

RFID – It’s Appeal to Higher Education

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Abstract:

The presentation will focus on one of the fastest growing wireless technologies, RFID – Radio Frequency Identification. Basic elements and characteristics of the technology will be defined, along with a discussion of the various uses in industry, government and education. The growing need for curriculum enrichment, integrating RFID into college and university departments and classrooms, will be discussed and explored.

Introduction:

There is a revived technology – RFID - being implemented worldwide that is destined to impact various disjointed areas of our lives. Educators have a responsibility to examine this technology and to convey all aspects of its place in learning environments to insure the maximum benefits of its potential and use.

Simply put, RFID (Radio Frequency Identification) results from a tiny computer chip attached or imbedded in such everyday objects as a book, a car’s windshield, a garment, a passport, an animal or even a human artery. These same chips, coming in various configurations of memory and function, are capable of being read and then transmitting real-time information over a network to a computerized database for information analysis and resultant actions by controlling personnel. Certain chip configurations also allow the updating of information on the tag.

Pilot deployments of the technology have achieved successes and serious work is now underway in exploiting RFID technology to the fullest. The stakes are high for all of the participants. Remembering Dustin Hoffman as the beleaguered young Benjamin Braddock, who, while suffering through the awkward seduction by Mrs. Robinson in the Oscar winning movie “The Graduate” in the 70’s, was being career-counseled by her unsuspecting spouse to “Get into Plastics!”. A current revised version of the same movie would probably have him being encouraged thusly: “Young man, get into RFID!”. Let’s explore the current merits of that advice by looking at examples of its use.

You are no stranger to RFID if your automobile uses the EZ-Pass on our turnpikes, as you swiftly pass through a tollgate while automatically paying your toll. That white RFID transponder, glued to your windshield, transmits your automobile’s identity when it passes under the radio frequency reader overhead at high rates of speed.

As with most technology innovations, the benefits -very often - are often counter-balanced by potential misuses. The Internet and the World Wide Web are vivid testimony to that. The author

of this paper will examine the current uses of RFID technology, its benefits and cost implications and the cultural impact it can have on the general populace it affects.

Defining RFID

RFID Categories:

Active tag: An RFID tag with an internal power source and a transmitter, capable of sending a continuous signal.

Passive tag: An RFID tag without a battery. It is usually powered by the electromagnetic field generated by the reader antenna.

Read-only tags: A tag that has information written to it during its manufacture. This information can only be read from the tag, never changed.

Read-write tags: Tags that are capable of being re-programmed to change existing data or add new data, while the tag is attached to the object it identifies. This capability is referred to as in-use programming, and tags with this capability are referred to as re-programmable, read/write tags, memory cards, and memory modules.

Reader/Writer: An electronic device that reads RFID-based data and/or writes RFID-based data on a tag.

Database: A back-end logistic information system that tracks and contains information about the tagged item.

Ubiquitous Computing: Where Does RFID Fit In?

The term “ubiquitous” relates to the presence of an object that can be anywhere or anything. When applied to computing networks containing RFID-based technology, it defines the method that certain objects utilize to communicate to other objects or computing devices within the network.

Examples of Applications of RFID Technology in Government, Industry, and Education:

Government

DOD – Department of Defense

- **Army - Combat zone equipment identification**
- **Navy – tracking airplane parts and containers**

FDA – Food and Drug Administration

DHS & State Department – PASS system (People Access Security System)

General Industry

Distribution and Supply Chain – Walmart suppliers required to use RFID

Retail – Walmart: tracking of retail sales – goal to replace bar codes

Transportation

- **EZ Pass – vehicle billing and access to turnpikes**
- **Passport monitoring – e-passports in use for international travelers**
- **Airline Luggage – Delta Airlines tracking luggage**
- **Bus service – tracking bus travel schedules and fare equipment**

Logging - Log identification from forest to factory (Germany)

Manufacturing – Automotive and Airplane Assembly

Medical – Patient tags, equipment tracking, prescription tracking, security

- **Implanted microchips for realtime monitoring**
- Mining – Personnel and Equipment Tracking, Safety items**
- Pharmaceuticals – tracking of prescriptions to insure proper use**
- Technology – Software development, tag readers through USB port**
- Agriculture – poultry and cattle accounting; monitoring for disease control**
- Hospitality**
 - **Hotel check-in, security**
 - **Resort – customer protection**
- Education**
 - **Fixed Asset Accountability & Reporting**
 - **Curriculum Development of RFID courses in various disciplines**
 - **Libraries – Installations in higher education, VTLS capable of RFID**
 - **Security and Public Safety**
- Generic**
 - **Fixed Assets**
 - **Vehicle Tracking**
 - **Security**
 - **Passgate use**
 - **Computer access control**

Assessment of Integration of RFID into Higher Education Curricula

- The author has developed a plan to integrate RFID technology into the undergraduate or graduate curriculum of a higher education institution.
- This plan, proposed to an interested collegiate enterprise, will result in a curriculum package, comprised of a syllabus, professorial class curriculum and a customized strategy to publicize RFID technology among enrolled and prospective students.

Issues and Challenges of RFID Implementations

- **Standardization of Technology** – The progress that has been made in the implementation of RFID-based solutions is remarkable when one considers the previous lack of standardization for data and tag transmissions. As defined in a recent issue of Infoworld magazine, “the largest single enabler has been the emergence of Generation 2 – Gen2 – officially known as EPCglobal Class – 1 Generation – 2 UHF RFID Protocol for Communications for tag data transmissions”. Previous RFID pilot implementations had been using the less effective Class 0 and Class 1 hardware readers and tags. Those protocols were slower and prone to data inaccuracies in early pilot sites.

Generation 2 tags are 4.5 times faster, have expanded memory and extensive security options and provide worldwide interoperability and are ISO ratified.

- **Defining the problem to be solved** – There is no substitute for intensive analysis of the business logic required in the development of an RFID-based solution. Lack of proper systems analysis in the design stage, akin to the lackluster web-based approach of some

now deceased “Dotcom-based” enterprises, will bring certain failure. A collaborative team effort would be best, employing the skills of a business systems analyst, a network engineer, a “middleware” expert and an operating system specialist to define all aspects of the RFID-based process.

- **Legal and Privacy Issues** - When RFID is implemented for internal uses within an enterprise, there are minimal concerns about issues of privacy invasion of the user population. When utilized externally, however, there is the potential for violations of personal privacy when the necessary precautionary steps are not taken by those responsible for implementing or overseeing the RFID implementation.

Characteristics - As defined in a Microsoft-sponsored report “Radio Frequency Identification (RFID) Privacy: The Microsoft Perspective”, risks to privacy protection could occur due to the following characteristics of the technology:

1. **Unobtrusiveness** – RFID tags can be read without clear line of sight, unlike barcodes. Neither tags nor readers need to be visible to a user or observer. However, a protective shield, such as an aluminum cover, can prevent the RFID tag being read. An example would be the reading (or not reading) a citizen’s passport in certain public areas.
2. **Uniqueness of ID** – Unlike barcodes, RFID tags can be very specific and can be tracked over time in an accumulated record of sightings.
3. **Interoperability** – Since multiple enterprises can read RFID tags, the potential exists for data “leakage” where unscrupulous organizations could track tag activities and travel.
4. **Proliferation** – As tags continue to decrease in cost, applications of RFID will grow significantly, thereby raising the risks of the characteristics defined above.

Microsoft’s position is that it does support RFID use among its customers and will work to “help develop practices and policies that will engage the benefits of RFID while helping to ensure that privacy is protected”.

Legislation – We can expect increased legislation at the state and federal level, particularly as it relates to issues of privacy, in the uses of RFID in the near future. Two early instances are:

1. **California, SB 1834** – Restrict ways that businesses and libraries use RFID tags, attached to consumer goods and books, to identify individual users.
 1. Defeated – June 25, 2005
2. **Rhode Island, HB5929** – Prohibit state and local government from using RFID to track movement or the identity of employees, students, clients or others as a condition or benefit of services rendered.
 1. Passed by the legislature
 2. Vetoed by the Governor, July 15, 2005

At the federal level, one can expect additional legislative efforts to promote the use of RFID, as in the documentation and tracking of immigrants to this country, simultaneous with efforts to slow down the use of RFID applications for reasons of potential violation of privacy of our citizenry.

Mr. Melloy's presentation will feature a full discussion of the points listed below:

Grant and Business Partnership Opportunities

Government Grants

[www@grants.gov](http://www.grants.gov) website

- **National Science Foundation**
- **Corporate Grant Potential**
- **Collegiate Test Beds**

Trends in RFID Technologies

- **Shortage of Trained Personnel; needs to be addressed now**
- **Venture capitalist interest in RFID providers is growing**
- **Move Toward Standardization; Gen 2 is here.**
- **“Middleware” making installations easier and practical to integrate to ERP**
 - **Sybase product “iAnywhere” is comprehensive product**
 - **Can simulate all available RFID products for teaching and testing**
 - **Developer's license is available at no charge.**
- **“For Profit” Educators See Window of Opportunity: Devry, for example.**
- **RFID Product Providers Looking for Educational Partners and Testbeds**

RFID's Next Wave

- **Chipless RFID Technology**
 - **Ultimate goal is RFID tag with cost of less than one cent.**
- **Polymer-based RFID Chips**
- **Hacker-proof RFID tags**
- **“Mesh” Networks – wireless RFID devices communicate to other RFID devices**

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