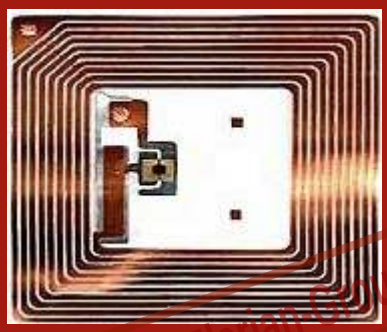
THE RFID CASE STUDY BOOK

RFID application stories from around the globe



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Introduction to the book

RFID is one of the hottest new technologies around and it will impact our lives much more than we realize. Strictly speaking, though, it is really not a new technology at all. In fact, it started out as a defense technology, sometime during the final years of the Second World War, when it was used by Allied ground forces to track German bombers.

After the end of the Second World War, for close to the next fifty five years, it got relegated to the background, almost forgotten by everybody. It became one of those "also ran" kind of technologies.

Then, almost suddenly, during the last six years or so, it got revived by a combination of various factors, the details of which are beyond the scope of this book. The end result of all these factors is, that now it is very much alive & kicking. You hear of RFID almost every day, either as a solution to all of humanity's problems, or as the road to doomsday, depending on which side of the RFID fence you are sitting on.

The RFID early adopters swear by it and say that it will drive unprecedented efficiencies all around, help in anti-counterfeiting efforts, increase product traceability and give other monetary, as well as non –monetary benefits. But those who oppose it, are almost equally vociferous. They claim that it will track your movements secretly, gather personal or confidential information about you, invade your privacy & ultimately allow others to control your life. Somewhere in between these two views are those pragmatic businesses, governments & individuals who have seen RFID for what it is, which is nothing but another tool to improve their lives. Over the past few years, these people and institutions have taken to it like a fish to water, applied RFID technology to a really wide gamut of situations and have already started reaping the benefits.

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RFID technology may be hi-tech, but it is not rocket science. And it is after all just another technology. A technology, however hi-tech it may be, is worthless if it cannot solve some real life problem. Fortunately, RFID does solve a lot of real world problems. It does not take a PhD in Physics or Telecommunications to apply RFID to your own situation or business, however. All it takes is some knowledge about the technology, to know precisely what it can do (strengths) and what it cannot do (weaknesses).

Hence the idea of this e-book, which you can easily download to your PC or laptop. This e- book is an application storybook, which has twenty five different RFID stories from around the globe. The stories have been compiled alphabetically, from A to Z (there is no Z actually, the last application is a Y). The ordering however, does not in any way indicate the application's importance, it has been done so, just because listing in an alphabetical manner is a generally acceptable way of listing anything. In this book you will find how ordinary people and businesses have started benefiting from this technology.

The number of application stories is twenty five. This is not my lucky number or a magic number. And no, it not an important RFID frequency either. I simply found twenty five good stories about RFID, which I wanted to share.
Each application story is divided into different parts which give details about the history and background information about the particular application, problems encountered , how an RFID based solution has solved the problem and the future scenarios and trends.

This e-book is designed to not only offer you an insight into how everyday people and businesses are using RFID to solve their real world problems, but also to provoke you into coming up with your own application story. Instead of a regular printed book, I felt that an e book would be a better way, to convey information about a technology that is too fast for the world of printed books.

You can study it and then apply RFID to YOUR own business or profession. If it you do it in an interesting way, do let me know, I will expand this book to also include your application story.

For those who prefer the printed word, please print out a copy and read it anywhere you like. There are no restrictions on printing at all.

This e book does not have any complicated technical jargon, equations, diagrams, graphs or charts. There are also no illustrations. The book is designed to read more like a story book, which it is really. It tells you twenty five stories about RFID. However bear in mind that these are "true stories" and not fairy tales! Consequently , you may find many tags , readers and frequencies, but no charming princes, beautiful princesses or fairy godmothers.

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This book is meant for an audience that already has some knowledge of RFID technology. For those who have never heard of it before (which is highly unlikely given the current hype in the press all around the world) or for those who always like a good backgrounder, before starting their info-journey, I have prepared a short introductory chapter, which gives the basics and some explanation of the jargon associated with this technology.

I was warned by people that I should expect no appreciation for a free ebook, as giving away an ebook with obvious value is foolhardy. I ignored their advice and hope that you will not let me down, by discounting the book or the ideas in the book, because they have been given away free.

However, to get a really in depth knowledge about RFID technology, why don't you take some time and enroll in our easy e-learning course. You can find enrollment details at
http://www.elarin-group.com

Do not be fooled by the price of the course, though. This course is priced the lowest in the market simply so that a lot of people can afford it. Don't take my word for it.

Comparable content courses retail for much more than our price, but may not even give you half the knowledge.
There are two versions of the course & both allow you different levels of access, for a very small price (as compared to what you would spend in classroom training, seminars or books). Details can be found at the website described above.

This is the preferred way to learn, as there are no complicated equations, charts or gobbledegook to scare you off. You will learn everything about RFID through easy to read text, graphics and animations that explain key concepts. You can also give the online test & get a certificate of achievement if you pass!

Now, that you know where to go if you wish to learn more about RFID, let us proceed to learn some background information about RFID in the next chapter.

Introduction to RFID

The following gives you a general background information about RFID technology, some basic working, its raison d' etre and some more information, which will allow you to enjoy the rest of this book.

What is RFID?

RFID is an acronym for Radio Frequency Identification. It is a method to automatically identify people, animals or objects by means of radio waves. This means that an RFID device is physically attached to the object that we wish to identify (at a later time). This is known as tagging and the object is now said to be *tagged*. In case of objects, this tagging may be an RFID device that is glued on to it, in case of an animal it could be an injectable tag (that is injected through a special syringe into the animal's body) and in the case of a human, it may take the form of a wrist-band that a person wears. The wrist band contains the RFID device.
Now, a remotely located RFID reader, can read this tag at a distance and then identify the object instantaneously.

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Is this the only automatic identification technology?

Certainly not. The most ubiquitous identification technology that all of us know, is the barcode. This is the set of funny thick and thin lines that you see on all items, be they computer parts or shampoo bottles. What do they do? They help identify what the item is, who made it and such kind of information. At a supermarket, the checkout clerk has a barcode scanner that reads this info and uses it to generate your bill.

This also makes it faster to take inventory, when a shop assistant moves about with a handheld barcode reader and checks the items present on the shelves. There is no need to write down an items name, brand, description & other information. All this information is stored as a number (represented by the bar code). The bar code scanner reads off this bar code & hence the number. This number acts like a pointer to other relevant information. A database correlates this number with all the other necessary information like manufacturer, item, description, etc.

As a corollary, consider your ID number at your workplace or your social security number. Once an ID number is ascertained , it points to the rest of the information which includes name of the person, date of birth, residential address, etc.

But, you must be thinking, even a bar code reader can do the same function as an RFID scanner. So what's the point?

Well, a bar code reader can read a barcode, ***one at a time***. This means however fast barcode scanners you may have, however sophisticated your barcode software is, you will always be physically constrained by the one at a time rule.

Why is RFID faster than a barcode reader?

When was the last time you were in the departure terminal of a major airport? If it was recently, you must have noticed that you have to walk through a metal detector gate before they will let you inside. Notice how each metal detector can only handle one person at a time. Hence the group of passengers who are going to board the aircraft approach the metal detector gate in a single file & go through it one by one. This whole process causes a lot of delay. If the metal detector technology improves to the point where everybody could go in at once through the gates in a group , but still the detector could pick up that one particular individual who was carrying a metallic weapon like a gun, then the boarding procedures would be much faster.

This is exactly what RFID scanning does. One single RFID reader can identify hundreds of tags in it's range within a fraction of a second.

But how? It is not as simple as it sounds actually. Between the time of tagging, until the identification by a reader, there are many things that must be taken care of.
If you would like to have an in-depth study of how all this works, please visit http://www.elarian-group.com to know more about RFID.

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So what is the use of RFID?

Uses of automatic identification are manifold, limited only by one's imagination. Once an object or person or animal can be uniquely identified, automatically and once this identification can be done for hundreds of thousands of similar objects in a second, you are on a totally different platform altogether.

How? Think when was the last time you visited a supermarket. You took some items, put them in your shopping cart or basket and came to the checkout counter. The pretty girl who was there smiled at you and took the various items that you wanted, one by one, out of the shopping cart and held it close to a bar code reader. The bar code reader "read" the bar code on the object and sent it to the computer. The computer (or smart cash register) identified the item from this code and put the corresponding price into your bill. Once this whole process was complete, the computer totaled it up, you paid your bill and walked out.
Now imagine the same scenario, had the items been tagged with RFID tags. The minute you placed the shopping cart near the RFID reader, it identifies all items within a second and prints out your bill. Presto! You can walk out in a less than a minute. There is no need for the checkout clerk to laboriously scan each item, one by one.
Everything is scanned simultaneously.

Other than the fact that you can now smile at the pretty girl for less than a minute, there is no apparent disadvantage.

Is this a reality? Well not really, but we are very close to getting there.

How much faster did the entire checkout process become because of RFID? It depends on how many items you wanted scanned. If you had a large number of items then your checkout process can be reduced to even $1/10^{th}$ the time normally taken. Is this unusual? Not really. Most RFID applications that we have reviewed here, improve throughput not be a few percentage points but by many times over. So increase of productivity because of RFID implementation is not something like 30% or 60%, it is simply more than 200% or 300% at least (double or triple or even more). It is something like what happened when people started traveling by air. Instead of the earlier 60 mph that a road travel entailed, air travel happens at something like 600 mph. The productivity enhancement is ten times , not ten percent.

Interesting? Exciting? You bet! Read on below, through each application story, to get an idea of how RFID can improve things in our life.

These are not the only applications though. By studying these applications, you can come up with your own applications, in your are of work. That can be a subject of the next edition of this e-book. Or if you have any other good stories, mail them to me & I will include it in the next edition.

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To know more about RFID technology, do remember to visit http://www.elarian-group.com and enroll for our RFID learning course, for an easy to understand , but in-depth knowledge of RFID technology.

Application Stories

Animal Identification

History :

This is actually one of the earliest RFID applications. The concept of animal tagging is nothing new. In early days, the various cattle farms and ranches used methods like branding irons, to label the name or symbol of the ranch to which an animal belonged.
A red hot branding iron, having the proprietary mark of the farmer or rancher, was used on the poor animal to etch out a mark on its hide.
(This is the origin of the term "brand" for an item. Surprising, isn't it?)

Thus if the animals grazed in a common area, the cowboys or shepherds could identify their animals because of the branding. There were obvious disadvantages to this system, one of them being that it was a painful process for the animal itself. After branding, the actual identification of the animals was done manually. The only advantage was, that there was little room for dispute with another animal owner or ranch owner about the rightful ownership of a particular animal.

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Present situation:

Branding gave way to physical plastic tags mounted on the animals in holes made in their ears, specifically for this purpose. Identification was still done manually though. This is the situation for cattle and other commercially raised animals. There was no system however for pets. Therefore pet owners always had problems when it came to identifying lost pets . Usually they had to rely on some birth mark or the animal's response to a name when called out, or the animals affectionate reaction to the owner—a very subjective way of identification indeed.

With the advent of RFID technology, the plastic dumb tags began to be replaced with RFID tags. They were still mounted in the same fashion, but now there were several more advantages. The first was that the tags were read easily from a distance, with a hand held reader. The tags themselves were just a number, but this number pointed to a large amount of data in a remote database, which contained other information about the animal like age, vaccination and medication record. This made record keeping easy and efficient without becoming a pain for the ranch owner. It also satisfied emerging requirements about traceability and food safety, especially after the mad cow disease and similar scares.

The RFID solution

Injectable RFID tags are now available. They are injected to remain under the skin of the animal. Delivery is through a special syringe. The advantage is that they are less painful, also there is no outside identification mark for a malicious person to know where the tag is embedded in order to remove it or modify it. The RFID chip inside the tag is generally 'Read-Only" so that data once recorded cannot be modified.

Injectable RFID tagging system is being used for pets today. Your pet cat or dog can easily be injected by this kind of syringe which embeds an RFID tag under its skin. The tags have no side effects and have an estimated life of 25 years, which is more than the lifespan of the pet. The size of the pet is not a consideration, since the tag itself is very small, about the size of a rice grain. Hence these tags can be injected into any pet, big or small, a mouse or an elephant. Since it is injected under the skin, there is no possibility of the tag getting dirty, damaged or lost.

A tag is inserted through a Single Use Disposable syringe (SUDS) into the animal. It remains under the skin of the animal. An animal can be injected the first time it is brought to the vet for vaccination. There is no other procedure required throughout its lifetime, other than scanning by a remote reader. The number of the RFID tag is unique and cannot be altered. There are about a trillion numbers available, so there is no risk of duplication.

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When an animal is to be scanned, it is either brought near a fixed RFID reader or scanner, or simply a portable wand (having a small reader inside) is used to sweep in the space near the animal and the tag is read.

The reader is connected (by means of wired or wireless connections) to a remote database which correlates the unique RFID tag number on the animal with other data on the animal.

These other data fields may contain information about

a) Date of birth

b) Last vaccination done

c) Any medical history

d) Distinguishing features about the animal

Of course these fields can be many more than the four described above and it also depends on whether it is a pet animal or a wild tiger in a nature reserve or cattle raised on a farm. The data can vary but the principle remains the same.

Advantages over the earlier system :

a) No external tag is visible. It cannot be damaged, stolen, changed, modified or altered in any way.

b) Not painful to the animal at all

c) Visible only to an RFID reader.

d) Unique number for every tag and every animal, so no duplication, error or confusion.

e) Easily maintain electronic records of vaccination and medication, health checkups.

f) Provides audit trail traceability for food safety in case of cattle.

g) In case of pets, provides a fool proof identification system in case the pet is lost or stolen.

Likely Future scenarios:

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a) The government or other statutory authorities may mandate that ALL animals should be tagged, whether pets, cattle, livestock or endangered wild species.
Pet tagging would have the records of pet health easily available including vaccinations for, say, the rabies vaccine, which is normally given to pet dogs. Livestock tagging would enable government monitoring of the food chain.

b) International trade bodies, industry associations may mandate that all food produced from farm animals require traceability to the *particular animal* from which the food was made. The records of the animal can then provide clues. This will be useful in case of future outbreaks of hitherto unknown diseases.

c) Endangered species tagging can enable environmental agencies to monitor the numbers of particular species for example tigers in a particular nature reserve. Radio tagging is present being used, but not on a large scale. Many places still use crude methods like looking for the animals droppings, spotting them from the air, etc. Due to this only estimates of numbers are available, never the actual numbers. Also there is now way to have a census or to know if poachers have killed any of the animals.

Anti- Theft Systems

History

In the past, the only anti-theft systems in place at supermarkets and large shopping malls were the CCTV (Closed Circuit TV) cameras and watchful security guards. These were the only known anti-theft systems, which were effective enough in preventing shoplifting. As with any other technology, the same technology was used to prevent shoplifting in a grocery mall as well as a jewelry shop.

As expected, the grocery mall's investment did not pay off much (as the cost of the goods shoplifted were less than the cost of installing and maintaining the expensive security systems). The only place where this system gave a good ROI (Return on Investment) was in the jewelry shops, where each small item (say a diamond ring), is much more expensive than a grocery item.

Present scenario

RFID anti –theft tags and systems were introduced about a decade back. Initially again, only jewelry shops, high end designer boutiques and similar "expensive goods" shops could justify the ROI. But now, with falling prices of these systems coupled with rising costs of manpower, these systems are getting attractive and are now used in many of the large department stores, supermarkets and malls.

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Their usage is growing day by day. In many supermarkets, the management relies on these systems, rather than the surveillance cameras and security guards, to actually protect their merchandise. Of course surveillance cameras are used, but mostly, they are useful only *after* a theft has taken place. If a theft is noticed, then after the event , security personnel have to endure going through hours and hours of often grainy black & white camera footage from all the store cameras, trying to pick out suspicious movements and suspected thieves.

They would rather have a device which would alert them the very moment somebody tried to walk off with an item without paying for it.

Is this possible? Of course, it is possible, by using RFID technology.

The RFID solution

Each item to be protected is tagged with an RFID anti-theft tag. The tag can be re-used in many cases. The tag is typically attached by a strong string or a plastic band or other means (similar to a price tag, sometimes it **is** the price tag), to the item (say for example an umbrella). Now once a shoplifter takes this umbrella and walks to the exit, large RFID door antennas placed near the exit detect the presence of the tag and sound an alarm.

In case of a genuine shopper, if she takes the umbrella to the checkout counter, the clerk , after receiving the payment for the item, cuts the plastic band and removes the tag. The umbrella can now be carried by the shopper outside passing by the door antennas, without triggering any alarm. The store staff will then typically attach the same tag again to a new umbrella that would be now kept on the store shelf.

Alternatively, in case of a disposable tag, the checkout clerk will hold the item near a "tag killer" machine, which kills (destroys) the tag by subjecting it to a strong electromagnetic

radiation. The tag, then though physically present on the item, will not trigger the alarm while passing through the door antenna field.

Future trends

a) Almost all stores, including the smaller ones will implement this technology, as costs of these RFID anti-theft systems keep falling due to better technology, higher demand and several new players in the market. The rising cost of employing security guards to physically detain & frisk shoppers is not only expensive, it is distasteful to the 99% genuine shoppers, who are not thieves. The stores certainly do not want to alienate their honest customers by such crude methods of security.

b) Retailers are presently using RFID tags mainly only for anti-theft purposes, but now many have started implementing smart RFID tags for item tracking, shelf replenishment, collecting info about buyer behavior and other such data. The collection of this data is possible not only by simple anti-theft tags but by more sophisticated data tags. This trend has already started and it is now only a matter of time when the anti-theft and tracking capabilities will be available in a single tag.

Asset Management

History :

Asset identification has always been a major headache for corporations, especially during audit-time, when the auditor would like to physically verify the presence of an asset. Usually in the older days, asset numbers were either stenciled on the asset or painted on it, large assets like plant equipment had bolt on steel plate type tags ("boiler plate tags") on them, which contained details of when the asset was manufactured, when installed, capacity and so on.

Since the assets typically had long lives, they almost outlived the life of the tag. This posed a problem as mis-identification, duplicate asset counting and asset "vanishing" took place. Asset identification and tracking therefore is a major issue, especially between a company's management and its independent auditors. The management may be genuinely overwhelmed by the number, type and sheer numbers of the various assets under its control, but the auditors always look on these matters suspiciously, especially after earlier debacles like Enron. They can never be too sure.

Present situation:

Presently many assets are still tagged by labels, steel plates or have numbers painted onto them but the confusion prevails. In the recent past many progressive companies have some sort of automatic identification systems like bar codes in place, but they may not cover all assets, or the paste-on tags themselves get lost, dirty or otherwise damaged. They cannot be read in most of these cases, leaving behind open questions from auditors and a red-faced management trying to explain, convince and cajole the auditors into not mentioning these slip ups in the annual reports.

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The total value of these assets is a huge figure on the balance sheets. Even if the present value of the assets is not shown to be high (because of depreciation) the actual replacement cost of these assets is substantial. It is therefore an essential task of all company managements to have a better asset identification and tracking system in place.

The RFID solution

RFID tags need not be physically present only on the exterior of an asset. They can be mounted safely in a place where they may not be visible easily to the eye, but are none the less, easily visible to an RFID reader. Therefore a company can easily tag all its assets with RFID tags. The tags need not always be pasted on, they can be located in a place from which they may not easily get damaged. Since a physical line of sight is not required, even in case of dirtying, they are still visible to the reader. For tagging assets in a manufacturing plant, industrial grade tags are available. Typically they can be attached to metal surfaces without problems. If required, they also come with safety certifications allowing them to be used in hazardous areas.

The system works like this. An asset is tagged at the time when it is dues for its next physical verification. The tag need not be the same for each asset. One can have different

types of tags depending on the physical nature of the asset, its mobility, its replacement value and other such factors. For example a steel reactor which is fixed at one location would have a different type of tag than a laptop, which is a mobile asset. Also the vulnerability of the laptop to theft or malicious "vanishing" may be more than that of the steel reactor, even though its replacement cost is low.

After analyzing these different classes of assets, one can come up with a tag type list for each asset. After this is done, the tags are physically fixed in locations on the assets which are not necessarily visible to the naked eye, but are nevertheless visible to an RFID reader.

The tag numbers are unique and each tag number corresponds to a unique asset in the company's asset register or asset database, which may be a database in its ERP system. The unique ID number of the RFID tag thus points to the corresponding asset in the database.

An external independent auditor can now easily roam about the plants and offices, armed with an RFID reader to query each asset. This system gives a remarkable amount of transparency to, what has been till date , a pretty much opaque system. This increases the confidence of auditors in the company's management manifold and leads to lesser legal hassles of compliance.

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Future trends:

a) It may be possible for the government or a similar authority, to pass a law saying that all assets declared by a publicly held corporation, on its books should be tagged with read-only RFID tags.

b) With the Enron & Worldcom corporate scandals still fresh in people's minds, this RFID asset tagging could be a solution suggested by external independent auditors.

c) Standardization of asset number tags is a possibility. Therefore all "asset" tags will follow a certain standard (both in physical aspects as well in their internal data structure.

Anesthetic Dosages

History

In medical operation theatres across the world, anesthetic dosages have always been a very critical part of the surgery, almost as important as the surgery itself. This is because the right dosage of the anesthetic is absolutely critical. A very low dosage will result in

a) the patient either feeling the pain, or
b) the patient not remaining immobile (can move about) resulting in a botched surgery.

A too high dosage will however, prevent him for moving forever (in other words he may get killed). Now to reach this virtuous mean, is real a challenge and a test of skill, for all surgeons and anesthetists.

Many times, anesthetics have been administered to the patient, by making him breathe- in some form of a volatile vapor or gas, before surgery. This really cannot be controlled precisely, again leading to overdosage or underdosage.

Problems with the present system

The present system of administration is imprecise. Also the volatile anesthetics that are breathed in by the patient, lead to many unpleasant side effects like a groggy feeling in the head, as the patient recovers (similar to a very bad hangover), nausea and vomiting. This in turn makes recovery slow and painful.

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To have a better system, a leading pharma company came out with an injectable anesthetic, that could directly be administered intravenously. The anesthetic is metabolized (broken down naturally) by the body, over a period of time and the patient recovers fast without the typical groggy headed feeling of a large hangover. However there is a catch. To ensure that the anesthetic works well, the doctor has to be able to maintain the blood concentration at an optimum level. This means that the infusion has to be continuous, at a rate higher than the rate at which it gets broken down. This rate is different for different patients depending on their age, body type and state of health. Thus there are different vials for different types of patients and time duration of the surgery.

The infusion of this anesthetic is done with a vial. This vial has to be infused in a syringe, which is then fitted into the infusion pump. The anesthetist has to be absolutely sure of which vial is being loaded into the syringe.

The RFID solution

For the dosages, the company eliminated the vials and came out with single use syringes, preloaded with different dosages. Depending on the patient, the anesthetist had to choose which dosage would be most suitable and select the correct syringe accordingly.

To make the system fool proof, RFID technology was used.

The RFID solution was to implant a multi frequency magnetic resonance tag in the syringe itself. The infusion machine has a pump, which is equipped with a device, which calculates the amount of anesthetic to be administered and also has an inbuilt RFID reader.
Once the anesthetist fills in the patient information, the system calculates which dosage would be right. The anesthetist then has to select the syringe with the correct amount of dosage in it.
The reader then accurately identifies the syringe and displays it. In case the wrong syringe is loaded, the pump will not start and give out a warning.

Thus automatic identification of the drug ensures patient safety .

Present situation

Only one company has so far introduced this system and patented it too. About 4.5 million syringes are already being manufactured for this application in one year.

Future trends

a) If this product continues to show success, there is no question that other similar products with different applications will be introduced by other medical device companies. As an astute medical practitioner can see, this technique can be used for other dosages too, not just for anesthetics, but may be also for other drugs and medicines.

b) Later on, if patients & hospitals find this technique results in a lot less failures, then the authorities may even legislate this into law, as the only proven method for reducing unwanted incidents.

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Baggage Handling

Present Situation :

An airline may score very high on the passenger's evaluation in terms of in flight service, pretty airhostesses, in flight entertainment systems, timely arrivals, punctual departures and courtesy at check-in counters.

However the same satisfaction levels may not exist, when it comes to passenger baggage handling. In fact lost baggage, delayed baggage arrival and other baggage problems take up a large chunk of an airline's "headache list".

How much is the magnitude of the problem? By IATA 's own estimates, an amount nearing about **$760 million** is spent by the airlines, due to lost or misplaced baggage. So you see that it is a really big problem.

Adding to this cost are the rules related to safety due to increased terror threats.

Unaccompanied baggage is not allowed to be loaded in passenger flights and reconciliation of baggage tags with the passengers who have already boarded a flight is a painful process. If at the end, it is found out that a passenger who has checked in, has not actually boarded the plane, then the airline has to remove his baggage from the hold of the aircraft.

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Airline baggage is fixed with large stick-on barcode tags at the time of luggage check-in. The luggage then moves along various conveyors, which have bar code readers mounted on them, to scan each baggage tag that comes in its field of view. Unfortunately, the readers cannot correctly scan all bar code tags because of the following reasons:

a) Barcode readers require a clear line of sight. If the tag is misaligned, it cannot be read.

b) Baggage articles may get bunched together because of careless loading on belt by the staff. This makes labels unreadable.

c) Tags may be dirtied, torn, wet ….. any damage makes it difficult for the readers to read the barcode automatically.

The baggage is routed to the correct bay for pickup by the baggage trucks which carry it to the right aircraft. Then , the baggage is then loaded into the hold of the aircraft. While loading, again, hand held bar code scanners are used to scan each piece of baggage, so that the central computer now knows which bags have made it to the aircraft hold.

During this time, passengers begin boarding the aircraft. Their boarding passes are swiped and this data is fed automatically into the computer system. Now this data is available as a passenger manifest, which tells the airline staff, which of the checked-in

passengers actually boarded the aircraft. This is tallied with the passenger's baggage and a one to many relationship, between the passenger and pieces of baggage is established. This is to prevent unaccompanied baggage from traveling.

Now, suppose, it is detected that a bag which has been loaded into the hold does not have its owner (the passenger) inside the aircraft cabin. This becomes a case of unaccompanied baggage and this bag is then unloaded from the hold. This is not as easy as it sounds. The baggage attendant has to enter the hold and search for this dubious piece of baggage (amongst a sea of similar bags) , in a poorly lit hold of a large plane, using only his hand held barcode scanner for guidance.

Other problems may be that the bag in question really was supposed to be in another plane, but because of misreading of the bar code, landed up in this particular aircraft. So now its not merely a case of suspicious baggage, it also means an infuriated passenger somewhere whose bag has been "lost".

This entails manual intervention on the part of the airline and co-ordinating with various people to re-unite the passenger with his bag.

In case of transit passengers, the situations can get more complex, as the bags and passengers move from one terminal to the next.

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The RFID solution :

Instead of the ordinary bar coded stick-on labels, we can use RFID inlay stick-on labels. These have a printed portion, as well an RFID tag inlay, which can be either a read only or a WORM (write once read many) type. This tag can be read by RFID readers mounted at various locations on the conveyor belts. The RFID readers have several advantages over the traditional bar code readers like

a) Many bags can be read at one time, not one at a time as with bar code readers. This alone speeds up baggage handling by a factor of at least three.

b) No problem of misaligned or dirty, unreadable labels. The RFID reader can read the tags even if the text label gets misaligned or dirty.

c) Retrieving bags from the hold is now easier because of the baggage handler can now have a hand held RFID reader which does not require any line of sight. It can read the multiple bag tags simultaneously and help zero-in on the suspicious bag within a matter of minutes.

Present Situation:

Implementation has started or has been carried out on a pilot scale at Hong Kong's Chek Lap Kok International Airport & San Francisco International airport.

Other airports , sooner or later will follow this trend. Reportedly Bangkok's new airport also is conducting pilot trials. This technology is essential for airports which are regional hubs for airlines and which have a lot of traffic due to transit passengers.

Future Scenarios

a) IATA may make it mandatory for all airlines/airports to install RFID reader systems & tags by a certain date.

b) The newer airports, or airports who are upgrading to newer control & automation systems may provide facilities for having both barcode as well as RFID tag identification systems for baggage handling, to make their airports passenger friendly.

c) The government & security agencies may also mandate that all airports install this kind of system.

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Blood banks

Present situation

In thousands of hospitals across the world, blood transfusion is an everyday business, but fraught with risks. This is, not only because contaminated blood may be transfused into an otherwise healthy patient, but also because he may receive the wrong type of blood altogether. This is not a rare occurrence, although we would like to believe so. Data from US hospitals show an alarming number of cases of medical negligence or mistakes, many of which are related to blood transfusion. In fact, data compiled from Year 1993 to the Year 1999 showed an increase in blood transfusion errors. Note that these errors are not in some remote third world hospitals, but are data from the US itself.

Why have the number of mistakes increased?

This because many hospitals have cut back staff due to cost pressures. The person who collects blood is not the same person who transfuses it. Typically the patient is not known personally to the nurse who administers the transfusion. The mis-identification can occur due to overwork, carelessness or any other factors.

What is important is that it does take place. After the event , there is no point in blaming people, processes or institutions. What is important is preventing such incidents.

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And, due to RFID technology, these errors are actually completely preventable.

In a typical hospital emergency room, the following situation is not unimaginable.

a) There has been an accident and large number of victims have been brought in.

b) Suddenly a large amount of blood is needed for the emergency procedures to be carried out on these patients.

c) The patient himself is either asleep, sedated or otherwise unconscious, unable to talk or communicate with the paramedics.

d) The nurse or paramedic do not know the patient personally.

One sees that the nurse or paramedic can easily pick up the wrong blood bag, get confused because of similar sounding names and hence transfuse the wrong blood. This is in most cases, fatal.

The RFID solution

The RFID solution is to embed a tag into the blood bag label itself. The paramedic who transfuses the blood can scan the bag before transferring. He typically enters the patient ID number, or in a better system, the patient also has a wrist band RFID tag which identifies him uniquely. In case the wrong blood bag is scanned, the reader can throw up a warning like this.

WARNING!! BLOOD MISMATCH!! YOUR IMMEDIATE ATTENTION IS REQUIRED!!	
The blood bag is for patient JOHN SMITH Patient ID JS1002453	**The patient on the bed is** **JOHN SMET** **Patient ID JS1003453**

This will save the life of Mr. John Smet (who will no doubt, be eternally grateful to the technology, if only he knew what was about to happen!)

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Advantages of using RFID

a) No errors at all ,even in case of demanding and panic like situations. This itself can be said to be the ROI of an investment in such a system. Saving a few lives a year is definitely worth the cost of a few tags & readers!

b) Greatly decreases the mortality rate due to negligence.

c) Can be used for other body fluids or patient dosages too, need not get restricted to only blood. For example medicine dosages, intravenous drips, etc.

d) Offers traceability and tracking, can evaluate the actual level of patient care that is offered by the nurses, to upper management, by means of data collection. For example middleware can be used to match queries like “how much time did nurse Jensen spend between collecting the blood from the blood bank and transfusing it into Mr. Smith” and so on, which is invaluable to provide better quality of service to patients.

Car manufacturing

Car manufacturing, in reality today, is less about manufacturing and more about assembling. This means that once the frame of a car is ready, it moves on a conveyor belt and slowly various components and things get added to it along the way. Therefore, a very large number of components have to be fitted in the right place, which again means that the correct components should be available at the correct workstation, when the car frame arrives there for fitment.

Present situation:

Car frames move along a conveyor. There are several workstations along the conveyor. At each workstation, the conveyor halts, while workers add or modify the frame and add/ fix components into it. Once the activity is over, the conveyor moves again, bringing the next car frame to the workstation. Similarly, workstations which are downstream add their own components to it.

How are the components correctly installed? Each car frame has a bar code stuck or embossed on it. The bar code reader at each workstation reads the bar code and assigns components which are to be installed to this car. The workstation has a barcode scanner on it. The workers use a handheld scanner to identify the correct parts that would be fixed into this particular car. For example, a green colored car would have green or other matching colored door handles to be fitted on it.

This whole information is captured by the central computer system and material parts are allotted to various workstations based on this data.

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The problems with these kinds of systems are:

a) One at a time reading. The worker's handheld barcode reader has to scan one component at a time, to make sure it matches with the required type.

b) Dirty, faded or torn barcode tags make the readings impossible.

c) Incorrect or no readings on some workstations mean that wrong data is being stored and collected. This could lead to parts not being made available in time at a particular workstation.

The RFID solution

A typical RFID solution would be to use industrial, metal friendly and RF noise friendly tags. This is because standard RFID tags may not function correctly in an RF noisy environment because of the large amount of welding machines, cutting machines and so on which generate a lot of Radio Frequency noise.

The tags would require a range of about 3 meters, sufficient for use at one workstation. This rugged tag is installed in the car body itself and fixed RFID scanners mounted on the workstation read the tag. The workmen use handheld RFID readers to quickly locate the parts that would go into the particular car with the read RFID tag number. The addition of these components is then recorded automatically at each workstation and this information is fed to the computerized Manufacturing execution system (MES) which tracks the cars and the components, as they move along the line.

The advantages gained by implementers are:

a) A moving snapshot of the entire manufacturing line in real time.

b) No stock outs at workstations.

c) Better quality controls at workstations, as very little possibility of the wrong parts being fitted into the car bodies.

Present situation

There have been several pilot implementations, but not widespread use till now. The reason is definitely not ROI as the ROI for these systems is said to be in the region of 1400%, which is really good for any capital investment.
The real reasons for slower adoption of this technology in the global auto industry may be that the present shaky financials of most of the auto majors.

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Future Scenario

In future, one would see many such implementations because of the high ROI, which is essential to a troubled industry like automobile manufacturing.

Drug Pedigree

Present situation

About 1% of all the medicines sold in the world are likely to be counterfeit. In percentage terms 1% may seem to be small, but given that the global medicine trade is in the several billions, this small percentage is a very large number in absolute terms.
The problem of counterfeiting is especially rampant in Asia & Africa but it also exists, surprisingly in a region like North America. Here, the problem may not be of only counterfeiting, but also of diversion. For example, hospital pharmacies may divert cheaper subsidized drugs meant for Medicaid beneficiaries to other fully paid patients, charge them the normal price & pocket the difference. To counter this problem the US FDA has mandated that all intermediaries in the pharma supply chain should ensure that the drugs that they handle can demonstrate their source or "pedigree".
However at present there is no national or international system in place to have such a pedigree check.

The RFID solution

Implementing RFID systems is of course not the only answer to the pedigree problem, but is by far the most attractive. A manual paper & pen based system is certainly possible but unworkable as the amount of paper trails will be huge adding to the supply chain inefficiencies. Bar coding may not serve the purpose as bar codes can be easily counterfeited. However, encrypted RFID tags containing a unique code may be difficult if not impossible to counterfeit.
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The ideal implementation would be for all drug manufacturers and their distributors, traders and other supply chain participants to enroll in a product identification consortium like EPC Global so that each strip of tablets or bottle of pills could be assigned a unique RFID based product code number. Since this code number would be unique, duplication would be impossible for any counterfeiter. The hospital or pharmacy could hold this bottle of pills near an RFID reader which would be connected to an ERP like system database, which would identify the bottle and give out information related to its batch number, serial number, date of manufacture etc which could be compared with the printed label. If any discrepancy is found, obviously the bottle is a fake. Also , this central database would track the bottle through all its stages of delivery right from its packing, to factory warehouse to transporter warehouse and so on, so the source & pedigree is very clear and transparent.

Advantages

a) The system will make it impossible to pass on counterfeit drugs as genuine ones and thereby solve a major problem for all healthcare consumers.

b) For supply chain participants, it ensures that only legitimate drugs passes through their channels. They can thus breathe easy.

c) Governments can choke off the supply of illegal drugs and ensure that all legit taxes are collected.

Present situation

The US FDA had made a deadline of December 2006 for all pharma supply chain intermediaries to put in place a pedigree tracking system. This was actually enacted as an act , known as the PDMA (Prescription Drugs Management Act), a long time back, but the deadline to comply kept getting extended again and again. With so many cases of counterfeit, diverted and / or banned drugs in the supply chain the FDA finally gave a final ultimatum to the pharma industry to "comply or else.." by December 2006. However, as always, this too got extended…. And the story goes on.

Now there is talk of co-operation between EPCGlobal, the organization that allots Electronic Product Codes (similar to barcodes, but in RFID format) and the Pharma industry & trade associations to have a universal system that would make it easy to track the movement of drugs by using EPC tracking codes and the EPCGlobal database. This same database is already in use for keeping track of consumer items and there was no earthly reason why this could not be used for tracking drugs.

Elarian Group had in an earlier white paper on t he subject, recommended just this solution, years ago.

Apparently somebody finally heard it and has started implementing it.

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If you would like to have a copy of this White Paper, please visit http://www.elarian-group.com and download it.

Future Scenario

a) If EPCGlobal and Big Pharma can pull it off together, they can ensure that everybody globally follows a standard set of Electronic Product Codes for prescription drugs. Since available EPCs are in the hundreds of thousands, this should not be a problem. Tracking can be enabled through secured connections using either dedicated telecommunication channels or the internet.

b) The only question is of funding. Here, the governments may mandate that all drugs passing through the country's supply chain must demonstrate their pedigree & genuineness through EPC codes using RFID.

c) Companies will realize that the savings due to anti counterfeiting measures like electronic pedigrees will far exceed the costs of setting up such a system. The paybacks would be achieved in a matter of months. Once this realization sets it, it will lead to a rapid deployment of this system.

Event Management

Present situation :

Large events, be they sports events like football matches, rock shows or trade exhibitions are always a challenge to manage. The challenges arise from the fact that the organizers are trying to control, not just ordinary crowds of people, but large *fanatical* crowds (like football fans). Restricting entry to only genuine ticket or pass holders is a major headache. There have been many cases of fraudulent tickets (duplicate numbers, counterfeit tickets) being sold to an unsuspecting and eager public. These cases not only give heartburn to the person who has been cheated out of his money, but also create ugly scenes at the venue, where the organizers have to inform the victim, near the entrance to the grand show, that all along, he has been misled and sorry, he cannot enter, because he is holding a dud ticket.

Thus the problems with the present situation are:

a) If the ticket is just a printed ticket, then the entry to the event has to be manually regulated, where each person's ticket is checked by a security guard and then allowed entry. It requires a large number of guards who have angry and impatient fans breathing down their neck.

b) If the ticket is just a printed piece of paper, it can be easily counterfeited. Worse, if the organizers themselves cannot make out the difference between a genuine and a counterfeit, then a genuine visitor who has purchased the official ticket may find his seat occupied by a fake ticket holder, who merely arrived earlier.

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c) To make matters better, organizers introduced bar coded tickets. Now due to the automatic identification, the process of gatekeeping was faster, but alas, bar codes could also be easily counterfeited. So we are back to square one.

The RFID solution

Printed Tickets with RFID inlays are the best present solution to this problem. The ticket looks similar to an ordinary one, but has an RFID inlay inside. The RFID inlay is a passive, read only type tag which can now be identified by a reader. Since the tag can be identified at a distance, it is possible to have an access control system at which the visitors flash their tickets at an automatic door which opens. Alternatively, for large events where security guards are anyway necessary to control the crowds, they can be equipped with handheld readers that quickly scan the ticket and allow entry.

Advantages of this system

a) No possibility of counterfeits. It is difficult for a counterfeiter to make or source RFID inlays matching the specs of the original, as also the impossibility of guessing the genuine serial numbers.
b) Easier managing of access at gates as the scanning is faster with RFID tags on the tickets.

Has this system been implemented? Of course. The most visible demonstration of the new system was at the recent FIFA Soccer World Cup in Germany. About 4.8 million RFID tickets were sold to fans, leading to no counterfeit problems and easier access control to the matches.

The Future scenario

RFID tickets will become the norm rather than the exception, for all events, not just football matches. The Beijing Olympics will also have RFID tickets.

Food Safety

Present Scenario

The safety of food products is a prime concern today. What with the recent spinach e coli outbreak, the not so old mad cow disease and other such scares , one cannot but feel scary. This is important for most people because eating is something that one can never avoid, unlike say, traveling by air. Hence anything related to food safety is very important for all of us.

There are other cases in which food safety may not be an issue but traceability and credibility are. For instance, is there any way to verify that a package of "organically grown" spinach is not so, but has been plied with generous doses of all kinds of chemicals from sulfate fertilizers to toxic pesticides? Not at all. There is no way for example to verify whether the carton showing "California oranges" does actually originate from an orchard in California or a little known Chinese province.

Problems with present system

a) No way for the consumer to know the source of the food. For example I have no way of knowing whether the particular apple I am buying came from Farmer Jones or not.

b) No information to verify the "packed on" or "best before" dates.

c) No traceability. For example in case of an e coli outbreak, the tracing has to be done manually by sifting through records of various entities in the supply chain including retailers, wholesalers, importers, shippers, transporters, etc. Very cumbersome and slow.

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The RFID solution

One way of raising consumer confidence in the farm produce is by guaranteeing that a particular produce has been sourced from say an "approved" farm. This could be a way to verify that the "organically grown" produce has been really grown in an organic farm, not just labeled that way.

Let us take the case of the "organic" farm producer, say an apple grower. He is interested in somehow "stamping" his produce with his logo, which gives customers confidence that they are buying the right stuff. Hence he puts small stickers on his apples, they are packed in a box and shipped off.

Unfortunately, stickers can easily be duplicated and they often are, especially when the produce is exported to other countries. The RFID solution would be to tag the carton with an RFID inlay passive tag which is accessible to customers.

How? Does this entail the customers buying RFID readers? Thankfully not. A new application , which is being developed in Japan allows mobile phones to be used as RFID readers. Therefore any shopper in a supermarket, who wants to buy this carton of apples can point her mobile phone to the tag, scan it and read all the details.

What are the advantages of this system?

a) The customer gets confidence in the product as the genuineness can be checked by herself.

b) The customer pays the right price for the right produce.

c) The store also creates confidence in its customers that the genuine stuff is being stocked and not some cheap imitations being passed off as real.

d) The farmer gets a good brand image.

e) Since the reader is integrated into the mobile phone, it is a painless process for the customers.

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f) Easy trace back in case of any problems. No need to sift through endless reams of paper data like invoices, packing lists, shippers lists, import declarations, etc of multiple entities in the entire supply chain. Just imagine, all this work just gets eliminated in a whiff! This will really help, in cases of public health scares when it is essential to trace the source of a particular scourge like an e coli outbreak in double quick time.

Future Scenario

a) In future the governments & food safety authorities, the WHO & other international bodies may mandate the usage of RFID tags to determine the safety of food in the supply chain. Thus international shipments of foodstuff may have to carry tamperproof RFID tags.

b) Savvy customers may now demand that produce labeled as “organic” or “chemical free” is really so. They may demand that the seller prove the origin by means of a pedigree trail (similar to the drug pedigree shown earlier) or else risk loss of his sales.

Gasoline dispensing

Present scenario

Large bulk transporters who have fleets of trucks to carry their materials have to operate gasoline filling stations, located in their yards, where truck drivers can refuel their trucks. Consider the problem faced by a large cement company, who operates a large fleet of trucks. The trucks have to be periodically refueled at gasoline stations. Typically the driver takes the truck to a fuelling station. Authorization is based mostly on personal identification by the fuel station personnel, which opens the system to misuse and unauthorized fuel fills.

The problems with the present system are:

a) Scope for misuse as authorization is based on personal relationships.

b) Difficult to repeatedly track information like which trucks go to which fuel stations, whether all such refueling trips are necessary, etc.

c) Time gap between event occurrence and knowledge about it to management.

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The RFID solution

Gasoline stations which are part of the fuelling contract fitted with RFID enabled gasoline dispensing units. RFID tags are fitted to the trucks. When a truck approaches a filling station unit, the RFID reader recognizes it as an authorized truck and enables the driver to fill in gasoline. Once the truck drives away the gasoline pump shuts and information about the truck (number, type, etc) and gasoline dispensing information (amount filled, time , date, time spent in filling, etc) is relayed immediately to the headquarters of both the trucking company as well as the gasoline dispensing company, thus keeping a track of trucks which are being refilled.

Advantages of the RFID solution

a) Automatic, fast & secure authorization due to RFID tags mounted on the vehicle itself. There is no waste of time when the driver approaches the filling station as there are no cards to be swiped.

b) Gasoline filling station can be unmanned. Authorization is on basis of RFID tags and not personal relationships between truck drivers and gas attendants.

c) Keeps a near real-time track of trucks, gasoline filled and drivers, leading to optimized operations. Minimizes billing errors too. Allows daily reports and tracking, reconciliation of records between the trucking company and the gasoline company.

Future Scenarios

This application is useful for not only fuel filling, but also for loading of road tanker trucks with chemicals, oil or even gasoline at filling terminals and tank farms. The same process described above can be used by a chemical manufacturing company for example to automate its loading and dispatches.

Imagine the following scenario, which is now followed at many modern chemical processing plants. An empty road tank truck arrives at the loading station gate. The security personnel sees the tanker drivers papers authorizing him to fill the tanker with the chemical say Benzene. He then issues an RFID card to the driver who then drives his vehicle to the benzene tanker loading terminal. He holds the card near the batch controller station's RFID reader and the setpoint is automatically set by the controller based on his card. He uses the loading arm to fill up the tanker . This ensures that none of the chemical plant factory's operators are involved in the loading, the truck driver cannot load excess quantity of the chemical and the entire operation with times are recorded in the batch controller and transmitted to the plants Central Control System.

This may become the norm at all chemical plants, oil terminals, etc.

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Hotels and Resorts

Present Situation

If you visit either a hotel or a holiday resort, the reception staff gives you several things that you have to take care of, in addition to your luggage and personal belongings. They give you a room key, an identification card, one or more breakfast coupons, a bar coupon for some welcome drinks, a health club pass, a casino pass, free tokens and so on. You are supposed to keep all this stuff carefully and use it to gain access to all these places in the resort.

For the normal leisure traveler, this is very irritating. She has come to a resort, to enjoy, not keep track of various scraps of paper. For the resort, however this is essential as they have to ensure that genuine guests use the facilities, track usage of the coupons & gather other information.

Problems with this system

a) It is a pain for the guest to carry all this stuff all the time, in addition to taking care of other essential belongings like cameras. Besides vacation wear may be just a pair of shorts and a T shirt with no pockets, to keep anything at all.

b) If you are a parent traveling with young children, then you have multiple such coupon sets to take care of.

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c) The coupons and access passes are misplaced when you need them, or you realize, when you reach the entertainment venue, that they have been left in your room. These resorts are quite large places and walking back to your room is quite a pain.

d) The hotel staff has to issue and redeem these coupons and passes based on the tariff and meal plans or packages that the guests have bought. This manual system is not easy to manage at all.

e) Reconciliation of used coupons with issued ones is difficult. Hence a lot of useful data (how many guests used which area at what time for what duration) cannot be had.

f) The guests have to sign bills at various restaurants in the complex, to confirm services which they have availed of. For example if John Q Public downs three sundowners in the lounge bar, he is presented a bill, which he signs. This bill is then added to his room bill.

The RFID solution

The RFID solution is to issue an RFID wrist band to each guest, including children (other than infants). The wrist band contains an RFID tag. The wrist bands can be worn like watches and they can be made in any number of colors, designs and patterns. Also, they can bear the logo of the hotel or resort chain. The wrist band acts like a door key as well as a coupon to all the facilities that the guest is entitled to.

For example, a guest detail can be entered into a database like the following:
Guest Name—John Q Public
Room No –101
Dates/Time from 12/27/2006 14:00:00 to 12/29/2006 14:00:00
Breakfast : Yes, in coffee shop, on 12/28/2006, 12/29/2006
Gym : Yes,…….
Casino : No,……
Pool : Yes, but only in morning from 0700 hrs to 0900 hrs.

This programming can be unique for every guest and therefore depending on the guests fancy, as well as the ability to pay, the hotel can work out infinite such tailored one of a kind package deals. Some guests may fancy the casino more than the gym and the health freaks may require at least a two hour workout in gym but no casino and so on.

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Now when the guest flashes his wristband near his room door, the lock reads the RFID tag inside the band, confirms with the central database that he is entitled to enter room 101 and the door opens.

Similarly the coffee shop entrance has a large reader equipped to detect John's wrist band and allows him access to breakfast.

In the evening when John walks down to the casino, the doorkeeper can read on his reader that John is not entitled to free access here and politely informs him that he is not entitled to a free entry, but if he wishes to enter it, $50 will get billed to his room account, again, by just flashing his wristband.

At all times, John just has to wear his wristband, with which he can also go swimming or skiing, since the RFID tag is embedded inside a plastic housing and cannot get wet or cold. Also, the hotel management can get data on his travels inside the resort. Large amounts of such data can then reveal how many facilities offered are popular and how many are not popular. These can then be revamped or shut down.

As an additional benefit, the resort can offer guests infinitely varied packages by asking the guest to buy a pre-funded wrist band, loaded with say $3000 worth of services. The guest can then either play off this entire amount in the casino or down it all in drinks at the bar, it is entirely up to him. There need not be standard offers like AP, EP, bed and breakfast only, etc.

Future Scenario

There have been successful implementations of this system at some US resorts. In fact, this may soon become the standard method of operation.

Just as those bulky room keys and manual locks, got replaced by magnetic swipe card keys, so also will RFID wrist bands replace the magnetic swipe cards. One can imagine that within the next five years there would be hundreds of hotels & resorts who would want to upgrade their systems to RFID wristbands.

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Hospital Stores management

History :

In the past, hospitals were places where patients underwent surgeries, recovered and convalesced. They still do today of course, but these days, surgeries require a large amount of special parts, that are either used and thrown away, or are implanted directly into the patient's body. These parts are typically stored in cupboards or boxes in the hospital's supply store. Inventory tracking, keeping records of the material requisitions and replenishment are still manually done, or at the most, some basic forms of computerized databases are used. However, the keying in of data is still manually done at many places.

Typically, a doctor or paramedic, will issue a written requisition to the store for a part, say a catheter. This part will be retrieved by the store staff from the store shelf, checked for its shelf life and then issued. Data entries into the system will be done manually , perhaps at the end of the day. In large hospitals, this process will be repeated many times for many items, every single day.

Problems in the present system

a) Medical Parts generally have a shelf life. This means that they must be used within a certain number of days of manufacture. There is no automated system at present to intimate or give warnings when the parts will cross their expiry dates, hence either a large number of parts may have to be thrown away before they are used, or worse, date-expired parts may be actually used.

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b) Since reconciliation of the actual parts present on the shelves and the register or database is done only periodically, at any given point of time, nobody has an idea of how many parts of what type are actually present in the store (vis a vis being merely present on the books).

c) Due to reconciliation problems and the possibility of not being found out immediately, is great incentive for thieves to steal these parts, which are quite expensive.

The RFID solution

The RFID based solution would be to embed each part as it comes in with an electronic label (an RFID tag). The RFID tag would have a unique ID number which is linked to the material database, having all relevant information about the part. The electronic labeled part is now put into a smart shelf. The smart shelf is composed of a built in antenna and an RFID reader, which keeps track of all the RFID tags inside (the medical parts). The moment a part is removed, the RFID reader senses this and communicates this fact to a central database which updates its material list. In fact, the system can be made even better, with requisitions also being routed through the database.

When a doctor or paramedic enters a material requisition (say for a catheter) in his PDA, the database instantly "reserves" one for him in the smart shelf. This reserved part is typically which has the lowest shelf life amongst all the remaining catheters. This requisition is also flashed to the stores personnel, who also get a number of the particular catheter (not just any catheter that fits the bill), that has to be removed from the smart shelf for issue to the doctor.

The storekeeper removes this particular catheter from the shelf, peels off the RFID tag and sends it across to the doctor. The instant the catheter is removed from the shelf, an entry is made in the central database, which informs the Purchasing guys that they just reduced their inventory of catheters by one. Once the number of such reductions reaches a critical mass, (the re-order level in inventoryspeak), an order will be automatically issued to replenish the stock.

This system also has other side benefits. There is an automatic audit trail generated showing who issued a requisition for what, who removed the material from the shelf at what time, cost to be billed to patient, which catheter got used by which patient, etc, etc.

There is very little scope for any malpractices like using date expired materials on unsuspecting patients, being suddenly short of supplies (because one day most of the catheters got used up and some were pinched or "lost").

Advantages of the RFID system

a) Audit trail of expensive hospital parts usage.

b) Optimum utilization of inventory will lead to lower inventory carrying costs, lesser stock outs and less number of "surprises".

c) This system could be a big boon for government and public hospitals who work on tight budgets.

d) Patient safety is not compromised while meeting lower operating cost goals.

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Future Scenarios

The hospital smart shelf may become the norm, rather than the exception in all publicly funded hospitals and even in privately owned ones. Costs of such systems are dropping, but even now the ROI is easily justified, it will be impossible to ignore in the days to come.

Medical surgeries

Present Scenario

In a typical surgery today, a large number of objects like scalpels, tweezers, tongs and other implements, gauze pieces, towels, etc are used. The number of implements and objects used increases, for complicated or larger duration surgeries, which have more than one surgeon and assisting staff. A common error which can lead to serious post operative complications, is for something to remain inside the patient after the operation is over. These conditions are not very rare, they do occur often. In most cases, these objects are discovered only after the patient complains or is scanned by ultrasound for some other problems.
To avoid this, there has to be a tracking system, to check which implements were brought inside the operation theatre, number of towels or gauzes used ,etc.

The RFID solution

The RFID solution would be to tag all such objects with RFID tags. They would be of different types, as the tags used for steel objects like scalpels and tweezers, would be different than for towels. However, the bottomline is, that all of these objects can be tagged. A "smart" surgical holder, is similar to a trolley having a lot of open shelves having multiple trays holds all of these objects. This smart trolley has an RFID reader which remembers all the objects that were on it. After the surgery is over, the staff replaces all the stuff back on the smart trolley. In case, the number of objects is less than what the smart trolley had before coming into the operation theatre, it gives out an alarm, indicating that some towel or gauze is not put back. It may have been left inside!
Once all items are reloaded back onto the trolley, it leaves the operation theatre to another department for cleaning and replenishment. After cleaning, the trolley is again loaded with a set number and type of items necessary and sent back to the operation theatre.

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Advantages of the RFID solution

a) There is no room for human error. Implementing the system means that the patient can be confident that nothing will be left inside his body after the surgery.

b) The doctors and paramedical staff have one thing less to worry about. The smart shelf take care of it.

Future Scenarios

The system will get adopted at the large hospitals soon. It may also be forced on to the hospitals by the government or the Medical Insurance companies, who realize the advantages of having such a system in place.

Mother Baby pairing

Present Situation

This sure sounds unbelievable, but reportedly, there were 20,000 cases of mother-newborn baby mismatches in one year in US hospitals alone! The main problem is, that all newborn babies look alike (at least to many people including me). It is difficult to distinguish one bundled baby from another, especially in a hospital wards where there may be tens of these "bundles of joy" kept together for a bath or whatever. In many cases if the mother has undergone a cesarean section, then she is likely to be under some kind of anesthesia. If a nurse carries away a newborn baby for its bath and then gets confused herself when she is to bring it back to the mother, she may put the baby in the wrong crib.
Hence the need for an effective pairing system between babies and their mothers.

The RFID solution

To prevent mismatches between mothers & their babies one could easily use RFID tags designed for the purpose.
The infant could wear a very small wristband, more like a bangle, which is embedded with an RFID tag inside. This RFID tag has the same number as the one which the mother wears (also as a wristband or a large bangle). It could be a read only tag, with several data bytes, so there is no question of duplication of numbers at all. One could designate all even numbers as babies and all odd numbers as mothers, for example. Now, when a nurse takes away a baby for its bath or vaccination or whatever, she can bring it back to the mother without any problem as the RFID reader available with the nurse confirms that the baby is indeed returned to its own mother.

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Advantages of the RFID solution

a) No mismatches between babies and mothers. Less stress for anxious mothers and sometimes even their fathers.
b) The RFID "bangle" tags on the mothers and babies can be linked to their entire medical history database in the hospital including blood groups, vaccinations done, any other medicines given, etc.

Future Scenario

This may become the norm in all hospitals. The authorities may also mandate that this system be followed to avoid lost baby cases. Insurance companies may also insist on this system.

Museums

In many museums today, the lack of a knowledgeable guide, prevents visitors from fully appreciating the artifacts on display. Yes, each showcase or window does have the description of the item being displayed , as a signboard or a small painted text panel.
However the story behind each artifact cannot be told so dully. A museum guide if present in person, can bring history to life by vividly describing the item.

Problems in the present system

a) There are not many educated, passionate and informed museum guides available with many museums, for whatever reasons.

b) Doing away with a guide altogether results in a less than optimal solution. The simple text display near the showcases does not give all the information, history and other details of the artifacts on display, to the visitor.

c) There is now way, the museum administrators can find out who spent how much time where, which artifacts were most interesting, which artifacts captured the attention of visitors first when they enter a hall, what route does a typical visitor follow, etc.

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The RFID solution

There is not one, but many RFID solutions to the problem. The first is to equip each visitor with a handheld device, which is really an RFID reader. The device can have a set of headphones connected to it. The main device can be kept in the pocket and headphones can be worn as usual. Each item bears an RFID tag. When a visitor gets in front of the item, the reader senses this and relevant information (audio) is delivered to the visitor through the headphones. The handheld can also display some additional pictures and information about the artifact. It can also display a list and location of where in the museum similar artifacts are located.
After the visitor leaves, the entire route that she takes and the time she spends on each artifact can be retrieved, which gives the museum curator or administrator some data which tells them which are the most popular items, what route does a visitor take, how much time is spent where, etc. The visitor also gets an enhanced experience.
Additionally, the museum can also have a facility of sending the information (by email) about the artifacts in which the visitor showed special interest.

Advantages of the RFID solution

a) The visitor gets all the benefits of a guide without really paying for one.

b) The Museum also utilizes the electronic guide, can give a very good experience to the visitor, but without paying for a physical person.

c) The Museum can assess which artifacts elicit the most interest, decide on placement of individual objects so that the visitors interest.

Future Scenarios

With declining number of guides in museums, especially publicly owned or government owned, and lower manpower budgets, the RFID based system is sure to catch on. Also the same system need not be used only in museums, it may also be used in less intellectually stimulating locations like furniture shops, open layout stores, etc.

National Identification

This has been a problem plaguing countries for all time in the recent past. How to identify her own genuine nationals from those aliens (especially the illegal variety) who sneak in and manage to stay for long times, use public goods without paying taxes and even pose security threats?

This problem was sought to be mitigated by plastic or paper based ID cards like Social Security Cards, Driving license documents, etc. But like all other paper documents, these IDs are prone to fraud, duplication, skimming and other ills.

Now with increasing security concerns and the large number of illegal aliens, it has become an even bigger and more pressing problem.

Present situation

a) A citizen carries a multitude of ID cards, which can be for various purposes and issued by multiple agencies. For example a single adult bona fide citizen may have a social security card, national ID card, a passport, a voter card, a driving license, etc.

b) The cards are prone to illegal copying, skimming, identity theft and other ills.

c) The magnitude of this problem is huge. The resources to hunt and track down fake card holders are too less to solve the problem.

d) The fake card problem is a recurring one, growing by the day.

e) It has now become a national security issue.

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The RFID solution

A user typically has only a single card with an embedded RFID chip with a unique number. This RFID tag number then points to an online database which is accessed by a multitude of agencies. The same database can have all information related to the holder, including details like date of birth, whether allowed to drive (electronic driving permit), whether entitled to social security benefits and a multitude of other attributes. Since this common database will be accessible to all regulatory agencies, in different views, it will be difficult for any one cartel or criminal group to access it and change ALL entries related to an individual.

Thus the transport bureau can have access only to the Name, Age and whether allowed to drive fields, past driving violations cells in the table and not have access to other data.

The immigration office can have access to other data like whether in country or out of the country, when arrived and left, passport validity, etc.

Advantages of the RFID solution

a) A single ID card needs to be issued. No need to issue multiple documents and cards to the same person.

b) A secret serial number (encrypted) on the card which connects it to the right database entry. No way to duplicate or forge this.

c) A single fake document can no longer be used to generate other perfectly legal documents. For example today many criminals start with one fake document (say a Social Security ID card) and using that as the identifier, apply and get other perfectly legal documents like passports, driving licenses and the like. This will not be possible in an RFID based system.

d) Instant snapshot data of the population. No need to painstakingly conduct surveys or mine data on demographics, population behavior, age profiles, etc. This is especially useful for governments to plan their spending.

Actual implementations

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The biggest RFID card project implementation is going to be in China, where the plastic ID cards issued to Chinese citizens will be replaced by RFID cards. This may be one of the world's biggest RFID projects, since the Chinese population toady stands at 1 billion and every man, woman and child will have to be issued one individual card. The estimated value of the project is about 6 billion dollars, truly a large project. Interestingly, the Chinese are not talking about Read only cards and a central database. They are thinking about ID cards with read/write capability, biometric information, as well as a magnetic stripe which older card readers can also read. The read/write functionality will be used mostly by police and civic authorities to update information like residential addresses or telephone numbers.

Future Scenarios

In future, most national governments may employ such a card to distinguish between real & fake citizens, monitor compliance to laws and even track movements. This may be a too big temptation for any non democratic government to resist.

This in turn will lead to a stiff fight between privacy advocates & political opponents on one side and security personnel & the ruling establishment on the other side.

Office printers & cartridges

Have you ever faced a problem when one of your office printers gave you an “ink low” alarm and you spent a lot of time searching for which new print cartridge (among the many lying in inventory) could be compatible with your “out of ink” printer? Well if you have , you are not alone. Hundreds of people in offices face this problem everyday. The bewildering number and model numbers of printers and print cartridges make it more difficult.

Problems with the present system

a) There are multiple numbers of print cartridges that will fit a single model of a printer.

b) Similarly the same printer cartridge may fit into multiple models of printers.

c) There is no easy way to determine which printer cartridge can be used where. This is true for all printers, inkjet or lasers.

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The RFID solution

Embed an RFID inlay inside both the print cartridge and the printer. Before opening the seal, the printer’s RFID reader senses the cartridge’s RFID tag and displays a message on either the PC which is attached to the printer ,or on its own display (if it has one). The message could be a warning like
“STOP! THIS CARTRIDGE WILL NOT FIT ME!!”
or it could be simply informational like “THIS CARTRIDGE IS SUITABLE FOR 300 DPI ONLY !”
This makes it easier for users to know, before they open the pack, if they have the correct cartridge. Hence no more decoding of fine print on the cartridges, or looking up printer manuals to know which cartridge will fit.

Advantages of the RFID solution

a) Increased office worker productivity.

b) Tracking of usage by printer and cartridge.

c) Less chances of printer damage by using wrong cartridges.

Future Scenarios

In future all printer and cartridge vendors may adopt this technology.

Plane Spare Parts

History

The UK's Royal Air Force has several squadrons of Sea Harrier "Jump Jets" fighter aircraft. These are known as Jump jets because they require very short take off and landing lengths on the runway. Each Jump Jet has thousands of spare parts, some of which are very critical and expensive. Until now, the only way to track the movement of these parts in the various materials stores, depots and aircraft hangars was either manually or by semi-automatic means like bar coding.
This is true for all makes of aircraft , not just the fighters. Thus even civilian aircraft have thousands of parts which need to be managed well to keep the fleet operational.

The RFID solution

Something like one thousand parts (amongst the several thousands that a plane has) , are very expensive and critical to operations. These parts can be easily tracked using RFID.
The RFID based system ensures that the tags are sewn in along with the cloth labels that a part carries. Each maintenance hangar or stores has several RFID readers deployed which can sense which of these parts is available in the respective locations. These RFID readers are in turn networked using middleware to a dedicated inventory management system that knows which parts are available where. Hence surplus parts in one location can be quickly identified and shipped out to places requiring them. This also reduces the amount of "insurance spares" that each hangar has to carry.
Typically each hangar needs to carry some excess spares to always ensure that the required spare is always available (hence known as insurance spares).The new system means that such excess inventory need not be carried.
This is a very big advantage to todays airlines, who have been squeezed due to low margins and high operational costs. The optimization of spares using RFID means that less cash is held up in inventory and more is available to meet the airline's operational cash flow requirements.

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Advantages of the RFID solution

a) Instant location of critical spares in all hangars, material stores & depots and even on board remote places like aircraft carriers.

b) Less need to carry excess inventory of must have spares, as the required spares can be almost instantly located. Hence less cash gets locked up in inventory without sacrificing reliability

Future Scenario

The UK's Royal Air Force has already started implementing an RFID based tracking system for the Jump Jets. In future the same system can be used by any airline or any air force for better inventory management.

Real Time Location Tracking (RLTS)

In large factories, chemical processing plants, oil refineries, steel plants, etc there are large numbers of various kinds of people, who come in and go out during the day. These facilities operate round the clock with employees, contractors, other visitors like vendor reps entering and leaving the facility. Today, most places issue either a dumb badge with a photo to its employees and contractors and a "visitor" badge (without a photo), to all other people. These entries and exits are recorded manually. Well, they might appear "electronic" because a security guard enters it in a PC, but it is no different from a paper record, because in case of an emergency or evacuation, though one can find out how many people are inside, it is impossible to find their exact location. A typical site may be about 100 acres or more.

Problems with this system

a) No system to really locate a person, even within a vicinity of a few hundred feet.

b) This is really a big problem in case of a fire or other disaster. One still has to carry out a physical head count.

c) Once given a badge, a person can freely access any part of a large site which is not desirable because of safety, security and confidentiality reasons.

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The RFID solution

The RFID solution could be of many types. One could be just replacing the photo badges with RFID proximity cards which require to be held close to door locks or other access control devices. These access control devices would have to be networked to a central computer to collect data on which cards moved through which gates. While this is a viable solution for an office complex, it is not really practical for a chemical plant because most of the equipment, plants, storage tanks are huge and do not have any "doors" or "gates" to have access to them. Building gates at each such area would be counterproductive as regular plant operations personnel cannot move about freely and their work can get hampered. Hence in such areas a RLTS or Real Time Location System can be used effectively.

How does this system work? An employee or contractor is issued an ID card with a powered UHF tag. The tag can be read from a distance of several meters. Visitors who enter the facility also get such a tag. There would be numerous RFID readers scattered all over the facility, which can simultaneously read any number of such RFID tags moving in their vicinity.

Once an employee comes in the range of a reader (say near a storage tank farm) he is automatically logged in that area. Once he moves out of range, he is logged out until he is spotted by another reader.

Advantages of the RFID solution

a) A real time picture of all employees, contractors and visitors who are in the facility.

b) One can know if a particular employee or contractor is spending more time in a particular area.

c) One can see if a contractor has unauthorizedly accessed another area.

d) Visitor movement can be tracked.

e) In case of an emergency evacuation , one can pinpoint the numbers and identities of people in particular areas, so emergency efforts get correctly directed.

f) If conducting a practice drill, one can actually log people movements to see if the drill was done correctly.

Future Scenarios

It is utmost essential that personnel be located quickly in case of a disaster. In an infamous recent industrial accident, it was not known to the site management, how many own people were inside, how many contract workers were inside, whether they were safe, etc. It was a full two days before people were located.
In view of these incidents, the authorities may make it mandatory to have such a system in place for all such high hazard facilities.

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Retailing

Retailing is a very broad term covering any kind of selling to consumers. In our discussion of retailing we will consider only one typical application, that of using item level tagging to sell designer (read high priced) goods to upmarket customers.

A typical situation in a designer store is as follows. Several items are displayed on tables, soft-lighted shelves and such platforms. The only eyesore is a tag hanging out, with a bar code on it and which also displays the price. Therefore, the tag is discreetly kept inside the item (say a ladies hand bag), but when the price is asked for, the sales staff should be immediately able to tell it to the customer. Normally, stores like to just keep a barcode sticker on the label, so that the price is invisible to the customer. The sales staff will scan it with a reader and then inform the price to the interested customer. This is done so that the sales discussion & the purchasing decision does not revolve around the price.

Problems with present system

a) The staff has to scan the bar code with a reader and then get price and related information.

b) No way for the staff to monitor the number of interested customers that pick up and merely examine an item, without asking any information from any sales staff.

c) Customers who are interrupted by the sales staff while they examine an item disturbs them and they end up not only not buying that particular item, they may not visit the store itself again because of "intrusiveness" of the sales person. This is really expensive for the store.

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d) No way for sales staff to accompany shoppers to the dressing room and suggest other colors, styles, etc.

The RFID solution

Equip fixed RFID readers all over the store, including the trial rooms. The goods all are tagged with RFID tags. Sales staff have small handheld unobtrusive readers, also called as wands by some RFID vendors

A typical scenario:

A shopper casually walks into the store. She is glancing at interesting items and comes across a scarf (say costing $500—yes, it's a designer scarf, remember?) the fixed RFID reader located some distance away notices and records this interest. If the shopper calls out to a sales girl (equipped with a "wand") she can get all information about the scarf by waving her (magic?) wand. The wand reads the tag, connects wirelessly to the store database and displays information about the scarf on a large LCD screen somewhere nearby. This information is not only price, but design elements, the hidden meanings of the design, materials used, name of the designer, similar styles in other colors, etc. This encourages her to buy it.

If she would want to take the scarf to a dressing room (the trial room) she can carry it and wear it inside. The trial room reader senses this scarf and displays on another screen inside the room, similar designs of scarves, any other merchandise that can go along with it, and other such information, that may result in a profitable upsell.
Even if the shopper does not pick up the scarf but merely sees it or hovers near it, the reader can sense this. At the end of the month it can identify products that were picked up the most, hovered near but never picked up, picked up & tried, etc. A whole lot of consumer behavior data can now be gathered and analyzed and acted upon, to improve sales.

Advantages of the RFID solution

a) The sales staff have instant access to all item data with the wand.

b) The readers located around the store can identify shopping patterns (probably a more pleasant area of the store has more footfalls).

c) Customers can be upsold with additional items smoothly e.g. a matching necklace that goes along with the scarf?

d) Enormous amounts of customer behavioral data can be collected and acted upon.

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Future Scenario

Many higher end retail stores, could implement this system easily. Plus having high margins means that the ROI on such investments will be much higher and in a smaller timeframe. Designer clothes boutique stores, high end fashion accessories stores, leather handbags and accessories stores will be the implementers of this system in the coming few years.

Underground Sewers

In any modern city, there are hundreds of miles of underground sewers and other pipe networks. To ensure public health and sanitation, it is essential that these drain pipes and tunnels are checked on a regular basis, to ensure that there are no leaks or ingress of potentially harmful biological waste in the surrounding area. This is essential to ensure that groundwater and other underground resources are not polluted.

Problems in present system

a) Workers manually do the checking, by entering into manholes. They find it difficult to carry anything that they can record their observations on. They have to come outside and fill up forms, which are then passed on to repair crews.

b) There is no way that a supervisor can be sure that a worker has done his job. There is no record of him having actually entered the sewer. There is just a paper record which the worker himself creates. The sewer being not exactly a pleasant place to enter, makes it even more likely that the worker may not actually enter a sewer but only make a dummy paper record of entry.

The RFID solution

RFID active tags can be embedded inside the sewer pipes at particular locations. The sewer workers enter the pipes and do their inspection. Their observations are recorded by them by means of a small handheld RFID reader (which also has writing capability).The observations can be formatted in simple Yes/No forms. The form data is then downloaded into the tag by the RFID reader. Thus the observations are available at site, inside the sewer or pipe. The worker then emails or sends these observations wirelessly to the necessary office to take action or to merely record the good state of the pipes. Now if any supervisor or higher level authority wants to cross check the inspections, they can carry their own readers and interrogate the tags inside the sewers, to know whether the workmen had actually visited the location.

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Advantages of the RFID system

The experience of municipal organizations that have implemented this system has been positive. To summarize

a) The RFID system implementation has resulted in the sewer inspection system becoming very efficient. There are also now less chances of mis-reporting a faulty pipe (by way of recording the wrong number).

b) It also frees the workers from juggling sheaves of papers while doing their work, leading to more time available for the “real work” of cleaning the sewer rather than spending time on creating records.

Future Scenarios

This system is likely to be adopted by many other city & local government authorities as an effective way to monitor their sewer systems.

Vehicle identification

In large multistoried office blocks and similar buildings, typically a large number of cars are allowed access everyday to the underground parking lots. The building management company allots some kind of stickers or IDs to cars which are authorized entry. Security personnel near the entry check these before allowing access.

Problems in the present system:

a) A typical parking access pass is a windshield sticker that shows the times at which access is to be allowed, to which lot & valid upto a certain date. The sticker can get peeled off, smudged, defaced due to rain or bleached due to sunshine.

b) During the morning rush hour, it takes a long time to gain access to the parking lots, because security personnel will painstakingly check the access pass and then decide whether to allow entry or not. Meanwhile angry drivers behind start honking.

c) The security guard will then manually note down in a diary or make a data entry regarding the vehicle, date and time of entry and exit. This requires a person manning a booth in addition to the one standing outside, who checks the sticker passes. In case any data is to be retrieved later on, it becomes time consuming.

d) Stickers can be easily forged or tampered and pass validity "extended" unauthorizedly. This can even lead to a security problem as malicious persons can enter on the basis of forged passes and carry out some undesirable events.

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e) The entire security system depends on the honesty & integrity of the person manning the gate. Not a very comfortable situation for any building owner.

The RFID solution

An RFID tag (UHF with a long range) is affixed to the underside of a car that is to be allowed entry. An antenna positioned some distance away senses an approaching vehicle, sends data to a central server based system which decides if the vehicle is authorized and opens the gates. A record is also automatically made which enters date & time of entry or exit. There is no "booth" based security. A single security guard merely observes that the system is working physically and telephones in case of any mechanical problems like gate not opening, etc.

Additionally a display can be provided near the gate, which shows information about the car, its pass validity, name of driver/owner, etc just as a verification for the security guard, to double check the system operation, as well as to detect if any passes were swapped. For example if a Cadillac approaches and the display shows the car to be a "Mercedes", then obviously the tags of the Mercedes have been refitted (unauthorizedly) into the Cadillac. The guard can watch out for these things.

Advantages of the RFID based system

a) No possibility of tampering. The RFID tag number can be encrypted while communicating with the reader, if so desired. The number by itself is meaningless because it merely points to a record in a database, which contains all the details about the vehicle, date upto which access is to be allowed, owner, etc.

b) Faster access during times of heavy traffic like in morning rush hour.

c) System working does not depend only on the integrity of the person manning the gate.

d) Less manpower is required to man the gates but more security is ensured.

Future Scenarios

The Jin Mao building in Shanghai downtown, which is 420 meters high, is the tallest building in China. It has 88 stories consisting of corporate offices, a five star hotel from the 53rd to the 87th floor, a rooftop restaurant and a sightseeing deck for tourists. More than 600 cars use the underground car park on any working day. A long range RFID system recognizes vehicles while they are approaching and opens the gates. Hence rush hour traffic snarls get avoided and security is also assured.
Similar vehicular access control will be implemented at most of the new buildings coming up in the major metropolitan cities.

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Waste management

Present Situation

In many countries today, the local authorities, or the contractors appointed by them, are responsible for collection of garbage from urban neighborhoods. Every urban neighborhood has a large garbage bin allocated to it. Residents or their domestic helps, typically carry their garbage to these collection bins. Alternatively, garbage collection personnel collect garbage door to door and then dump it in these large bins.
These large bins are then carried away by personnel traveling along with the garbage trucks. The truck will typically have a fixed route everyday. It will lift the large filled garbage bin, empty its contents into the truck and keep the empty bin again at the same place. There will be hundreds of such trucks along different routes everyday.

Problems with the present system

a) Tracking these trucks and the personnel who man them is a problem for the local authorities. There is no way to monitor that garbage has actually been collected everyday.

b) No way to verify the time taken to travel along every route, or to verify the time taken to collect say x number of bins of garbage every day.

c) No way to verify whether the staff appointed for the job are really busy or do only half the bins in a day that can be easily done.

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The RFID solution

Each waste bin or bucket has an RFID tag attached to it. Every garbage truck has an RFID reader attached to it.

When the waste bin is lifted and emptied into the truck, the truck reader reads the RFID tag and transmits this data to the wireless handheld in the truck driver's cabin. This data is encrypted and cannot be viewed by the staff. At the end of the route the data is transmitted to the central server, where any supervisor or manager can view it. This data will include garbage bin number, collected at what time & date, who was the garbage collector (assigned to the truck) & so on. This vastly improves the traceability of the trucks and allows the authorities to monitor & improve the productivity of this activity.

It makes the entire garbage collection function, very transparent.

Future Scenarios

In Europe, a municipality in Greece has already implemented such a system and more are likely to follow. The attractiveness of the system will make other local city councils and municipal authorities to implement these kinds of systems. It will improve governance, cleanliness and ultimately help the ecology.

The ROI is very good, given the returns are not just in X dollars, but also have environmental side benefits.

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Yard management

Present Situation

Container yards are massive areas where trucks, trailers and other large haul vehicles lug in containers, deposit them for transfer to other trucks or ships. Similarly they pick up containers offloaded from ships or other trucks. This is of course, not as simple to operate as it sounds. Some container yards easily measure 25 kilometers across having thousands of containers, either to be deposited or awaiting pick-up. Truck drivers are interested in picking up or depositing their containers in the shortest possible time. Even large amounts of staff, radio handsets, access to computer terminals and databases do not make this task easy.

The present system in many yards works like this. A trucker brings in his container, which is to be deposited into the yard. At the gate entrance, he gets a ticket which allows him to enter and deposit his container in an available slot. Most times, he would not be content to merely deposit his cargo and go back empty. To optimize his costs, he is also supposed to pick up another container from the same yard for hauling back. Locating this container, which needs to be picked up in a massive yard, in the middle of the night is not an easy task. First he has to find a parking slot for his truck, unload the container which he has brought in. Then he has to move around trying to locate the container which needs to be picked up, and then load it into his truck and move out.
Considering that there are at any given time, hundreds of truck drivers doing the same thing, the situation is nothing short of chaotic.

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The RFID solution:

The RFID solution is to go in for a RLTS (Real Time Location System). This involves installing a UHF system (operating at say 868 MHz). The UHF system consists of RFID tags of UHF type (long range tags), mounted on the containers themselves and a slew of powerful UHF readers, located around the perimeter of the yard. The readers are connected to a central computer database, which manages the system.

When a trucker brings in his container, the gatekeeper issues him an RFID tag, which he affixes to his container. He is also given a GPS receiver which he keeps with him inside the cabin. His truck is now tracked by the GPS and both his containers, the one to be deposited and the one to be picked up are visible to the system. Because now the computer system knows where the container to be picked up is located, it directs him to the correct bay. He is told to deposit his container in say Bay B01 and collect the container in bay C01. Since at any given time, the system has a motion picture view of what is happening where, there are very little chances of mistakes.

Advantages of the system

a) Drivers have no waiting time inside the yard.

b) The average cargo turnaround time reduces by at least 20%, which means that the handling capacity of the yard increases by 20% without adding any more bays or any physical expansion, involving buying more real estate. This of course can translate into millions for a Yard management company.

Almost zero chance of lost or misplaced containers, much better customer experience, serves a very big competitive advantage.

Future Scenarios

In future most container terminals and associated yards will implement some kind of an RFID system, similar to the one described here. Increasing pressures to improve security, speed up transportation while at the same time reduce costs will drive more yards to implement such systems.

CONCLUSION

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RFID is a technology which has finally come of age. As you have seen by now, it is not limited to just Wal-Mart or the Department of Defense (although it is precisely due to the mandates issued by these venerable organizations that RFID technology has received a boost today). RFID has myriad possibilities and uses and can be applied in more and more places today. But effective implementations of RFID require a good understanding of the technology, what it can do and what it cannot do. This can only be achieved by suitable training.

However, in our experience many organizations today use 18th century technology (classroom based training) to impart knowledge about 21st century technologies. This has to change if organizations are to achieve a good ROI on their RFID investments. They have to look beyond traditional classroom training.

The best and most cost effective way to learn RFID is by e-learning.

It allows organizations to rapidly train large numbers of their employees in this technology in a very cost effective and timely manner.

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If you would like to include your own application story in this please let us know, if it is interesting we will be sure to include it in our next edition.

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