



ARE INNOVATIONS AND INVENTIONS THE SAME?

Do you think these are the same?

Not at all. These are not the same. Do you have any arguments?

POOJANI YATATHAWALA, Engineering Undergraduate, University of Moratuwa

INVENTION is the formulation of new ideas for products or processes.

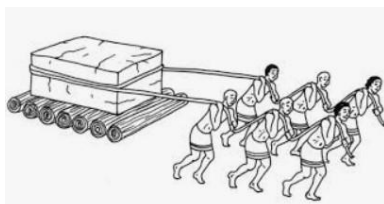
INNOVATION is the practical application of the invention to a marketable product or service.

INNOVATION = INVENTION × COMMERCIALIZATION

I think this equation helps you to get the clear difference between these two words. Invention is an idea, technology like something newest. We can also define it as a creation of a product or introduction of a process for the first time. In brief, invention is the formulation of new ideas for products or processes. Innovation is something new that generates value for the world, and it makes something faster, better, cheaper with time. It is about the use of the concept. In brief, innovation is the practical application of the invention to a marketable product or service. Let us get clear this difference using an example. Invention - Tim Berners-Lee invented the world wide web(internet). Innovation – Mark Zuckerberg used the internet to define social.

Now we are moving to one of the ancient greatest inventions.

Here we are going to discuss about wheels which were the sharp point in the historical innovative world. To be a great invention, it should be a solution for many problems not only one problem. So, the wheel is one of the greatest inventions that used in many applications.



How the wheel was invented (BC)



(Wheel design – 3500 BC)

The earliest wheels were used as potter's wheels. They were invented in Mesopotamia about 5,500 years ago. The wheelbarrow was a simple cart with a single wheel that was invented by the ancient Greeks.

Combined use of wheel and the axle is a device for transport was first seen around 3000 BC in the ancient civilization of Mesopotamia. The greatest importance of this is, the wheel can be used on farmers' carts. It contributes as a fast and efficient transportation method to move crops and other food items from farmlands into the cities.

The different ways Wheels were used in ancient times are listed as follows:

- Flywheel and pulleys – To lift heavy stones and rock which allows buildings of cities to rise up quickly and efficiently.
- Water wheel – This became a primary source for generating early forms of power.
- Rotating gears – This became the essential device in an endless variety of tools and machinery helping to spark the Industrial Revolution.

You know well how today's transportation is advanced, which it has begun from a wheel. Think how far it has gone, so wheels were a huge beginning of many innovations.



Now we are moving to one of the greatest innovations that changed the world.

The printing press is one of the greatest innovations that changed the worlds' history. Why is this considered as a great innovation? It allowed people to share a large amount of information quickly and in huge numbers.

Knowledge is power, as the saying goes, and the invention of the mechanical movable type printing press helped disseminate knowledge wider and faster than ever before.



(Gutenberg's printing press)

German goldsmith Johannes Gutenberg credited with inventing the printing press around 1436, although he was far from the first to

automate the book-printing process. How did the printing press change the world?

- A global news network was launched
- The Renaissance kicked into High Gear
- Martin Luther became the first best-selling author

Luther was not the first theologian to question the Church, but he was the first to widely publish his message. Other "heretics" saw their movements quickly quashed by Church authorities and the few copies of their writings were easily destroyed but the timing of Luther's crusade against the selling of indulgences coincided with an explosion of printing presses across Europe.

Printing powered the scientific revolution

For millennia, science was a largely solitary pursuit. Great mathematicians and natural philosophers were separated by geography, language, and the sloth-like pace of hand-written publishing. Not only were handwritten copies of scientific data expensive and hard to come by, but they were also prone to human error. With the newfound ability to publish and share scientific findings and experimental data with a wide audience, science took great leaps forward in the 16th and 17th centuries.

Fringe voices got a platform

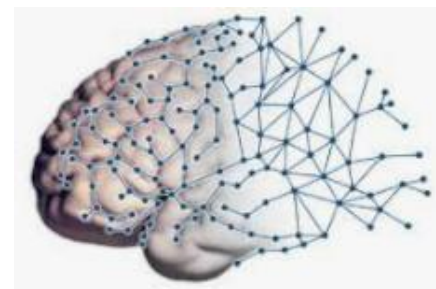
Radical voices who were silent in earlier systems published their radical myths, intentions.

I think you have an idea about how the printing press caused to change the world and why it is called a great innovation.

Now we are moving to one of the greatest present innovations and one of the hottest current areas of research

It is brain mapping.

The IEEE journal on Electromagnetic Brain Mapping states brain mapping is an attempt to identify the location of everything in the brain. An accurate map of the brain would immeasurably enhance our ability to understand how it works.

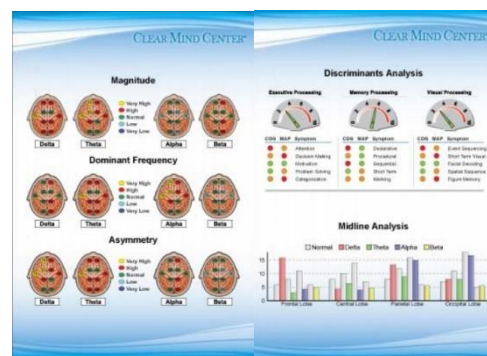


How does brain mapping work?

Using a cap placed on one patient's scalp, their software captures the electrical signals in the brain. This method is called

EEG (electroencephalogram). The results show brain wave patterns in different parts of the brain. The process takes only 5 minutes and then data is converted to a visual brain map report. By analyzing the report, we can get a clear idea about the brain and if there is some issue in the brain, we can identify it by brain map.

Here some several pages of the brain map report.



I hope it makes you excited; Do you like to get the brain map of your brain as well?



Now we are moving to one of the latest innovations, swallow-able electronic medical devices which could be the future of the medical devices

Battery-powered, swallowable cameras the size of the large pills has been on the market since 2001. These capsules are made to take pictures of the esophagus, small intestine, and colon as the capsules move through the gastrointestinal tract-offering a less invasive alternative to endoscopies and colonoscopies.



The IEEE journal on A Swallowable Smart Pill for Local Drug Delivery states, today's pill cameras are large and rigid, use batteries and made of toxic materials. Therefore, it is not good for health, and are designed to pass out from the body in a day or two via a digestive process. However, tomorrow's ingestible sensors need to do their job unnoticed, reside longer in the body, and disintegrate into benign materials. To achieve these goals, engineers need tough, biocompatible materials to make unobtrusive devices that are easy to swallow. And they need to power these devices with nontoxic, long-lasting batteries. Once fully developed these little medical devices will revolutionize how medical professionals diagnose and monitor some very serious diseases. This will be an incredibly powerful tool for things like cancer and intestinal disorders like environmental enteric dysfunction.

What would you think about this? It will be a good change if engineers could find that.

Here I have explained some greatest inventions and innovations using 4 examples. I suppose now you have enough idea and I hope you could catch many interesting points reading this article.

So, why do not you try to invent or innovate something? Yes, you can do that definitely, do not give up until you reach the victory.

AGRICULTURE AND GARDENING IN A NEW ATTRACTIVE WAY

ARUNADEE WIJESINGHA, Engineering Undergraduate, University of Moratuwa

A voice for plants?

Humanities first open-source CNC Farmbot

A Robot to pull off the weeds

There is a high risk of poisoning of vegetables and fruits in the modern market. Therefore, people tend to grow the vegetables and fruits they want at home. In the face of the current Covid 19 epidemic, more attention is being paid to cultivation. It would be more meaningful to cultivate with innovations that make it easier to work with new ideas instead of cultivating using conventional methods and tools. Furthermore, large-scale cultivation is being innovated according to new ideas. We have given you a valuable opportunity to present such an invention to the world.

Therefore, I decided to give some information about the gardening and agricultural innovations currently use in the world. I think it gives you an idea of the innovations related to gardening and agriculture. Then you can introduce a new technology to make the work easier as a 'Junior Inventor'.

Nut Harvester

This is used to collect nuts easily. It required minimum affect for the user.



Quick Drill

This is used to create a hole in the ground easily. It is coming in three various sizes. Size S to create a hole to the diameter 10 cm. size M for 15 cm diameter hole. Size L for a large hole with



20 cm diameter. There are marks on the drill to get understand how deep the hole is.



Paper Pot Transplanter

This equipment is designed to automatically plant by minimum human contribution. It is used to complete transplanting and pull the transplants.



MIMO

This is a robot, who cut grass easily. This robot has special blades to cut grasses. We can adjust cutting patterns by using a control system. This device has a recharging system.



Weed Puller

Removing weed is a simple but time-consuming procedure. The main problem is you have to work in an uncomfortable position. Weed puller pulls the weed to the ground and then takes off the weed.



Farmbot

This is Humanity's first open-source CNC farming machine. Farmbot plants seeds and then waters them precisely. Farmbot can grow a variety of crops all in the same area at the same time.



FYTA Beam

This is a smart plant sensor. That gives your plant a voice and it helps you look after your plant in a smart way. It can measure soil moisture, light intensity, air temperature, soil level around the plant. It connects plant with your smartphone. The FYTA app compares the measurement of beam with plant data base which notified you what is your plant want. That beam connects with your smartphone via Bluetooth. This app informs you about the condition of the plant. This beam is built-in solar cells, which support the battery and every piece of this sensor can be attached customized and separately recyclable.



Aerospring

This helps you to grow a garden full of nutrient foods in your around and create your own personal urban garden inside and outside of your home. It allows you a plant 27 plants in a small area. You can fit it anywhere in your home easily. It has a low-pressure aeroponic design that produces more foods per square meter. It also provides the roots with enough oxygen. So, you do not need any soil to grow plants. This consists of 20 gallons of a water reservoir that supplies water to the root of every plant

in your garden. It also has a triple-band LED technology that produces full-spectrum light. Aerospring is simple and easy to use.



Grovio

A device which will help you take care of your house plant with a grate case. This is a smart watering system. It monitors plant health in real-time, tracks moisture, air humidity, temperature, light intensity. It can take care of your plants for up to 45 days as it can detect when your plants need water. So, you can go about your business without worry about your plants. This is powered by 4 AA batteries. So, it can be moved anywhere. This can manage three plants simultaneously with its watering system.



Tertill

This is a solar-powered robot that removes weeds and makes your garden smarter and work easier. This detects the height of the plant. It cuts the weeds with a small nylon string on the bottom. This is a waterproof device. It features Bluetooth that allows it connects with an app. It works with solar power. So, every day it will charge itself from the sun.

Vertical Farming

Vertical farming is the practice of growing crops on vertically stacked layers. This is an innovation related to urban agriculture. Crops are grown indoors, under artificial conditions of light and temperature. It aims at higher productivity in smaller spaces. It uses soil-less methods such as hydroponics, aquaponics, aeroponics. Being indoors the crops are not subject to seasons and hence give high productivity year-round. Lettuces, tomatoes, green crops can be produced through this practice. Countries like Japan, Denmark, USA are taking up vertical farming. This method is not much famous in Sri Lanka.



These are some innovations related to gardening and agriculture. Furthermore, there are some innovations like a driverless tractor, 'Fruit Mould' system, levitating plant, oscillating sprinkler...etc. These innovations make our work easier. Now I think you have a good idea about innovations. So, you can find more information about these innovations. You can search for problems of gardening and agricultural system and find solutions for those problems in your own, new way. Then, it will become an invention automatically. Remember that, this is a good opportunity to show your talent to the world. Finally, I wish you could be the Junior Inventor of the Year.



CAN BATTERIES SOLVE THE ENERGY DEFICIENCY ISSUE IN THE FUTURE?

MUDITHA ADHIKARI, Engineering Undergraduate, University of Moratuwa

In the recent few years, many countries and companies have set their goals in adopting to renewable energy resources. Sweden, Costa Rica, Nicaragua, Scotland, Germany, Uruguay, Denmark, China, and USA are most leading countries in the process. All European countries and Australia also have set their goals in making a fixed percentage of their total energy need from renewable energy resources by the end of year 2030. Even Sri Lanka is making a good progress in adopting to renewable energies and the recently developed wind electricity farm in northeast coast is a proof for that.



Thambapavani Wind farm, Mannar Island

The largest wind farm in Sri Lanka and the first wind power plant to be owned by CEB.

It's important and possible to shift from our currently using energy resources like fossil fuels and nuclear to renewable energy resources and also it's considered necessary to shift for other energy resources emitting fossil fuels because according to estimations we are running out of all the fossil fuels by 2060 and they are threatening to our goals of a clean environment too. So, there are many countries, companies and organizations are working on developing more economically profitable, environmentally friendly, and easy to find energy resources. Nuclear energy, Wind energy and solar energy have taken the lead of the competition, though nuclear, as it's more dangerous and cost of maintenance, have become not very much popular.

While there are so many energy resources are found for use instead of fossil fuel, it's not easy to replace. When all the equipment and machines are made to work with fossil fuels they should be adapted to work with electricity. In that case there are

many companies and research labs are working on adapting electrified machines and equipment. With that, we can see the latest trend in transportation, the electrified vehicles. Electric cars and trains are becoming regular in use and recently one company discovered a Truck which can be functioned with electricity too.

It'd believed that most of the time an innovation pops-up they are following a problem. When there's a problem to be solved, it's where the innovative ideas are created. Finding a long-lasting energy resource and making perfect electrified vehicles, which are mentioned in the above paragraphs advert to one common problem. It's building better batteries. Researching in better batteries is considered most needed for the future. Why is that batteries are so much important? How do batteries relate in finding a long-lasting energy resource?



Battery farm in Australia

As mentioned above wind and solar has become most popular and safest energy resource in use. Though it raises the question, "Are they reliable?". Generating electricity is a real time process, which means it's not possible supplying electricity when power stations are not generating electricity. When it comes to wind and solar, they can't generate electricity continuously for a whole day or a whole year. When it's night generating solar power gets distracted and causing climate changes wind farms are not able to generate electricity regularly throughout the year. A solution can be presented like "So let's generate electricity using other resources when it's not possible to generate electricity from wind or solar power". Unfortunately, it's not possible because it's costly to spend money on other energy resources while using wind or solar. Anyway, why do we need wind and solar if we have other clean energy resources?

So, the ultimate solution has become batteries except for finding another energy resource which can full fill all our requirements. Some countries like the USA have already started using this technology. They are using hundreds of high-capacity batteries aligned in rows, which we can call battery farms, to



store the extra power generated and use them while it's not possible to generate electricity. One of these "Battery farms" are located in California, USA. California has a sunny weather most of the times of year and they make lots of electricity from their solar farms and store them and even distribute electricity to neighboring states. Though this is considered an ultimate solution, there are issues to be solved.

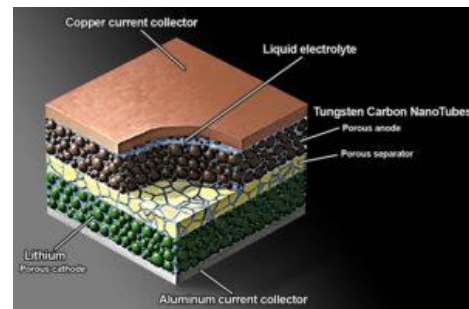
Another point which batteries come on to the stage is electrified vehicles. Electrified vehicles contain a high-capacity battery and all sorts of electrified equipment and systems can have these kinds of batteries to be used when there's a problem in the power supply. While the usage of batteries keeps rising companies and research labs are trying to increase the quality of these batteries. They are trying to increase the capacity, safety, durability, and the charging speed. Yet companies have faced another issue, Materials. Lithium-Ion batteries are the most used batteries and the element Li used in these batteries exists only 0.02% of the earth's crust according to estimates. So, battery companies are in need of another material to replace Li in the next few decades.

So, researches have invented few other types of batteries. The solid-state battery is one. In this type of batteries, a non-flammable molten salt, which has a low melting point is used instead of the liquid component of Li-iron battery, to reduce the fire risk of Li-Iron battery. Another is Sodium-sulfur battery, which has melted sodium and melted sulfur for electrodes while the electrolyte is solid. This battery is mostly usable in large scale energy storing batteries which they will be highly efficient at producing electricity and last longer. Flow battery is another battery type which can be used in large-scale stationary storage of wind and solar power. This battery consists of two tanks of liquids that feed into electrochemical cells. Still, many innovations are in the process.

Other than replacing the material battery companies are facing few other problems; Batteries are not easy to transport and store with their size, Batteries are over heating when it's charged too fast and they can be exploded, Batteries are having a fixed number of discharging cycles, performance of battery changes with temperature and after all when we are displacing the battery it's not environmentally friendly as the chemicals inside are quite toxic. So, innovations in battery technology have become an important and trending task at present. New kind of technologies are developed using nanotechnology and electro chemistry theories. Anyway, it's considerable the fact that better battery technologies are going to change the future.

According to the article "Battery Technologies that will change the future" published by the educational website Gray.com, followings are few new battery technologies which are under experimental at present.

Nanobolt Lithium Tungsten Batteries



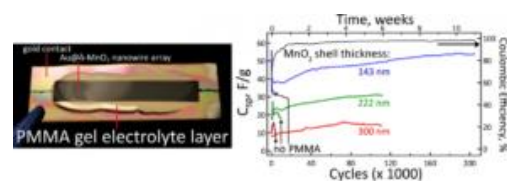
Nano technology is for sure, a technology that's going to change the future. This is made from nanotubes and that has made this battery small in size with a high battery capacity and it's charging very fast too.

Zinc Manganese Oxide Batteries



This was an unexpected discovery. Zinc and manganese have replaced places of lithium and iron. This battery is considered an alternative for both lithium-iron and lead-acid batteries (Can battery).

Gold Nanowire Gel Electrolyte Batteries



This battery is discovered to have 200,000 battery cycles without

losing its ability of holding a charge. Finally, a solution for a big problem in current rechargeable battery.

Tanktwo String Cell Batteries



The low charging process has always been a barrier to use electric vehicles since it takes hours to charge. This amazing technology is going to make it possible to charge the battery in few minutes.

These technologies will develop for a few more decades directing the world's power industry to a whole new dimension.



After all, I want to remain one question with you. Can these technologies make it possible it has electrified ships and electrified airplanes in the future? For now, electrified Airplanes and ships are not possible because they need so much power to transport even their own weight. Try searching and you will find an answer! It's quite attracting how technology is adopted to the new environments and one thing is clear that the world needs more inventors in Power and Energy to write the future of earth.

LATEST TRENDS ABOUT INVENTIONS

KESHIKA RATHNASIRI, Engineering Undergraduate, University of Moratuwa

An invention is a unique or novel device, method, composition or process. Inventions are developed by experiments, trials and errors. When inventing the incandescent light bulb, the greatest scientist Thomas Alva Edison had also failed 1000 times. Therefore, before an invention is introduced there will be number of failures, because those failures lead to make the invention more productive.

Human beings always try to find ways to make the life easier or to find a solution to a problem, and that leads them to make inventions. Even though the life is easier than before, we still need to make it much better. Therefore, many inventions occur in many fields and they will continue in future also.

Robotic Process Automation (RPA)



Robotic Process Automation is a technology that automates jobs. This is the use of software to automate business processes such as interpreting applications, processing transactions, dealing with data and also replying to emails. However, there is a disadvantage in this invention. That is, even though RPA creates new jobs, it also alters existing jobs. According to Forrester Research this will threaten the livelihood of 230 million or more knowledge workers.

5G

In present we are using 3G and 4G technologies. They have enabled us to browse the internet, use data driven services, increased bandwidths for streaming on Spotify or YouTube and so much more. In telecommunication 5G is the 5th generation technology standard for broadband cellular networks. As the What's a G article of 5G states, the main advantage is that they'll have greater bandwidth giving higher download speeds (eventually up to 10 gigabits per second).

FLYTE Levitating Light Bulb



The Beebom article of cool-awesome-inventions states, FLYTE Levitating Light Bulb was designed in Sweden. This operated with a combination of induction and magnetism, hovers by magnetic levitation and is powered through the air. This is made of oak, ash and walnut. FLYTE uses highly efficient LEDs that are rated at around 50000 hours, and it translates into 12 hours of usage a day for 11 long years.

Phree Electronic Sensor Pen

The Beebom article of cool-awesome-inventions states, this can jot down your thoughts anytime, anywhere and on almost anything. It can be used to sketch, annotate, write and etc. It is perfect in all those activities. This has a 3D optical tracking engine that measures its motions accurately and then sends the digital link to the connected Bluetooth device.

Li-Fi (Light Fidelity)



This is another network protocol that can replace conventional Wi-Fi systems. Wi-Fi uses radio waves, instead of that Li-Fi uses electromagnetic signals such as ultraviolet, infrared waves. The Beebom article of cool-awesome-inventions states, using LEDs which are dimmed below in



human visibility, Li-Fi compatible systems offer faster and more reliable connections than the Wi-Fi systems.

To conclude, this is a glimpse of all the inventions which are introduced to the world day by day. As it is stated above, the inventions will contribute to make the lives of human beings easier and more perfect.

ELECTRICITY CHANGES THE WORLD

P. M. TENISHA NIPUNI, Engineering Undergraduate, University of Moratuwa

“I believe that access to electricity and light can radically improve people, lives.”

Nowadays electricity has become the basic need in our day-to-day life. We cannot spend even an hour without electricity. Inventions of electricity change the world and lives have become more comfortable with the electrical applications. Although electricity helps to change the world have you ever noticed that how it is invented in the past?

IEEE journal on History of Electrical Engineering states that the first electrical machine which electrical charges were generated can be identified as the fundamental invention of static electricity. Electromagnetism discoveries started as a result of discovery of main static electricity laws and electrical currents. Leiden jar was a creation of P. Musschenbroek, which can generate powerful electrical discharge in a several hundred volts.



Leiden Jar

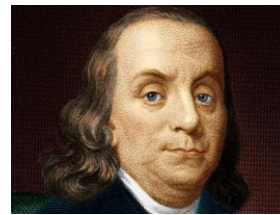
Benjamin Franklin the first famous American electrical researcher revealed that one form of very small particles, flowing through a conductor as an electrical fluid which over plus appears as a “glass” (positive electricity), and a deficit as a “resin” (negative electricity). Electrons are negatively charged, as a result current could be flowed from negative to positive terminals, but to honor Franklin’s contribution modern



Benjamin Franklin

textbooks which are related to electrical engineering declare that the current is flowing from positive to negative terminals.

Lighting electrical nature discovery was the major contribution of Franklin. He observed electrical sparks from the famous kite experiment. Franklin’s greatest idea was the proposal for lighting conductors and it was the first real electrical science application.



C. Coulomb

C. Coulomb converted electricity to the precise science by introducing a charge measure. He invented very precise instrument for small mechanical force measurement. He made a similar equation with Newton’s law of gravitation for two masses.

L. Galvani found the concept, “Animal electricity”. It reveals that the animal’s body generates new sort of electricity. He used frogs to do the experiment.

Several experiments brought Volta to create the first electrochemical cell. He invented the first air condenser or capacitor in the form of two metal discs separated by an air gap. He introduced new potential instrument named as electroscope or electrometer. Further, electric arc and decomposition of water into oxygen and Hydrogen were discovered by Volta’s followers.

Thomas A. Edison, who invented the “light bulb”, was able to make a difference in electric light by using different materials for the filament.

Website on 35 inventions that changed the world states that, Internet is one of the most significant inventions of electricity. Our day today life has changed and everything becomes more effective and comfortable as we can take the whole world in to our hands within few seconds. Every field in a country is connected to the internet. Nowadays, peoples’ lives become easier with e-learning, e-banking, e-channeling etc.



Further, alternating current or AC is another important invention in electricity which was discovered by Nikola Tesla. Compared to DC, AC provides safer environment and higher efficiency especially in long distance transmission. Invention of AC made a huge impact on people's lives hence, nowadays most of the electric equipment are created in a way that can function with AC power supply. Electric motor which converts electrical energy into mechanical energy makes huge evolutions in many industries. Likewise, gradually new inventions were introduced to the world. Digital cameras, computers, smart phones, electric cars are founded. Even at this moment new creations are being implemented by great scientists and engineers.