Real World Consideration

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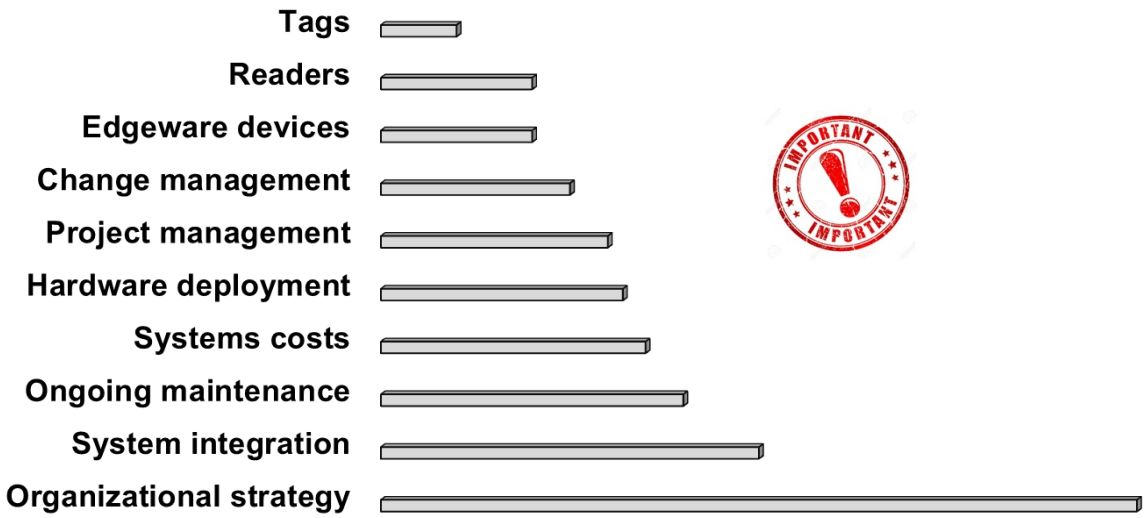
Agenda

- Costs
- Deployment issues
- System performance
  - Materials tagged
  - Quality of tags/readers
  - Noise/interference
- Privacy / Social issues

RFID: Systems Components

- Hardware
  - RFID transponders (tags, smart labels)
  - RFID reader (also called interrogator)
- Edge server (runs filtering middleware)
- Network appliances (manages reader/data flow)

The Cost



Remember: Its not just the initial system cost

Market Analysis

- Conducted in January 2019 - 2022
- Analysis of RFID VAR's and SI's
- Analysis of system cost
  - Readers / Tags (UHF only)
- Limitations of study – more system providers required

Cost of UHF Tags

- Tags approximate cost:
  - ~ Dry Tags: 0.015 – 0.06 USD per tag (S/R =46.6%)
  - ~ Tag Inlay / Smart tags: 0.6 – 0.14 USD per tag (S/R =60%)
  - ~ Wet tags / Inlays: 0.38 – 0.12 USD per tag (S/R =68%)
  - ~ Metal Mount / on metal: 1.4 – 11.4 USD per tag (S/R =87%)
  - ~ Heat resistant tags: 6.45 – 12 USD per tag (S/R =46%)

S/R = Scale reduction = cost reduction with increased volume order based on a single industrial roll i.e. 5, 10, 12, 15, 25 & 50K units

NOT FINAL COSTS: Costs vary according to purchase

Bringing Down Cost of Tags

- Research and development focused on
  - More efficient ways to assemble tags
  - Conductive inks / Printed antennas
  - Improved converting processes for labels
  - Recyclable tags
  - Embedding techniques
  - Improved functionality (Temp, RH etc)

Cost of UHF Handheld Reader

- Reader approximate cost:
  - ~ Handheld Reader:
    - Wearable - $1,100
    - Handheld with Camera (Bar code) - $1,300
    - Non Wearable- $1,450
    - Bluetooth - $2,350
    - Wi-fi - $2,500
    - Smartphone Integrated – Vary from $200 to $500
  - S/R = Scale reduction = cost reduction with increased volume order
  - NOT FINAL COSTS: Costs vary according to purchase

Cost of Fixed Reader

- Reader approximate cost:
  - ~ Fixed Reader:
    - 2 port - $1,280
    - 4 port - $1,300
    - 8 port - $1,550
    - Wi-fi - $1,800
    - GPS - $2,000

NOT FINAL COSTS: Costs vary according to purchase

S/R = Scale reduction = cost reduction with increased volume order

Bringing Down Cost of Readers

- Research and development is being done at system and component level
- Goal is to shrink the components on a reader's printed circuit board down to a few chips
- Investments directly linked to interest and volumes
- RFID in mobile devices – Smart phone etc
- RFID antenna in headphone jack

Middleware, Apps & Installation

- Cost depends on your project size

- Factors that must be included are
  - Readers
  - Tags
  - Middleware
  - Integration with back-end systems
  - Installation

Deployment Issues

- Limited number of people/systems integrators with RFID experience
  - This is changing however….

- Readers aren't plug-and-play
  - Antennas need to be properly positioned and tuned
  - Appropriate technology needs to be used

Deployment Issues

- Limited number of reader form factors
- Limited testing and deployment tools
- Not many best practices – but this is rapidly changing

Systems Performance Issues

- Materials can be “RF friendly” or “RF unfriendly”
- Water is unfriendly (absorbs UHF energy)
- Metal reflects radio waves
- Different types of materials detune tag antennas
- Anti-static containers absorb RF

  - Behavior of RF is unpredictable….

RFID: Surrounds

Material Composition	Effect on RF Signal
Corrugated Cardboard	Absorption from moisture
Conductive Liquids	Absorption
Glass	Attenuation
Groups of Cans	Multiple propagation effects; reflection
Humans/Animals	Absorption; detuning; reflection
Metals	Reflection
Plastics	Detuning (dielectric effect)

Tagging Liquid Products

- Look for air gaps in packaging to keep tag away from water-based products
- Use a tag with a foam spacer to keep tags off water products
- Use tags designed to work well around water

Tagging Metal Products

- Use metal-mount tags that have spacers to keep tags away from the metal

- Find air gap in packaging that keeps tag away from the metal

Quality of Tags

- Few companies deliver 100% readable tags
- Tag performance varys according to application

Quality of Readers

- Reader performance does vary
- Researching scenarios within your application will determine appropriate reader format to choose
- Interoperability is significantly improving

Challenging RF Environments

- Electromagnetic energy will affect your ability to read tags consistently

- Any device operating in the UHF spectrum can interfere with UHF RFID systems:
  - Cordless phones
  - Older wireless networks
  - Some alarm systems

Challenging RF Environments

- Other devices give off electromagnetic energy
  - Electric motors
  - Forklift trucks
  - Some conveyors
  - Fluorescent lights

    …….. possibly every industrial production environment in the world !!!!

Work around for RF Issues

- Have a site survey done to see where problems might occur
- Shield electric motors
- Upgrade older wireless LANs

Work arounds for RF Issues

- Deploy in areas with less metal, if possible
- Attenuate reader signal to avoid false reads
- Get antennas as close to tags as possible

Privacy Issues

- Address “BIG BROTHER” issues
  - Be aware of new - General Data Protection Regulation (GDPR)
  - Enforcement date: **25 May 2018**

- Tagging individual items or cases might raise consumer based issues:
  - Bad press
  - Angry customers

Privacy Issues

- Take concerns seriously
- Be open with customers about the:
  - Data you are collecting (General Data Protection Regulation etc)
  - RFID usage
- Inform consumers

Environmental Issues

- Metal antennas can’t be recycled
- Printed tags
- Metallic ink antennas can’t be put in some landfills
- Sustainably produced tags
- New readers will need to comply with recycling laws for electronic components

Questions ?

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THANK YOU

RFID JOURNAL LIVE!

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