Radio Frequency Identification

RFID, which is Radio Frequency Identification Device, is a technology intended to store and retrieve data using tags or in the early developments, transponders in a remote setting. The original idea is believed to be related to the birth of radar technology in 1922 (Landt/Catlin) since RFID if the combination of radio broadcast technology and radar. This combination was used during World War II by U.S. allies for identifying ally air craft, as to avoid friendly fire. This technology was called IFF, otherwise known as Identify Friend or Foe, and was invented in the United Kingdom in 1939. IFF used transponders to bounce radio waves to aiming devices on the ground, or to a ship’s deck. (Gnissios)

Other implementations have been made with this technology, such as preventing theft, gaining entrance into buildings, tracking library books, and ‘tagging’ humans with important information. (Landt/Catlin) Seems easy and convenient doesn’t it? You could look at it that way, but here’s something else you might want to take into account; what are the security risks that come with this technology? There are no set standards on this kind of technology, which leaves RFID’s development up in the air when it comes to what exactly it can and can’t do. The industry is also very immature. Radio frequency identification chips also cost a lot to make, they are extremely fragile, and they can be victim to interference. (Gnissios) There are also the medical issues that can arise when you implant an RFID chip in a human body. Any person could have an allergic reaction to the chip and infections can occur. When a doctor actually
implants this technology into your arm, it could be done improperly. (Microchip implant (human)) In this paper, our goal is to educate you about what RFID actually is, how it is/could be implemented, where it started way back when, and where it is today.

As you have read in the first few paragraphs Radio Frequency Identification has been around for decades, although the first patent with RFID terminology was granted to Charles Walton in 1983 U.S. Patent 4,384,288. Many studies and works were done from the 1930’s through the 1950’s, however the advancements really took off starting in the 1960’s.

(Gnissios) R.F. Harrington was studying electromagnetic theory in the 1963-1964 papers he wrote. Inventors began coming up with implementations for RFID in 1963 where they started with radio frequency powered devices and communication using radar in 1969. Commercial use of RFID was coming about in the midst of this development with the creation of Sensormatic and Checkpoint. These companies, along with a company called Knogo, produced anti-theft technology using radio frequency tags. This technology was called electronic article surveillance, otherwise known as EAS, and was the first mass use of RFID.

The 1970’s was designated as the developmental decade for radio frequency technology. The International Bridge Turnpike and Tunnel Association alongside the United States Federal Highway Administration held a conference where it was stated that since no one had any sincere interest in developing a standard for radio frequency technology, in reference to using in the automobile industry, it would be permitted that a variety of systems could be developed.

Wide spread use of RFID was beginning to pop up in the 1980s. In the United States, the use was more centralized around transportation, personnel access, tracking inventory, and animals. Wal-Mart implemented the use of RFID tags in all their merchandise between 1987 and 1988. (Wikipedia) Europe had a different approach, focusing on industrial and business
applications while Italy, France, Spain, Portugal, and Norway already had RFID equipped toll roads. Those kinds of implementations had been going on for years. The United States finally began to use it on the Dallas Turnpike in 1989 and in Port Authority of New York and New Jersey through the Lincoln Tunnel around the same time. The Port Authority was working with systems that were built by G.E., Westinghouse, Phillips, and Glenayre before they made the advancement into actually using the technology.

As the 1990s rolled around, the use of electronic tolls, such as the ones that were used in Dallas and Port Authority, had become more of a regular thing. The first electronic tolling system that allowed drivers to pass through the collection area at highway speeds was developed in Oklahoma in 1991. The only fault of this development was that there was no form of enforcement of the rules for the tolls. An advancement was made on that issue in 1992 in Houston, Texas by the Harris County Toll Road Authority when they put in place the first combined toll collection and traffic management system. Even still, there were issues with the tolling systems in place. If there was one system in Oklahoma, it wasn’t compatible with the systems in Texas. When this issue came about, there were seven regional toll agencies that formed the EZ-Pass Interagency Group in 1990 to develop a regionally compatible electronic toll system. When people in Texas saw how successful this was becoming, they set in place TollTag on the North Dallas Tollway, a tag that could be placed on a car so that all they had to do was pass through and pay their tolls.

The use of radio frequency wasn’t limited to the use in the tolling system. They were also being used in the computer technology field. IBM, Micron, and Single Chip Systems were in the works to develop a single integrated circuit for regular CMOS circuits. Together they developed the first microwave Schottky diodes that were placed on those CMOS circuits. (Landt/Catlin)
With all of the advancements being made, there is no telling where we could be in the next decade. At this point in time, there are various implementations, such as RFID implants in humans, which are being tested, made, and used as we speak.

Radio frequency IDs are being used in the library system as we speak. Take the campus library, for example. We have a scanner gun that reads the barcodes from any library in the Kent Link or Ohio Link systems. The tag, or barcode, that is on the book holds the tracking, book, and location data. When we need to check in or check out an item from the library, we then use the scanner gun that picks up the data and puts it in our system. That is basically how RFID is being used in our library system. It may seem simple enough, but there is a more complex process for this all to come about.

Future use of RFID in libraries wouldn’t be possible without the tags, readers, check-in/check-out/sorting technology, self-service check out stations, and software that makes it all run smoothly. The tags need to be attached to every item and programmed with the necessary information. Any reader a library needs to be portable in order to make it easier to carry out everyday procedures such as the checking in/out of books. The check in/out and sorting stations also need to be designed and built. By using these stations, you can save time, and sometimes patience, with self-sorting machines. Eventually, self-service checkout stations are going to be widely implemented. Decisions need to be made about the security of these stations, fine/bill payment procedures, and, in general, the user friendliness of the system itself in order for them to be implemented. The newer systems come with universal software that converts the radio frequency to digital signal for the system to comprehend. Older versions of these systems need third party software in order for it to be able to communicate between book and system, or vice versa. (Gnissios)
Along with the use in the library system, RFID chips are being implanted in humans. One example of the implementations is as ‘bar tab’ tags in countries like Spain and the Netherlands. With this tags, people at these bars/clubs can avoid long waits in line and run tabs at the bar where the money is drawn directly from their checking account. (Ridder) Another use of these tags is in the medical industry. Since the Food and Drug Administration approved the implementation of RFID’s in humans, there are around 80 hospitals and over 200 doctors that are now using the system. These hospitals are equipped with readers that can access the information on their patient’s chips, like their medical history, if they are ill, injured, or unconscious, regardless of where they are. (Gilbert) Other uses for these chips include things like theft prevention for cars, collecting tolls without having to stop, ID tags for buildings, automating parking, controlling access into gated communities, making transactions at restaurants or clubs, and various other implementations. (Landt/Catlin) Alongside the very fast moving and improving industry of technology, there are still risks involved with RFID chips.

The RFID industry is still very immature. There are little, if any, standards set for the development of future radio frequency devices. With technology growing faster than we can think, radio frequency chips and readers are being improved upon as you read this paper. (Gnissios) The biggest privacy issue today is the fact that chips that are implanted into humans that carry their sensitive information, such as their medical records or tax information, can be modified, altered, completely switched, or just completely stolen from them without them even knowing about it. (Microchip implant (human))

Let’s not forget that these chips are still very expensive to create and that the cost is not expected to drop any time soon. Another downfall for RFID’s is the fact that they are tiny and
fragile. The way they are made now, they still have bumps or some part of the chip that sticks out. This makes the chip very vulnerable to damage.

The risk of interference looms around these chips as well. There are ways of ‘diffusing’ of these tags is as simple as wrapping the item with the tag in layers aluminum foil which makes the item undetectable. You can do the same thing with multiple items by lining a bag with layers aluminum foil. If you place two tags close together, you can disrupt the signal and make the chips un-readable. (Gnissios)

The medical risks that come with the implementation of radio frequency chips into a human are enough to make anyone leery about having one of these chips in their arm. Any patient could have a bad reaction to the parts of the chip due to allergies to the components or an infection can occur. Animal testing has been done with RFID chips. Those studies have concluded that rats injected with chips can develop subcutaneous sarcomas or malignant cancers around the implant site (Microchip implant (human)). There is a lot of skepticism when it comes to RFID chips. Since the industry is still in its early stages and there is few, if any, standards available for RFID, most people don’t know whether it will help, or hinder, them and/or their efforts.

The radio frequency industry, which is the technology capable of creating RFID, has come a long way since it’s beginning in the 1920s. (Gnissios) Various companies have come about with their own advancements in the industry such as Sensormatic, Checkpoint, and Knogo. Since 1973 when there was no real interest in developing a standard for RFID chips (Landt/Catlin), there have been many technological advances made in order to set RFID technology in place. Library systems (Gnissios), human implants (Gilbert), theft prevention, collecting tolls without stopping, gaining entrance into buildings, automated parking, gated
communities, and tracking goods are among the many uses RFID has been employed for. (Landt/Catlin) In any technology industry, there are advancements being made on a daily basis. It becomes difficult to stay on the leading edge of things. With RFID having no set standards, the technology itself can go anywhere, but with the lack of security, there isn’t much trust in the technology. In this world, you can never be completely sure of something that is invented today will still be up-to-date and current tomorrow.
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