UNIQUE MICRO DESIGN
...engineering ICT solutions

UMD RFID Implementation Process

Introduction

There is an element of risk in implementing *Radio Frequency Identification* (RFID) data capture projects, as there is a considerable amount of investigation work required **before** and **during** the RFID development process before a finalised solution can be settled on.

To minimise this risk, time and cost in implementing RFID projects, UMD has developed an effective five-stage process.

Each stage builds on the **previous** stage and learning outcomes leading to a rapid project deployment without excessive consultancy costs.

Project Stages

UMD's Five-Stage RFID project process consist of:

1. Proof of Concept
2. Workshop & Scoping
3. Pilot
4. Software
5. Deployment

1 PoC	2 Scope	3 Pilot	4 Software	5 Deploy
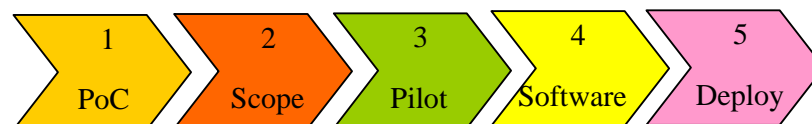
1.0 Proof of Concept

The starting stage of any RFID project is with the feasibility of being able to read an RFID tagged asset.

Just being able to read an RFID tagged asset is still not sufficient. Also understanding under what conditions RFID tagged assets can be read is crucial, as this will determine the architectural solution and therefore viability of a project.

The physics of electromagnetic radiation properties (RF), the RFID interrogators (readers), transponders (RFID tags), and the environment determine the readability of a RFID tagged asset.

The purpose of the "Proof of Concept" (PoC) is to provide basic tests with RFID readers and RFID tags in a simulated environment using the actual asset of interest.

These basic tests will ascertain under what conditions the RFID tagged asset can be read, and therefore influences the solution.

Factors which effect readability of RFID tagged assets include:

- Frequency choice: Low Frequency (LF), High Frequency (HF) or Ultra-High Frequency (UHF)
- Use of Passive or Active RFID technology
- RF antenna design (directional properties and antenna gain)
- RFID Tag package
- Orientation of RFID tag (tag placement)
- Distance between antenna and tag
- Power output of RFID reader
- Material RFID tag is being attached to
- Material inside of tagged asset (eg. liquid)
- Surrounding environment
- Surrounding electromagnetic radiation and interference
- Operating temperature of environment of asset.
- Vibration
- Corrosive materials

The PoC stage consists of the following steps:

1.1 *RFID Tag Selection Process:* which gives consideration to:-

- The physical elements of the tag
- RFID performance
- Tag mounting options
- Orientation
- RF permeability of material and other environmental issues.

1.2 *RFID Tag Reading:*

This can be as simple as attaching RFID tags to the item being tagged and using a hand held reader to verify the readability, or in some cases, building a temporary RFID reading portal.

Its important to conduct these test using the actual assets being tagged and it the environment in which it is to be read.

The POC can typically takes from a hour to a day to perform.
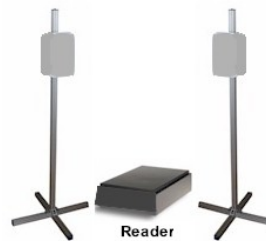
2.0 Workshop & Scoping

If the PoC tests are successful and the RFID tagged asset can be read in the required environment then a *Workshop & Scoping* stage can be conducted with the customer, which may includes the following steps:

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2.1 Systems Review:

- Provide an overview of the test results
- Design a feasible solution based on the outcome of the PoC in **consultation** with the Customer.

The Customers' input into this process is critical, as they will have an understanding of the operational constraints UMD will need to work under. A successful workshop will result in an agreed solution and approach.

Consideration is given to:

- RFID Reading system design
- Work flow issues and design
- Host system integration
- Data management (how is the data collected)
- Middleware software requirements and solution
- Pilot stage
- Regulatory and compliance issues
- Implementation plan
- Timelines

2.2 Site-Survey:

This may involve location visits to develop an understanding of the Customer's physical environment. Particular consideration is given to;

- Equipment location and mounting
- Surrounding environment
- Electrical and Data
- Network and Wireless requirements

2.3 Software

Software scoping would include:

- Systems architecture
- Device interfacing requirements
- Host interface requirements
- Console interface requirements (user interfaces)
- Application logic and process requirements.
- Reporting

2.4 Investment Proposal

Only at the end of this process can a proposal be provided with details of the investment required to develop a RFID solution, as the key parameters and systems requirements would now be understood.

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3.0 Pilot

The Pilot phase usually involves the design and installation of at least one of the RFID reading systems, or "portal", in its final environment.

It generally does not include any software development other than the supply of suitable test software and includes the following steps.

3.1 Installation and Testing

This involves the physical process of installing equipment into Customer locations as per the systems requirements identified by RFID Site Surveys. It may also include installing wireless and other network infrastructure.

3.1 Evaluation and Refinement

Once the pilot RFID reading equipment has been installed, an evaluation process follows which involves testing the RFID reading system and RFID tag assets in the actual environment.

Its purpose is to optimise the performance of the system in its real environment and to ensure adequate read rates are achieved and read errors minimised or eliminated.

This may involve some additional experimentation with antenna locations, reflectors and RFID tag placements.

Once this process has been completed the project is reviewed and if required, the project scope is refined or updated based on measured results.

4.0 Software

Only once the pilot has been successfully deployed and evaluated should any custom application software should be developed, tested and deployed.

5.0 Deployment

The deployment stage revolves around delivering the remainder of the infrastructure covering installation and commissioning.

Though not trivial, once the RFID tag can be read and converted into digital data, conventional IT technologies and consultation processes can be used to develop the desired business process and objectives.

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This would typically include:
- Final detailed systems design
- Hardware procurement
- System pre-configuration and testing
- Civil, electrical and data works
- Physical installation.
- Training
- After sales support structure

Risk

It should be understood that RFID projects are not *without* risk. This section provides a brief overview of some of the risks involved.

Reading and Environmental Issues

Either during the Proof of Concept or possibly during the Pilot phase, providing a reliable RFID reading environment may be difficult to achieve, or the environmental changes required may be also not be possible.

As a result the project will either need to change its scope or be abandoned.

Australian Regulations

Within Australia RFID equipment are governed by the Australian Communication and Media Authority (ACMA) using class licences. It is incumbent on the Solution provider to ensure that the RFID system complies with these regulations.

In particular when developing RFID systems using Ultra High Frequency (UHF) RFID passive tags (e.g. EPC Generation-2 UHF RFID) the current class licence for UHF allows RFID services in the 900 MHz band to operate between 918 to 926 MHz at a maximum power of 1 Watt EIRP or 920 - 926 MHz band at 4 Watt EIRP.

Using equipment outside these parameters will attract the attention of the ACMA and potential fines, decommissioning or changes to the RFID system used.

How to Minimise Risk

Choose a Systems Integrator that has a strong technical and engineering background and RFID experience, like Unique Micro Design (UMD).

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