platform
  - However, many OS's to support, **continual upgrading required**
- **BLE via Proprietary Powered Hub**
  - More hardware investment required
  - More control over spec and upgrades
- **Wi-Fi**
  - Device totally responsible for transmission security
  - User interaction required to set up connection with host Wi-Fi service

## 8. Don't reinvent the wheel *unnecessarily*

- Fully hosted (e.g. ThingWorx)
  - Rapid start-up
  - Higher costs, limits to flexibility
  - Good proof of principle for pilot scheme, investor demo
- Develop using pre-built frameworks (e.g. MIIMETIQ)
  - Lower costs, but hosting is now your problem
  - Still some inflexibility
- Develop own solution within established cloud platform
  - Microsoft (Azure), Amazon (AWS IoT), IBM (Bluemix),
  - Cisco(Cloud Connect), Salesforce , Carriots, Oracle, GE (Predix)

“Thing” must be capable of interfacing with the chosen API

## 9. Using Reference Devices

- Reference designs are designed
  - to enable rapid proof of concept
  - to showcase a chip, sensor, or communications stack
- They are generally not designed
  - for implementation in production systems
  - for use in regulated environments
- Furthermore
  - they are frequently sold as-is and may be flawed
  - documentation may be limited

Assume that after proof of concept, the system will undergo re-development.

If you develop your own, build in an advantage, and a roadmap.

## 10. Expect to work at the “bleeding edge”

- Rapid change
  - The best technology for your launch in 6 months may not be fully available yet
  - Documentation will be incomplete
  - Features may be deprecated without warning
  - Exasperated user communities may be best source of information
- Undocumented features may disappear without notice
  - So may vendors

Where you start may not be where you end up, so where possible, design for standards, not for specific vendor implementation.

Connectivity with other things may be key to the “value”

## In summary, to deliver value you must:

1. Be clear about the business model
2. Get the system design right first
3. Not treat security as an afterthought
4. Have a realistic power model
5. Have realistic network and platform expectations
6. Get the sensor technology right
7. Plan your data's route to the cloud
8. Not reinvent the (infrastructure) wheel
9. Understand what a reference design is (and is not)
10. Expect to work at the bleeding edge

Thank you.

Any questions ?