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"To Establish Omnipotent Learning Centre Meeting the Standards to Evolve as a Lighthouse for the Society."

Mission

- Setting up state-of-the-art infrastructure
- Instilling strong ethical practices and values
- Empowering through quality technical education
- Tuning the faculty to modern technology and establishing strong liaison with industry
- Developing the institute as a prominent center for Research and Development
- Establishing the institute to serve a Lighthouse for the society

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"We, Matoshri College of Engineering & Research Center are committed to practice a system of Quality Assurance that inculcates quality culture, aiming at quality initiation, sustenance and enhancement of quality comprehensively ultimately leading the institute as Center of Excellence."

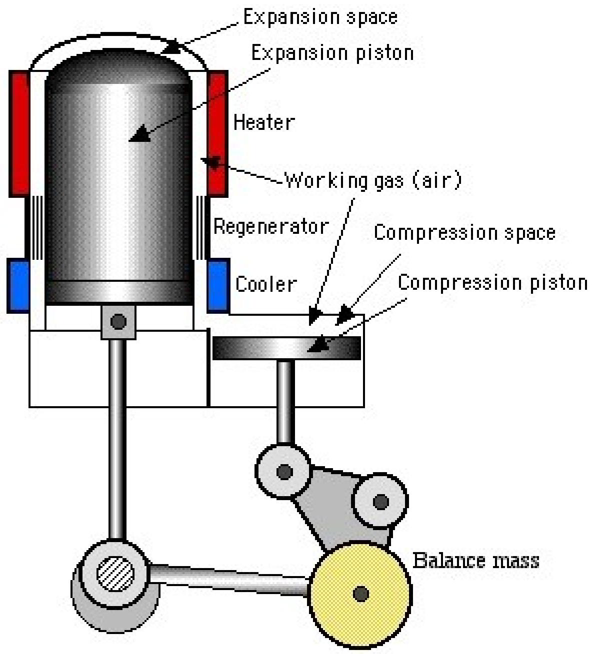
Pollution Less Engine

Ranjt Bodke

The quest of human beings to develop engines with high power, high torque, less vibration and most essentially with no pollution is on since the discovery and development of engine. Stirling engine is just one step forward towards the creation of a noise free and pollution less engine.

The Stirling engine is the engine, which uses a fixed amount of gas sealed inside a cylinder. The expansion and contraction of the gas, using heat from external source, creates the useful work. The main advantage of this engine is its capability to use any type of fuel and the emission of no exhaust gases.

Due to this pollution free and use of any type of fuel characteristics the Stirling engine shows a greater potential over any other type of engine existing today. To consolidate this claim an effort has been made to develop a working model of Stirling engine.



All of us including the lamest of laymen would have at one time or another experienced problems with our vehicles engine and most of the time after moaning and cursing finally in line with the universe and accepting our doom we would have coughed up the cash for repairs and parts and insistently taken old parts home, disregarding the fact that no descent human would have wanted them and during this exercise in existence it is doubtful that anybody would have chance to miss seeing a piston or two, this ubiquitous creatures that scurry up and down in an enclosed cylindrical space, getting their crowns slammed regularly and unceremoniously…eventually to be thrown aside and replaced by a marginally wider chap. Doubtful that any of us would be able to imagine modern travel without an internal combustion cycle. Hell if we ask our mechanic if he has ever seen a vehicle without any exhaust then he is probably going to refer to you to the nearest shrink.

So an engine without any exhaust gas is a mirage or it can be a reality? The answer for this is definitely yes. We can have an engine without any exhaust gas and that is what a Stirling engine is.

STIRLING ENGINE

The Stirling engine is a heat engine that is vastly different from an internal combustion engine. Stirling engines have two pistons that create a 90-degree phase angle and two different temperature spaces. The working gas in the engine is perfectly sealed, and doesn't go in and out to the atmosphere. The Stirling engine uses a Stirling cycle, which is unlike the cycles used in normal internal combustion engines.

The gas used inside Stirling engine never leaves the engine. There are no exhaust valves that vent high-pressure gases as in petrol or diesel engine, and there are no explosions taking place.

The Stirling cycle uses external heat source, which could be anything from gasoline to solar energy to heat produced by decaying plants. No combustion takes place inside cylinder of the engine.

TYPES OF STIRLING ENGINE

Stirling engines can be classified as:

• Two pistons type Stirling engine

• Displacer type Stirling engine.

Smart parking *Ankita Patil*

Smart parking is a niche field in which many companies are now investing heavily and the car parking industry has tremendous potential since the parking problems in developing and developed countries is increasing. Internet of things (KANG, 2011) is the next internet revolution which is going to trigger machine to machine communication. International Journal of u- and e- Service, Science and Technology Smart parking is a part of Internet of things wherein sensors will talk to remote devices over internet and share information using predefined communication protocols. This paper deals with the parking issues faced by people, their awareness about the new upcoming smart parking technology and their willingness to adapt to this new technology. Also, the paper throws light on some of the smart parking technologies currently used across the globe.

2. Parking Issues in India

India has more than 40 million vehicles. But the traffic on roads and parking space has been an area of concern in majority of Indian cities. In most of the cases, 40 per cent of the road space is used for parking rather than for traffic movement on a normal working day. With affordable cars launching in the market, almost every middle-class family owns a car which adds to the vehicular population in our country. If this trend is followed, no amount of space will be enough to accommodate stationary vehicles, which will lead to narrower lanes for movement of public transport. The present situation in some areas of Indian cities is such that the demand for parking is twice the supply. Shortage of parking hinders the free flow of traffic and can also lead to accidents. It also causes air pollution, traffic jam and driver frustration. Some of the reasons for parking problems are:

Low parking prices

- Weak implementation of parking regulations Number of vehicles is rising day by day

- The footpaths are not properly constructed so walking environment is not comfortable. Hence prosperous vehicle owners do not prefer parking their vehicles three or four meters away. Vehicle owners are not willing to pay the parking amount and often end up parking on the streets so building space for parking can seem like a waste. So to avoid all these problems, researchers recently have turned to applying technologies for efficient parking management(Joshi, Khan, & Motiwalla, 2012) These technologies have helped in solving the parking problems to a great extent. Different technologies are applied at different places according to the parking environment and the type of parking requirement in that area. The technologies used are as follows: 2. Parking Solutions Already Prevalent in India It is used for optimum utilisation of parking space by utilizing vertical space rather than horizontal space. The growing population and the increase in vehicles have made the plots expensive and hence the conventional parking has become non-feasible. Car ramps or car lifts also consume a lot of space therefore mechanized car parking systems prove to be feasible.

Multi-level car parking system (MLCPS) has a number of advantages over the conventional parking system. Some of the advantages of MLCPS are stated below.

2.1. Advantages:

Best use of Space

- It uses pallets and lifts for parking and retrieving cars. Therefore it eliminates the need of drive ways and ramps. This leads to optimum utilisation of space. Low construction cos t• Construction cost of MLCPS is very less. It is delivered and assembled on the site itself. The system is automatically operated hence the extra expense of parking such as structure building, security etc. are avoided.

Low working and maintenance cost

• Since MLCPS are mechanical systems, it needs less energy for its operation. Ventilation systems which are used for underground parking is not needed in this case. Cladding is selected to match the building's frontage.

Security of vehicle

• The parked cars in MLCPS are safe and cannot be accessed by anyone else. Also damage to the car is avoided which usually happens when parking is done through narrow drive ways.

Environment Friendly

• The greatest benefit of MLCPS is saving the ground space which is wasted in the case of conventional space parking. The saved open space can be used to plant trees or make other buildings. Advantage to driver

• Parking is made easier with MLCPS as the driver is not made to drive from the parking lot to find free parking space and do not have to park the car in the free parking lot(Sanngoen, Akihisa, & Takashi, 2012) [5]. Even retrieving the car from the parking space does not require the driver. All this saves a lot of time.

Benefit to architect

• MLCPS can be used for both public and private use. It is designed to accommodate any number or cars. It makes difference in designing and planning places.

Advantage to builder

• MLCPS uses the area and the volume of the parking space more efficiently. This leads to more parking of cars in the same given space. This causes more financial gains by the builders.

2.2. Limitations of MLCPS:

The vehicles of MLCPS on surrounding residential Blocks cause noise and air pollution. A pollutant such as motor oil leads to contamination of parking lots. The parking lot must be built in such a way that it effectively channel and collect runoff which would have otherwise become runoff.

Robotic surgery Hemant Wagh

Robotic surgery is a method to perform surgery using very small tools attached to a robotic arm. The surgeon controls the robotic arm with a computer.

Description

You will be given general anesthesia so that you are asleep and pain-free.

The surgeon sits at a computer station and directs the movements of a robot. Small surgical tools are attached to the robot's arms.

The surgeon makes small cuts to insert the instruments into your body.

A thin tube with a camera attached to the end of it (endoscope) allows the surgeon to view enlarged 3-D images of your body as the surgery is taking place.

The robot matches the doctor's hand movements to perform the procedure using the tiny instruments.

Why the Procedure is Performed

Robotic surgery is similar to laparoscopic surgery. It can be performed through smaller cuts than open surgery. The small, precise movements that are possible with this type of surgery give it some advantages over standard endoscopic techniques.

The surgeon can make small, precise movements using this method. This can allow the surgeon to do a procedure through a small cut that once could be done only with open surgery.

Once the robotic arm is placed in the abdomen, it is easier for the surgeon to use the surgical tools than with laparoscopic surgery through an endoscope.

The surgeon can also see the area where the surgery is performed more easily. This method lets the surgeon move in a more comfortable way, as well.

Robotic surgery can take longer to perform. This is due to the amount of time needed to set up the robot. Also, some hospitals may not have access to this method. However, it is becoming more common.

Robotic surgery may be used for a number of different procedures, including:

Coronary artery bypass

Cutting away cancer tissue from sensitive parts of the body such as blood vessels, nerves, or important body organs

- Gallbladder removal
- Hip replacement
- Hysterectomy
- Total or partial kidney removal
- Kidney transplant
- Mitral valve repair
- Pyeloplasty (surgery to correct ureteropelvic junction obstruction)
- Pyloroplasty
- Radical prostatectomy
- Radical cystectomy
- Tubal ligation

Robotic surgery cannot always be used or be the best method of surgery.

Risks

- The risks for any anesthesia and surgery include:
- Reactions to medicines
- Breathing problems
- Bleeding
- Infection

Robotic surgery has as many risks as open and laparoscopic surgery. However, the risks are different.

Before the Procedure

You cannot have any food or fluid for 8 hours before the surgery.

You may need to cleanse your bowels with an enema or laxative the day before surgery for some types of procedures.

Stop taking aspirin, blood thinners such as warfarin (Coumadin) or Plavix, anti-inflammatory medicines, vitamins, or other supplements 10 days before the procedure.

After the Procedure

You will be taken to a recovery room after the procedure. Depending on the type of surgery performed, you may have to stay in the hospital overnight or for a couple of days.

You should be able to walk within a day after the procedure. How soon you are active will depend on the surgery that was done.

Avoid heavy lifting or straining until your doctor gives you the OK. Your doctor may tell you not to drive for at least a week.

Outlook (Prognosis)

Surgical cuts are smaller than with traditional open surgery. Benefits include:

Faster recovery

Less pain and bleeding

Less risk for infection

Shorter hospital stay

Smaller scars

Alternative Names

Robot-assisted surgery; Robotic-assisted laparoscopic surgery; Laparoscopic surgery with robotic assistance

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Technosavior

What is robotic process automation?

Vikas Panwar

Robotic process automation (RPA) is a software technology that makes it easy to build, deploy, and manage software robots that emulate humans actions interacting with digital systems and software. Just like people, software robots can do things like understand what's on a screen, complete the right keystrokes, navigate systems, identify and extract data, and perform a wide range of defined actions. But software robots can do it faster and more consistently than people, without the need to get up and stretch or take a coffee break.

Industrial automation and robotics are the use of computers, control systems and information technology to handle industrial processes and machinery, replacing manual labour and improving efficiency, speed, quality and performance.

Automated industrial applications range from manufacturing process assembly lines to surgery and space research. Early automated systems focused on increasing productivity (as these systems do not need to rest like human employees), but this focus is now shifting to improved quality and flexibility in manufacturing and more. Modern automated systems are developing beyond mechanisation with the addition of artificial and machine learning.

However, automation and robotics are not the same thing:

Automation

Automation is the use of computer software, machines or other technology to carry out tasks that would otherwise be done by a human. There are several types of automation, which can include both virtual and physical tasks.

1. Software Automation

This is the automation of tasks usually performed by humans using computer programs. This area includes business process automation (BPA), using software to formalise and streamline business processes, robotic process automation (RPA), which uses 'software robots' to mimic humans using computer programs, and intelligent process automation (IPA), which involves the use of artificial intelligence to learn how people perform tasks using a computer program. The difference between BPA and RPA is subtle, with BPA being like replacing a human production line with an autonomous factory and RPA like adding a collaborative robot to work alongside the existing workforce.

2. Industrial Automation

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Robotics

This area of engineering uses multiple disciplines to design, build, program and use robots. Robots are programmable machines that use sensors and actuators to interact with the physical world and perform actions autonomously or semi-autonomously. Because they can be reprogrammed, robots are more flexible than single-function machines. Collaborative robots are designed to complete tasks in a similar manner to humans, while traditional industrial robots tend to complete tasks more efficiently than humans.

Automation and robotics have areas where they cross, such as the use of robots to automate physical tasks, as with car assembly lines. However, not all automation uses physical robots and not all areas of robotics are associated with automation.

An early form of industrial automation was the use of CNC (Computer Numerical Control) machines for high-precision aerospace manufacturing in the United States during the Second World War. Using the first industrial computing systems, the first CNC machines still required a high level of human input until they became more automated during the 1950s.

Modern industrial automation includes the use of data acquisition systems, distributed control systems, supervisory control and programmable logistics controllers. They are consistent and predictable, making them ideal for processing chemicals, pulp, paper, oil and gas or other raw materials. By adding Industry 4.0 capabilities to these systems, industrial automation can also include access to peripheral data to further optimise operations based on real-time data.

The Growth of Industrial Automation and Robotics

The growth of industrial automation and robotics came from 19th Century mechanised industry, where humans were called upon to operate increasingly complex machinery to deliver higher rates of productivity. As mechanisation advanced, the machine operators became increasingly peripheral to the operation and this notion was further advanced with industrial automation.

Industrial automation required even less human control for basic and repetitive tasks, which displaced some jobs but also created new opportunities related to the automation itself. This moved roles towards a white collar economy as nations such as Japan achieved highly roboticised electronic and automotive manufacture by the 1980s.

This parallel growth of industrial automation and robotics has continued with the advent of artificial intelligence, machine learning and robot vision. Today, it is not just manufacturing that can be automated but also programming and process organisation, leaving people free to focus on adding value through improved product designs.

Robots can be used in physical industrial automation, but are not required for virtual tasks and software-based applications.

Advantages of Industrial Automation

Industrial automation, with robots or without, offers a range of advantages:

1. Reduced Operating Costs

With no requirement for healthcare, paid leave, pension payments or other staff benefits and with no wages to pay, industrial automation is typically cheaper than employing people. While there can be maintenance costs, if managed correctly these should still be far less than staff-related costs for the same output or better.

2. Improved Productivity

Industrial automation allows plants to run 24 hours a day, 7 days a week with no time loss for staff handovers or holidays, improving the productivity of the plant.

3. Improved Quality

Industrial automation is highly repeatable, without the errors associated with human staff. Machinery will also not get tired, which can impact quality and productivity at certain times of a shift.

4. Highly Flexible

An automated system, including robots, can be programmed to take on a different task, offering greater flexibility than with humans, who may need training on a different task.

5. Improved Data Accuracy and Collection

Automated data collection is not just more reliable but it can also allow you to improve your data accuracy, offering the required facts to make decisions to reduce waste and improve processes.

6. Increased Safety

Using robots for hazardous roles or conditions will improve the safety at your facility when compared to using human employees.

Industrial automation allows more work to get done, cheaper and more effectively than with human employees. It also means that you do not need to seek skilled labour where a robot could be used instead.

Disadvantages of Industrial Automation

The primary disadvantage of industrial automation is the high costs associated with switching from a human to an automatic production line. There are also subsequent costs associated with retraining or hiring staff to handle the sophisticated equipment.

The Future of Automation and Robotics

Already worth billions of dollars each year, industrial automation and robotics-related services will keep growing as technology continues to advance.

As robot production has increased, so the related costs have reduced and this trend should continue as more emerging economies begin to look to robotics as a solution. As a consequence of this increased robot production, there has also been a rise in the availability of the required skills to design, install, operate and maintain them. In addition, the increased availability of software has reduced the associated engineering time and risk, while making robot programming much easier and cheaper.

As technology continues to advance, these trends should continue into the future with robotic systems able to collect data, monitor processes and troubleshoot any problems. Robots are already able to use sensors and other data points to monitor and adapt their movements in real time, mimicking the skills of a human craftsperson to improve a process and reduce rework or inspection requirements.

While robots will continue to be used to automate repetitive physical tasks, emerging technologies could allow robots to respond to voice commands as artificial intelligence allows them to cope with a broader sweep of tasks and adapt in response to changes in the working environment. This would see robots being used in areas such as agriculture, where the need to be able to find, assess and harvest produce has been difficult for automated systems. Robotic precision is another area that should see advances in the future, with the ability to complete more delicate tasks with improved coordination.

As robots advance, it will be possible to decide which tasks should be automated and which should be conducted by humans and, with advanced safety systems, robots will also be more regularly deployed to work alongside humans without potentially endangering them.

Automated systems are now advancing to be able to monitor and automatically adjust the speed of entire production lines to maximise output and minimise costs.

With all of these advances coming into play, an automation strategy will depend upon successfully deciding which areas to automate and at what level.

What is Industrial Automation?

Industrial automation is the use of information technologies and control systems like computers and robots to handle machines and physical or virtual processes instead of relying on human beings. Industrial automation is a step forward from mechanisation as part of industrial processes.

What is the Meaning of Industrial Robotics?

Industrial robotics is the use of a robot for manufacturing or other industrial process, including assembly, packing, labelling, painting, inspection, testing, welding, and more. The use of robots for these tasks should provide high endurance, precision and speed for the tasks.

What is the Difference between Robotics and Automation?

Although they are sometimes used interchangeably, robotics and automation are different things. Automation is the process of using technology to complete tasks otherwise performed by humans. These tasks can be either physical or virtual and can involve the use of robots to perform them. Robotics is the process of developing and using robots (specifically) for a particular function, which may or may not be automated.

Conclusion

While industrial automation and robotics are not the same thing, they often go hand-in-hand to improve productivity, quality and safety at low costs in a variety of industries.

With applications including manufacturing lines and precision surgery, the use of automation-enabled robotics continues to advance with the growth of Internet of Things (IoT) connectivity as more businesses explore the benefits of Industry 4.0.

However, just as robots do not need to be automated, so industrial automation does not just rely on physical robots. Industrial automation covers any aspect of an operation that can be done by a machine rather than a human, meaning that there are many virtual aspects to automation too.

Advances in industry have a history of causing concern among employees who fear that their jobs will be replaced by new technology. However, even as industrial automation takes the place of mundane, hazardous or repetitive tasks, it also opens up new specialisms in the design and maintenance of the automation systems themselves. This also allows staff to focus on more creative areas, such as product design.

Industrial automation and robotics looks set to continue growing and expanding into new regions, driving down the associated costs as new technologies emerge to provide smarter systems that can take data and react to environments in real time.

Electrical power industry standards development organizations (SDOs) and key interoperability standards Dr. Khule S. S.

There are several SDOs for electrical power industry worldwide. Additionally, several users groups and consortia such as the Utility Standards Board (USB) are working to provide input and guidance for the development and implementation of these standards. A brief coverage of the most active SDOs as well as users groups and consortia in Smart Grid-related issues and the key interoperability standards that have been handled by such organizations and users groups and consortia will be given in the following subsections.

1.1The International Electrotechnical Commission

The International Electrotechnical Commission (IEC) is considered as the leading global organization. It has undertaken the task of preparing and publishing international standards for all electrical, electronic, and related technologies, primarily for the electrical power industry. It has also undertaken some electrical-related work in industrial processes. The IEC Council is formed from the membership of national committees, one from each country. The international standards work is coordinated by the standards management boards (SMBs), which operate under the IEC Council. This standards work is executed by several technical councils (TCs), each targets specific area. For example, TC 57 aims at developing standards for communications and interoperability. It is also home to the working groups (WGs) which are developing many of the Smart Grid interoperability standards. These WGs consist of technical experts authorized by their national committee to participate in the two to four meetings per year, in addition to undertaking significant work between meetings.

IEC 61850 for substation automation, distributed generation that includes photovoltaics, wind power, and fuel cells, supervisory control and data acquisition (SCADA) communications, and distribution automation, plug-in hybrid electric vehicles (PHEV). IEC 61968 for distribution management and AMI back office interfaces IEC 61970 CIM for transmission and distribution abstract modeling IEC 62351 for security that focuses on IEC protocols, network and system management, and role-based access control IEC TC 13 deals with issues related to metering. It may combine its effort with TC 57 to develop communications for metering, specifically for AMI.

1.2 Institute of Electrical and Electronic Engineers (IEEE)

The methodology used by the IEEE for developing draft and, ultimately, final standards is similar to that of the IEC. However, in case of the IEEE the voting is conducted only by members of the working groups, that is, national committees are not involved. Additionally, the IEEE working groups have been engaged in the development of many other types of documents. This includes recommended practices, technical reports, conference papers, and other nonstandard-oriented documents.

Many standards have been developed by the IEEE. The most appropriate ones for communications and interoperability are listed below:

IEEE 802.3 (Ethernet)

IEEE 802.11 (Wi-Fi)

IEEE 802.15.1 (Bluetooth)

IEEE 802.15.4 (ZigBee)

IEEE 802.16 (WiMax)

Classification of power system communication according to their functional requirements Dr. R. G. Shrivastava

In recent years, capabilities of communication systems have developed from narrowband, low speed (range of 100 bit/s) to high-speed broadband ‘‘highways’’ (range of 100 Mbit/s) for all sorts of communications.

Power system communication systems may be classified, based on their functional requirements, into three categories as follows.

1. Real-time operational communication systems
2. Administrative operational communication systems
3. Administrative communication systems

Real-time operational communication systems

Real-time operational communication covers communication in real time that is necessary to maintain the operation of electric power system. This may be divided into (i) real-time operational data communication and (ii) real-time operational Real-time operational data communication As the name implies, real-time operational data communication is characterized by the fact that interaction normally takes place in real time, with critical time requirements. The requirements for this type of communication define the design of the technical solutions. This type of communication is used to transmit (a) protection signals and (b) power system control signals.

As far as protection signals are concerned, they must be transmitted within a very short time interval. This depends on the type of protection scheme under consideration. However, the maximum allowed time is in the range of 12–20 ms. This requirement is due to the fact that fault current usually cleared within approximately 100 ms.

However, power system control signals are mainly due to supervisory control systems such as supervisory control and data acquisition (SCADA) systems and energy management systems (EMS). Operational data such as measured signals and circuit breaker status signals are mainly transmitted using dedicated operational data networks. The measured values of power system control signals must arrive the control center no later than 15 s, while circuit breaker signals must arrive no later than 2 s after the occurrence of an event.

Real-time operational voice communication Real-time operational voice communication covers transmitting phone calls related to the operation of electric power system such as troubleshooting during abnormal conditions. Voice communication, which is normally conducted by operating staff such as those operating control centers, is considered as one of the most important tools, both during normal and abnormal operation conditions. Real-time operational voice communication also includes facsimile for switching sequence orders.

The means of using electronic mail (e-mail) for transmitting switching sequence orders is also considered.

Existing electric power system communication infrastructure and its limitation Mr. Shinde C. R.

Overview of current PSC systems and their characteristics The PSC infrastructure that has been in use, prior to contemplating Smart Grid concept, has evolved several decades ago to meet the needs of the regulated electric power industry. Its structure is based on what is called ''star topology'' whereby the functionality of PSC is based on communication between a control center and individual substations. This illustrates a typical example of existing PSC systems.

It shows two areas named as utility A and B. Each utility has (i) its own control center and (ii) remote terminal units (RTUs) installed at generation plants, transmission centers and distribution centers. The RTUs are linked, via PSC links, to SCADA systems and special protection schemes (SPSs), sometimes also called remedial action scheme (RAS).

The main functions of such PSC systems include (i) carrying control signals between various components of control systems that are necessary for the operation of such systems and (ii) carrying protection signals that are usually generated by protection devices following fault conditions to open appropriate circuit breakers necessary for isolating the fault.

Shortcomings of current PSC systems Several shortcomings associated with existing communication infrastructure

(ECI) have been identified as explained below:

Existing communication infrastructure such as that used by the control centers results in slow automatic control to balance load and generation. The manual control which is based on ECI used by operators to open and close circuit breakers is even slower. Examples of control systems used in power systems are the SCADA systems. These systems are built using star topology-based communication infrastructure, which conveys power system status information as well as commands back and forth within a period of several seconds.

Fast control systems including protection systems against short circuits, some voltage controls and special controls normally make decisions based on local measurements. Use of ECI by these control systems limits their ability to cope with grid-wide phenomena. For example, in thevent of a power outage, fast control systems such as the RAS protect lines against short-circuits and regulate line voltages, but they can neither detect nor correct rapidly occurring cascading failures in the power system. Therefore, it can be concluded that existing communication systems require complete updating in order to cater to the needs of the ever-growing power systems.

In this context, SPSs have been developed to meet some of the wide-area control needs that cannot be addressed by ECI. An SPS involves installing hardwired, point-to-point communication between two or more substations, which are in some cases separated by hundreds of miles. If an event or a measurement occurs in a certain location on the grid, installation of an SPS can help in triggering actions, such as breaker tripping at another location. However, these schemes cannot be relied on as a solution to the long-term control requirements of the grid.

Additionally, the limitations of existing communications infrastructure may also cause utilities' operators to be unaware of disturbances in neighboring control areas. Under such circumstances the operators tend to resolve the situation by communicating in a hit-or-miss fashion using telephones, which could lead to miss the opportunity to limit the spread of disturbance.

Low investment in transmission system while demand, including that for higher-quality power, keeps increasing. Introduction of deregulation, which led the introduction of regional transmission operator (RTO)-based operational structures, independent sellers and power producers, new requirements for ancillary services, increased separation of power producers and consumers (which results in increasing load on the transmission infrastructure), and many more participants involved in the system overall.

Continued increase of penetration of distributed generation that has led to several protection and control challenges. Increased concern about the security of the grid including malicious attacks on the grid.

Electrical Vehicle Advancement *Author: Mr. Aranke V. R.*

To begin simply, the abbreviation EV generally refers to an Electric Vehicle (EV), a vehicle that is fully electrified with no internal combustion engine (ICE) whatsoever. All of the power that is provided is done through the electric battery, powering one or more electric motors to provide propulsion and power to all of the other systems on the vehicle. These are also sometimes referred to as battery electric vehicles (BEVs), both terms are used interchangeably. However, the same abbreviation EV is also used to mean Electrified Vehicles (EVs), which refers to vehicles with all forms of electric power support including microhybrids, hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and battery electric vehicles (BEVs). For the purposes of this book, I will use EV to mean only electric vehicles. A PHEV is a vehicle that has both an electric propulsion system, generally ranging from 10 to about 40 miles of pure electric drive range, along with a combustion engine. This type of hybrid is often a parallel hybrid. In simplest terms, this means that the engine works in parallel with the electric motor. In this configuration, the electric motor is often "sandwiched" between the engine and the transmission. The benefit of the PHEV configuration is that it offers the full driving range that a comparable ICE vehicle would have—usually between 350 and 500 miles depending on the vehicle Similarly, the Extended Range Electric Vehicle (EREV), also referred to as a Range Extended Electric Vehicle (REEV) or sometimes as a Range Extender (REX), is considered a "series hybrid." In a series hybrid configuration, the electric motor(s) is(are) generally operated instead of the engine and the motors are not "in-line" with the engine, so you can use one or the other and sometimes both at the same time. In this configuration, the electric motors always power the vehicles propulsion; however, the power source switches between the electric battery and the ICE with the engine getting engaged and operating like a generator once the battery has reached a predefined minimum state of charge and keeping the battery voltage maintained at that preset level until the vehicle is recharged from the grid A common misconception of the PHEV and series hybrid configuration is that the engine will recharge the battery in this mode. This is not actually how they operate in the current designs. The engine will operate as a generator to power the electric motors but will only maintain the battery at its minimum state of charge until the vehicle can be plugged into the grid to recharge.

The term HEV refers to the most common configuration of electrified vehicles. These can range from the mild hybrid to a strong hybrid. A mild hybrid will have a smaller battery, usually less than one kilowatt hour (kWh), and will provide less electric power to the system, whereas a strong hybrid will have a slightly larger battery, often about 1.5 kWh, and will provide some minimal amount of electric propulsion in addition to powering some of the auxiliary systems. The term hybrid comes from the act of hybridizing of an ICE with a battery electric powered system, essentially creating a dual power system. In the hybrid car, the electric motor will generally provide power support throughout the operating cycle, but does not provide electric driving capability (mild hybrid) or at best only minimum electric drive capability (strong hybrid). During acceleration, the battery power will be added to that of the engine power to reduce the overall load on the engine, thereby improving fuel economy and reducing emissions.

Smart Grid interoperability standards — *Mr. R. C. Pawaskar*

The Smart Grid, as previously stated, is basically the resultant of the transformation of conventional electrical power system network to a fully automated network as a consequence of equipping it with distributed intelligence together with broadband communication and automated control systems. A key requirement of the Smart Grid is the interoperability among its various digitally based components which may be called ‘‘Cyber systems.’’ Additionally it has been recognized that To get from today’s electricity grid to tomorrow’s smart grid with interconnection and full two-way communications connection to distributed energy sources such as wind, solar, and plug-in electric vehicles requires an interoperability framework of protocols and standards.

The only way to achieve interoperability requirements among the various components of the Smart Grid is through the use of internationally recognized communication and interface standards. It is expected that Smart Grid standards will cover the entire grid. This means there is a need for two types of standards, these are: (i) interoperability standards (top down) and (ii) building block standards (bottom up) . However, this chapter will address the issues related to interoperability standards as applied to the Smart Grid. Interoperability defined by the IEEE as ‘‘the ability of two or more systems or components to exchange information and to use the information that has been exchanged.’’ According to this definition it is vitally important to note that a digitally based device should not only have the ability to exchange information but it must also have the ability to understand the exchanged information so that it can use it properly and efficiently.

In order to highlight the importance of developing appropriate standards that enable the interoperability among digitally based devices/systems manufactured by different vendors (and therefore making them talking to each other), it would be useful to develop an analogy between interoperability of people (talking to each other) who speak different languages and digitally based devices/systems manufactured by different vendors. In this context, example of digitally based systems includes computer systems, and example of digitally based devices includes intelligent electronic devices (IEDs).

A review of recent advances in the science and technology of seawater-mixed concrete"

Mr. H. M. Pawar

A review of the last 16 years of research (2005–2021) on seawater-mixed concrete is presented. A very significant amount of research, both fundamental and applied, has been performed on this topic, and there is worldwide interest in the use of seawater-mixed concrete to reduce concrete freshwater consumption. Seawater-mixed concrete should be used either for unreinforced concrete or for concrete using non-corrosive reinforcement (fiber reinforced polymer or stainless steel). The complex effects of seawater on hydration processes, concrete microstructure, and interactions with supplementary cementitious materials are relatively well understood. On the other hand, only limited information is available on the long-term durability of seawater-mixed concrete. Modeling of seawater-mixed concrete at a variety of scales appears to be nascent. A primary challenge with the large-scale adoption of seawater-mixed concrete remains the absence of codes and specifications that address the use of such material. As an increasing number of structures are constructed using seawater-mixed concrete and a greater understanding of long-term behavior is obtained, it is hoped that greater adoption for the right applications will eventually follow.

Seawater-mixed concrete is concrete in which freshwater used for mixing concrete is replaced with seawater. The justification for using seawater instead of freshwater is simple: the construction industry uses a massive amount of freshwater – 16.6 × 109 m3 of water is consumed annually for concrete production worldwide, which is ~18% of global annual industrial water consumption, and roughly equal to the annual domestic usage of 150 million residents of the US. In 2050, 75% of the water demand for concrete is likely to occur in regions that may experience water stress. Considering the vast availability of seawater and increasing shortfalls in freshwater as a natural resource, the potential for the use of seawater in concrete must not be ignored. The use of seawater-mixed concrete is likely to be most beneficial in desert locations (for example, the Middle East, which relies extensively on expensive desalination processes to produce freshwater), isolated islands, and in regions after the occurrence of natural disasters which lead to simultaneous reconstruction needs and freshwater shortfalls. The use of seawater-mixed concrete could be a solution for marine/offshore structures, where conventional concrete performs poorly; indeed some research shows that for marine conditions, seawater-mixed concrete outperforms the freshwater-alternative in terms of strength gain. Other wastewaters, and desalination brines in regions which rely heavily on desalination, could also be considered as freshwater replacements. A limited amount of research has been performed on cementations materials mixed with desalination brines and results appear to show performance similar to seawater-mixed and freshwater alternatives . Desalination brines are out of the scope of this work and are not discussed further. The idea of using seawater for concrete mixing (and curing) is certainly not new. It could be argued that the ancient Romans innovated seawater-mixed concrete, as the composition of Roman (marine) concrete is lime, pumice us volcanic ash, and zeolitic tuff, mixed with seawater.

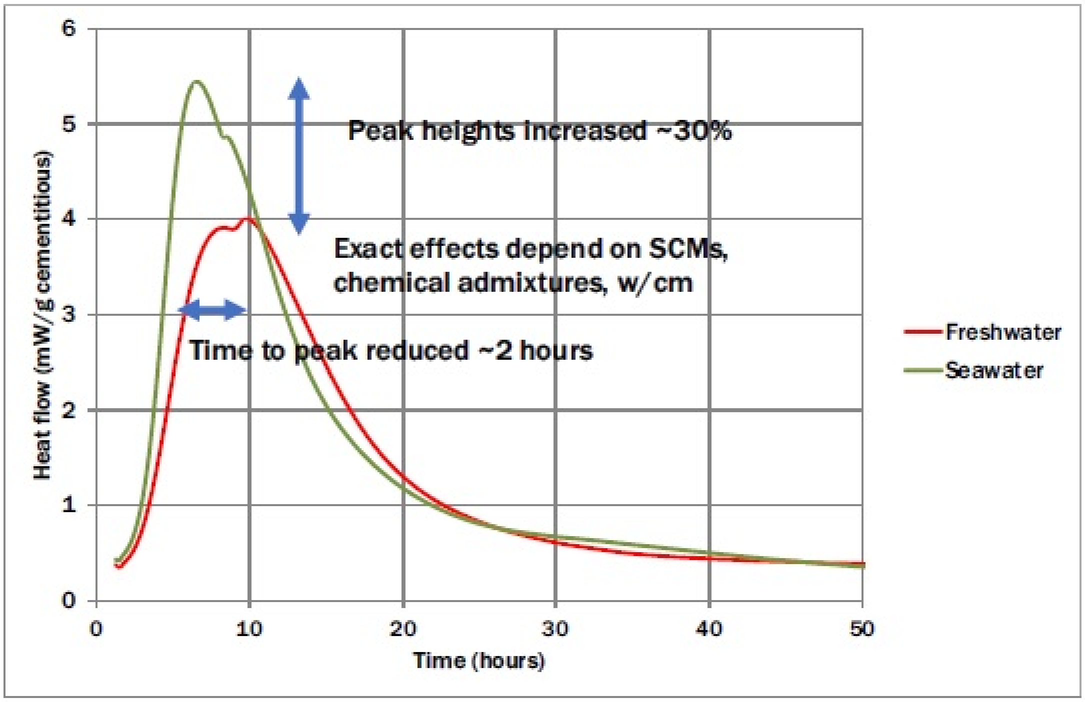


Fig. 1. Schematic of effects of seawater on heat flow of cementitious pastes (recreated using data published in [

A new method for studying wind engineering of bridges: Large-scale aero elastic model test in natural wind"

Ms. S.R.Joshi,

To overcome the limitations of the existing experimental methods (i.e., wind tunnel test and in-situ measurement) for wind engineering research of bridges, a new experimental method is proposed, i.e., studying the wind-resistant performance of bridges based on large-scale deck sectional models and full bridge aeroelastic models in natural wind. The representative wind field data are offered to briefly verify the feasibility of this experimental method.

The Outdoor Experimental Bases for Bridge Wind Engineering of Dalian University of Technology as well as three full bridge aeroelastic models and a large-size steel tower (for deck sectional model and cable aeroelastic model tests) are introduced, and the extensive possible research items are listed. The available sensors and instruments are outlined, which enable many kinds of measurements. The advantages and disadvantages of the newly proposed experimental method relative to the existing ones are commented for deepen the understanding.

Wind tunnel test and in-situ measurement are two fundamental experimental methods which have been widely used for wind engineering investigation of bridges. Based on deck sectional model tests and full bridge aeroelastic model tests in wind tunnel, both the academic and industrial fields have gained a lot of achievements and experience concerning the wind-resistant design of bridges. However, wind tunnel test is also criticized due to the following shortcomings: (1) the experimental tests is quite expensive due to the high investment of the wind tunnel laboratory, the requirements of various measurement facilities, and the large energy consumption during the test; (2) some similarity rules cannot be satisfied,

e.g., the Reynolds number; (3) it is difficult or even impossible to accurately simulate the characteristics of the natural wind field; (4) the wind tunnel wall and the supporting system inevitably disturb the flow field around the structure; (5) errors are inevitable concerning the detailed aerodynamic configurations; (6) it is difficult to simulate the geometrical, aerodynamic, and material nonlinearities; (7) for large-amplitude test, the blocking ratio may be too large and the model may be destroyed to further endanger the experimental facility.

With the successful constructions of more and more long-span flexible bridges, technologies for bridge health monitoring are continuously developing, and as a result, the in-situ measurement has been widely used for wind engineering investigations of bridges and great progresses have been achieved.

However, the current in-situ measurement has the following shortcomings: (1) the cost of the sensors are very high, and the installation of a large of amount of sensors is also a difficult task; (2) the bridge vibrates remarkably only in cases of strong typhoon wind, and hence useful measurement data are very limited; (3) it is almost impossible to adjust the structural parameters after the construction of a bridge, so that it is difficult to carry out the systematic parameter analyses; (4) in most cases, only the accelerations of the bridge decks and the cables can be obtained, while it is difficult to obtain the static aerodynamic responses; (5) it is almost impossible to collect the wind-induced internal forces of the structural components. (6) it is almost impossible to study the post-flutter/galloping behavior.

To overcome the abovementioned limitations of wind tunnel tests and in-situ measurements, a new experimental research method, i.e., studying the wind-resistant performance of bridges based on large-scale sectional models and full aeroelastic models in natural wind, is proposed by the bridge wind engineering research team in Dalian University of Technology (DUT). Similar experimental method was used to study the field wind data and building aerodynamics on the Wind Engineering

(a)

(b)

SE OF ECC BY PARTIAL REPLACING CEMENTWITH SLAG SAND ***Mrs. S. T.Borole***

ECC is developed by Dr.Victor .C. Li at the University of Michigan. ECC is made up from basic ingredients cement, silica sand, Poly Vinyl Alcohol (PVA) Fiber, superplasticizer. Fly ash, slag, silica fume is also used with cement to increase paste content.

Engineered Cementitious Composite (ECC) is application at construction sites. It should also check the possibility of partial replacement of cement and sand with slag sand obtained as waste product by the iron industries to developed in 2001 by Vector . C. Li to increase the ductility of the normal cement concrete (CC). It is class of High Performance Fiber Reinforced Cementitious Composite (HPFRCC) with high ductility 3-5%

Bendable concrete also known as Engineered Cementitious Composite (ECC) is class of High Performance Fiber Reinforced Cementitious Composite (HPFRCC) next to the DUCTAL. Investigate the properties of ECC with normal Cement Concrete (CC) & also the effect of partial replacement of cement by 10%, 20%, 30% by slag sand less than 500 micron. You can find out tested of split tensile strength. The splitting test is much used method to determine the tensile strength of concrete which greatly affect the extent & size of cracking in structure.

1.

Applying Systems Engineering to Survey Research

Mr. R.S.Mawal,

As systems engineering research matures, empirical data collection methods, such as surveys, are expected to be increasingly applied. Survey research has the potential to advance the maturity of systems engineering research. Applying systems engineering to survey research also has the potential to enhance survey research by offering a perspective that can improve the performance of various survey related activities with a case study survey are examined in the context of systems engineering technical and management processes, methods and tools. The current state of survey research literature is examined, and recommendations for how systems engineering can improve survey research are discussed. These recommendations include: (1) perform an in-depth analysis of the requirements of all of the stakeholders of the survey and (2) leverage the framework of risk and opportunity management offered by systems engineering to address survey data threats to validity. Researchers from all fields who use surveys to collect data can benefit from this complementary perspective and the unique recommendations presented in this paper.

As systems engineering matures as a field, there is a need to advance empirical research in systems engineering. Multiple empirical data collection methods can be used in systems engineering research including interviews, experiments and surveys. Surveys have distinct advantages for certain types of data collection. Surveys can obtain data from a significant number of respondents who are geographically dispersed at a reasonable cost. In recent years, there are a growing number of systems engineering research studies that employ surveys to collect data.

Examples of these include a study to understand the effects of the application of systems engineering best practices on project performance, a study to build a business case for systems engineering, a study to evaluate the importance of various lean enablers for systems engineering a study to determine the role of the product domain and the project domain in systems engineering management. In addition to surveys being used to advance systems engineering, systems engineering can also be used to advance survey research. Systems engineering offers a perspective that can be used to improve the best practices related to various survey research activities documented in the survey literature. Systems engineering also offers processes, methods and tools that can support effective survey research. While the applicability of systems engineering to derive survey questions has been explored [8], systems engineering has the potential to improve the effectiveness of the entire survey lifecycle.

The survey lifecycle encompasses processes from the time that a decision is made to use survey methods until the data from the survey has been thoroughly analyzed and results have been disseminated. The survey lifecycle includes determining the data items that need to be collected to address the research hypotheses, formulating questions to elicit the data items, reviewing and verifying the survey questions, implementing the survey (e.g., creating a questionnaire form to be mailed out, coding the survey online), verifying and validating the survey instrument, conducting the survey, managing and analyzing the survey data and ensuring that the necessary parties have the data and results from the survey.

This paper focuses on how to use systems engineering to organize and guide survey research. The experiences with a case study survey are examined in the context of systems engineering technical and management processes. Specifically, the following processes are discussed in the context of survey research: stakeholder requirements analysis, architecture design, implementation, validation, verification, project planning, risk and opportunity management, and information management. Methods and tools are also discussed in the context of these systems engineering processes. Specific recommendations are offered in the conclusions related to how systems engineering can improve survey research.

Applying Systems Engineering to Survey Research

Systems engineering provides a framework that can organize and guide creative problem solving from the definition of customer needs up through the corresponding solution. As a result, systems engineering is sometimes applied in novel ways to address novel problems. For example, researchers have applied systems engineering to computational biology problems [21] and to management problems for coastal maritime traffic . In a similar way, systems engineering can be applied to organize and guide a survey research project.

Systems engineering can be used to integrate existing survey research knowledge. Systems engineering can bring together various silos of expertise that are well understood and documented in the existing survey research methods literature (e.g., sampling, question writing, survey data analysis) in a way that has potential to increase the effectiveness of survey research. In addition to a general perspective, systems engineering offers specific processes, methods and tools that can be further leveraged to enhance survey research.

Systems engineering processes support the engineering of complex system elements in manmade systems. As a result, many organizations have defined and specified processes for engineering systems. Those who engineer systems can follow these processes to organize and guide their efforts to ensure that a system is delivered requirements. A few systems engineering processes are common to multiple systems engineering standards and are highly applicable to survey research. These processes include technical processes and management processes. This paper will examine stakeholder requirements analysis, architecture design, implementation, validation, verification, project planning, risk and opportunity management and information management in the context of survey research. For each of these processes, there are various methods and tools that are applied to satisfy the process objectives.

Management system for improving the efficiency of use water systems water supply

Mr. S. V. Pawar

This Management proposal to improve the efficient use of water resources in water supply systems. This is based on management tools, project management and is organized into three levels of planning (strategic, tactical and operational), following definitions of theories of strategic planning. This paper details these levels of planning, with a focus on strategic management, i.e., action plans at the strategic level, describing a methodology and detailing the main tasks that should be executed, as well as the main tools that can be used in each task, such as SWOT analysis and Balanced Scorecard.

Nowadays, water utilities of water supply systems in Brazil are facing a great challenge to save water, not only due to technical and economic reasons, i.e. to improve the performance of the whole system, but also because of the scarcity of water resources in many regions Brazil and the growing need for sustainable management systems. The water supply system in most Brazilian fund managers have water losses due to leaks and ruptures that result from the inevitable advanced age infrastructure, concepts and constructs deficient or inadequate operation and maintenance.

The development and implementation of effective water losses strategies and procedures is of the utmost importance for water utilities. The current paper aims at the presentation of a methodology for the improvement of the water resources use efficiency in water supply systems. This methodology is based on tools of strategic management, project management and is organized into three levels of planning (strategic, tactical and operational), following definitions of theories of strategic planning, associated with actions short, medium and long term. The paper details these levels of planning, with a focus on management, describing a methodology and detailing the main tasks that must be performed, as well as the key tools and technologies that can be used in each task to aid decision making, such as indicators performance, hydraulic simulators and optimization procedures.

Water Losses Control:

Programs to reduce and to control water losses as well as to rationalize the consumption of water and energy should be applied to the various stages of the supply, since the water intake, including the treatment, transport and storage, distribution and the final delivery to the consumer. Water input into the system has two main components

– authorized consumption and water losses (Fig. 1). Water losses are the difference between the system input volume and authorized consumption (measured or estimated). Losses have two components: real or physical losses that correspond to leaks and ruptures in transmission or distribution mains, in storage tanks and in service connections until the consumer meter (i.e., water that inadvertently leaves the system), and apparent losses include measurement errors (flow-meters), illegal connections and uncounted for uses (e.g., irrigation, street washing, fire fighting)

While apparent losses can be minimized by using more accurate measurement equipment, installing meters at uncounted for consumption sites and regularly surveying the system looking for illegal connections, real losses depend greatly on normal operating pressures, burst frequencies, infrastructure age, construction processes, and rehabilitation strategies and leakage reduction. Leakage control can be carried out by different types of actions

- Passive control that consists of the repair of leaks and ruptures only when they become visible.
- Active leakage control that consists of the establishment and monitoring of district metering areas and the implementation leak detection surveys; pressure management that presupposes the establishment of pressure zones by the redefinition of the network layout or the installation of PRV;
- Implementation of short-term and long-term rehabilitation programs.

Google lens

Vishwas Wadekar

Google Lens is an image recognition technology developed by Google, designed to bring up relevant information related to objects it identifies using visual analysis based on a neural network.[2] First announced during Google I/O 2017,[3] it was first provided as a standalone app, later being integrated into Android's standard camera app.

Features

When directing the phone's camera at an object, Google Lens will attempt to identify the object by reading barcodes, QR codes, labels and text, and show relevant search results, web pages, and information.[4] For example, when pointing the device's camera at a Wi-Fi label containing the network name and password, it will automatically connect to the scanned Wi-Fi network. Lens is also integrated with the Google Photos and Google Assistant apps.[5] The service is similar to Google Goggles, a previous app that functioned similarly but with less capability.[6][7] Lens uses more advanced deep learning routines in order to empower detection capabilities, similar to other apps like Bixby Vision (for Samsung devices released after 2016) and Image Analysis Toolset (available on Google Play); During Google I/O 2019, Google announced four new features. The software will be able to recognize and recommend items on a menu. It will have the ability to also calculate tips and split bills, show how to prepare dishes from a recipe and can use text-to-speech.[8]

Availability

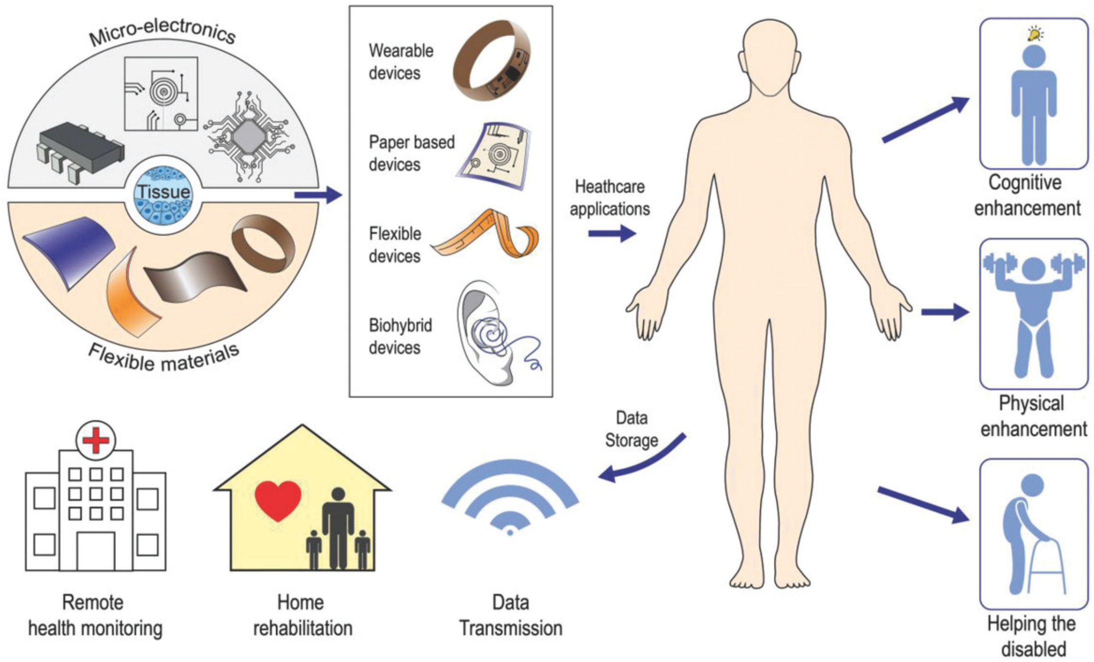
Google officially launched Google Lens on October 4, 2017, with app previews pre-installed into the Google Pixel 2 In November 2017, the feature began rolling out into the Google Assistant for Pixel and Pixel 2 phones.[A preview of Lens has also been implemented into the Google Photos app for Pixel phones. On March 5, 2018, Google officially released Google Lens to Google Photos on non-Pixel phones. Support for Lens in the iOS version of Google Photos was made on March 15, 2018.Beginning in May 2018, Google Lens was made available within Google Assistant on OnePlus devices as well as being integrated into camera apps of various Android phones. A standalone Google Lens app was made available on Google Play in June 2018. Device support is limited, although it is not clear which devices are not supported or why. It requires Android Marshmallow (6.0) or newer. On December 10, 2018, Google rolled out the Lens visual search feature to the Google app for iOS.[In 2022, Google Lens gradually replaced the reverse image search functionality of Google Images, first by replacing it in Google Chrome and later by making it officially available as a web application.

Blending Electronics with the Human Body

Maheshwar Soanawane

The field of cybernetics emerged in the early 1960s to describe the possible merging of inanimate materials with living organisms.1 The original definition of cybernetics has subsequently been expanded to also encompass technical healthcare monitors for the health-conscious consumer and implants for the sick and disabled. Indeed, throughout the course of history, the survival of mankind has relied on its ability to develop materials such as textiles, alloys, metals, and various types of rubbers, gums, and clays that could address our biological limitations in relation to a sustainable livelihood in the unfriendly and changing habitats of the Earth. In a broad sense, cybernetics therefore represents an expansion of the material-making industries of the past. However, in striking contrast to ordinary materials, cybernetic extensions are items that can integrate with the body to overcome the limitations of human biology in an even more daring manner compared to external clothing, tools, or machines for that matter. Therefore, cyborgs (short for "cybernetic organisms") could ultimately be the logical evolution of humans into a more adaptable, smarter, and stronger organism 1

These cybernetic extensions can monitor physiological signals, stimulate tissues, restore lost tissue functions, or even impose new superhuman abilities in their user. A great variety of cybernetic concepts are currently under development, some have already hit the healthcare market, while others are being carefully evaluated in laboratories all over the world.2-4 Classified broadly, these devices can be organized into three major categories: a) wearable healthcare monitors that can provide the user with individualized health information; b) prosthetics that can replace disabled organs or body parts; and c) implants that possess the ability to transcend human biology beyond its current limitations



AI is paving the way for the future of the electronics industry D.D.Dighe

The electronics industry has a long-standing reputation for innovation. From advancements in computer hardware to smartphones taking over the world by storm, the industry has repeatedly proved itself to be at the forefront of tech adoption. These tech-powered improvements have not only paved the path for disruption in electronics but also turned out to be transformation catalysts for all other industries as well.

Now with the emergence of new breakthrough technologies like IoT and AI, the electronics industry is getting a reboot. Experts believe that it is on the cusp of yet another major revolution and AI is playing a huge role. Incorporating AI is becoming high on the agenda of companies of all sizes here. The technology is transforming businesses across both industrial as well as consumer electronics segment and the results are overwhelming.

Electronics industry embraces AI

Executives in the industry have recognized the importance of AI and are embracing it with open arms. The same was quite evident during the Consumer Electronics Show (CES) 2019 conducted in January. From translator devices to baby monitors and televisions to vests, a number of exciting AI-powered electronics devices were showcased at the event.

Samsung announced that artificial intelligence capabilities would be a part of every device it manufacturers by 2020.However, companies are not just adding AI capabilities to their devices but using this futuristic technology in processors as well. AI-enabled electronics manufacturing is on the rise and industry leaders are definitely the front-runners here. Companies like Intel, Google, Apple, Samsung and many others have developed or are in the process of developing AI-powered processors and chips.

Areas where AI is proving useful for the electronics industry

The possibilities of using AI in electronics are endless and it will be interesting to see the various areas in which companies will incorporate AI in the near future. For now, we will be discussing the three areas where it has a major impact currently:

R&D

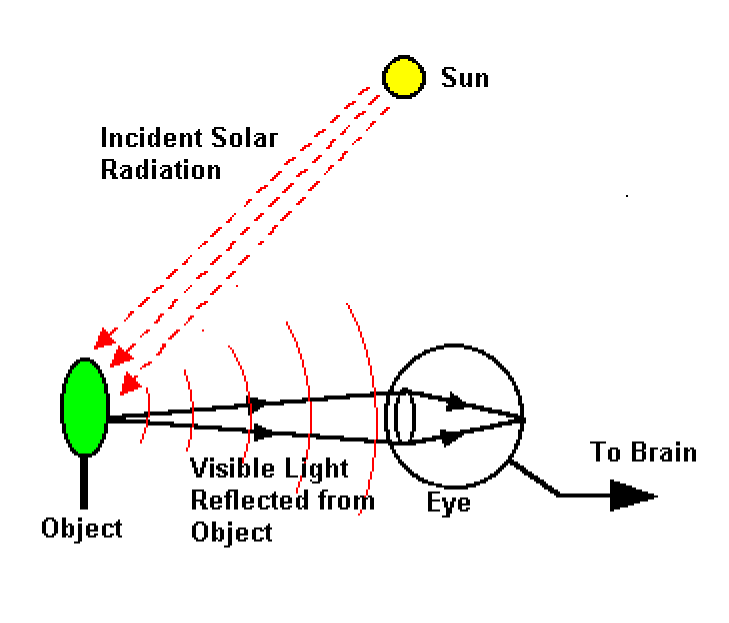
Leading electronics equipment manufacturers like Samsung, Mitsubishi, and Hitachi are using AI to carry out advanced research. These companies are making long-term investments in AI research to find commercial applications and to explore how this technology can help to improve their existing product range. The research focuses on machine vision, voice recognition, audio processing and other key areas related to AI. Through these R&D programs, organizations try to have a better understanding of the usage context, user behavior, their preference and needs.

Manufacturing

We have already discussed above, how companies are manufacturing transformative AI-powered electronics devices that benefit other industries. However, the use of AI is not just limited to this area of manufacturing. The industry is also using AI to reshape product development cycles, improve product design processes, reduce defects and deliver products faster to the market.

AI-enabled electronics manufacturing helps companies to create agile workflows for the rapid development of the next line of products. They combine and collect anonymized data from various sources like sensors attached to the products, customer usage patterns, current market scenario, audio and video files, technician comments, device manuals and more. This helps to generate key insights through which electronic companies are able to improve product quality, reduce costs and answer to market demands in a more efficient manner.

Visual System — *Rupali khule*

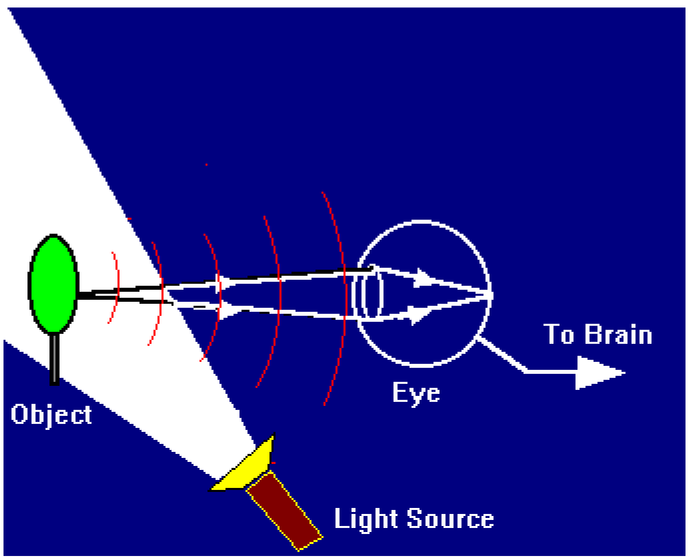


Passive Remote Sensing: The eyes passively senses the radiation reflected or emitted from the object. The sensing system depends on an external source of illumination.

The human visual system is an example of a remote sensing system in the general sense. The **sensors** in this example are the two types of photosensitive cells, known as the **cones** and the **rods**, at the retina of the eyes. The cones are responsible for colour vision. There are three types of cones, each being sensitive to one of the red, green, and blue regions of the visible spectrum. Thus, it is not coincidental that the modern computer display monitors make use of the same three primary colours to generate a multitude of colours for displaying colour images. The cones are insensitive under low light illumination condition, when their jobs are taken over by the rods. The rods are sensitive only to the total light intensity. Hence, everything appears in shades of grey when there is insufficient light.

As the objects/events being observed are located far away from the eyes, the information needs a carrier to travel from the object to the eyes. In this case, the **information carrier** is the visible light, a part of the electromagnetic spectrum. The objects **reflect/scatter** the ambient light falling onto them. Part of the scattered light is intercepted by the eyes, forming an **image** on the retina after passing through the optical system of the eyes. The signals generated at the retina are carried via the nerve fibres to the brain, the **central processing unit (CPU)** of the visual system. These signals are processed and interpreted at the brain, with the aid of previous experiences.

When operating in this mode, the visual system is an example of a "**Passive Remote Sensing**" system which depends on an external source of energy to operate. We all know that this system won't work in darkness. However, we can still see at night if we provide our own source of illumination by carrying a flashlight and shining the beam towards the object we want to observe. In this case, we are performing "**Active Remote Sensing**", by supplying our own source of energy for illuminating the objects.



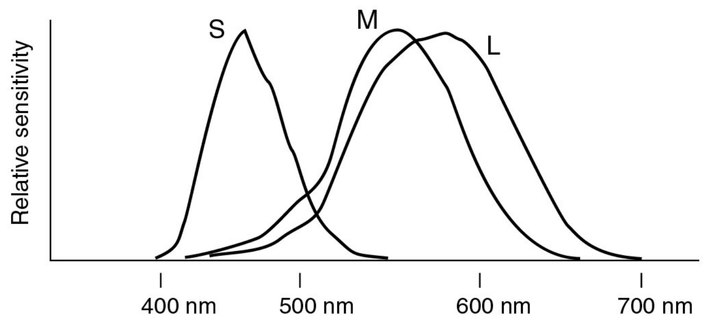
Active Remote Sensing: The sensing system provides its own source of illumination.

Sensing Violet: The Human Eye and Digital Cameras

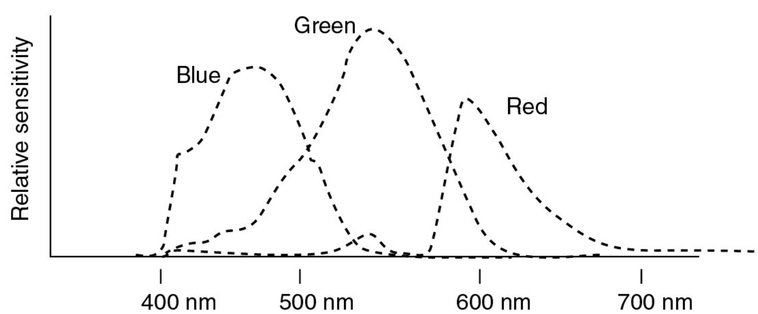
Madhuri Nimse

Both the human eye and digital cameras use sensors that are sensitive to blue, green, and red light, and yet we and the cameras properly sense light of other colors. Of course, what is happening is that the human and camera systems use the output from more than one sensor type to determine the wavelength of the light. What is surprising however, is the fact that humans distinguish colors in and beyond the blue region not with the the "blue" and adjacent "green" sensors, but with the "blue" and "red" sensors.

Visible light possesses wavelengths from 380 nm, violet, to about 700 nm, red, and contains the colors normally named violet, indigo, blue, green, yellow, orange, and red. The three types of color sensors in the human eye respond most strongly to blue, green, and yellow light as shown below, and they are usually referred to as the short, medium, and long, S, M, and L receptors.

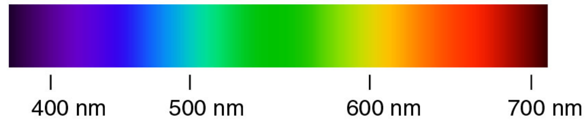


Sensitivities of the three human visual pigments



Sensitivities of the three filters in a Nikon D70

Colors of the spectrum



When yellow light strikes the retina, both the M and S cone cells are nearly equally stimulated and the ratio between the two signals determines the color perceived. This information is coded and sent to the brain on a channel called the red-green opponent channel. Red light more strongly stimulates the red-sensitive cone cells than the green-sensitive cone cells, and the brain processes this ratio as a shade of red. Colors at the other end of the spectrum similarly are coded by the ratio of the responses. This time the blue-predominantly responds, but the green-sensitive and red-sensitive cone cells also respond somewhat. A signal deriving from the blue-sensitive cone cells is sent to the brain on the yellow-blue opponent channel. In addition, a signal deriving from the red-sensitive cone cells is also sent, this time over the red-green opponent channel. The brain then interprets the combination of the two signals as violet, blue, or cyan.

To determine light's color in the violet-blue region of the spectrum either the red or green sensor would suffice in addition to the blue sensor if the shape of the response of the red or green sensor were different from that of the blue sensor. One would expect that the sensitivity of the red sensor to blue light would be considerably less than that of the green sensor. Hence, one would expect that the green sensor would be used. It turns out that in the blue region of the spectrum the sensitivities of the red and green sensors are so similar that it matters little which is used. Humans happen to use the red sensor. How do we know that humans use the red sensor? The simple demonstration is that individuals lacking red-sensitive cone cells, protanopes, in addition to being insensitive to red light, cannot distinguish violet, blue, or cyan.

Digital cameras distinguish colors in about the same was as the human eye. Most likely however, distinguishing colors at the blue end of the spectrum utilizes the blue and green sensors rather than the blue and red sensors used in humans. The ratio of the signals from the pixels covered with red, green, and blue filters are used to determine the color of the light. As in humans, it is the combination of the spectral sensitivities of the filters and the algorithm used to interpret the ratios of the signal strengths as colors that determine the camera's actual color response. Camera image files in the raw format contain the individual pixel responses and also a profile that tells the raw conversion program what colors various ratios correspond to. The presence of the profiles in the raw files allows different cameras to use color filters with different spectral responses. It is no surprise then, that the spectral responses of the filters used in digital cameras differ from the pigments in the human eye. This is shown in the figure above.

Although the human eye and digital cameras both use a three-color sensor, there is no fundamental reason why a digital camera could not use just two color filters. In order that all wavelengths of the spectrum be distinguishable by such a camera, one filter must have a sensitivity peak at about 400 nm with decreasing sensitivity to increasing wavelengths, all the way to about 650 nm. The other filter would need to be maximally sensitive at about 650 nm with decreasing sensitivity all the way out to 400 nm. It would probably also be necessary that wavelengths below 400 nm and above 700 nm be excluded by additional filters.

Ref: https://pages.jh.edu/rschlei1/Photographic/violet/violet.html

EAR sensors *Gunvant Sarode*

The human ears are an attractive location for bio-signal acquisition. Heart rate, respiratory rate, eye blink and eye motion signals and skin conductance, as well as the electrical activity from muscles and the brain can be recorded from the ear. Moreover, the ears provide a discreet and natural anchoring point for placing the necessary wearable hardware, thereby reducing the visibility of integrated devices. We define ear-centered sensing as monitoring physiological signals with sensors located in the ear canal, in the pinna, or around the ear. Ear-centered sensing allows data recording over extended periods of time in everyday situations with little disturbance for the users. The combination of physical measurements such as motion, temperature and moisture, and electrophysiological measurements, such as electroencephalography (EEG), electrocardiography (ECG), electromyography (EMG), electrooculography (EOG), and electrodermal activity (EDA), for example, integrated over long time periods, will help to gain a better understanding of psycho-physiological processes. Ear-centered sensing is therefore of interest for scientific, diagnostic and therapeutic purposes and we believe that it will play a significant role in future mobile health applications.

As the ear is an unconventional place for monitoring these physiological measures, a common challenge for ear-centered sensing is to gain a better understanding of the signals that are recorded at this location. The questions that need to be answered are: How does the signal (e.g. ECG, or EEG) acquired at the ear relate to the signal as acquired at the classical recording sites? Which signals are ear-centered systems sensitive to, which signals are lost? How can we reliably discriminate in real time signals from artifacts? And finally, how do we interpret data that is acquired over extended periods of time when we have little or no control over the recording environment?

For the sensing of physiological signals over extended periods of time dedicated sensor and amplifier technology is needed that is convenient to use, robust and reliable. People wearing these sensors should not be restricted in their activities. Hence, for long-term usage sensor and amplifier technology need to be unobtrusive in every aspect: the materials need to be biocompatible, adjust to the individual's anatomy and be comfortable to wear. They need to be sufficiently robust to allow for continued usage and self-fitting, and they need to be small and inconspicuous.

The electronic instrumentation, including bio-signal conditioners and amplifiers, analog-to-digital converters, means for signal processing and wireless transmission need to be sufficiently small and light-weight to be placed at the ear together with the sensors. The power supply has to be secured either by low-power electronics or by smart ways to recharge the battery, or even by harvesting body energy. For the tiny signal changes, as produced for example by brain activity amplifiers need to be sensitive enough to detect them while maintaining robust artifact rejection capabilities.

Industry 4

Datta Shingate

The Internet of Things (IoT) is not new – it has been impacting everything from how we exercise to how our cars operate for more than a decade. A newer phenomenon, one that has larger implications for IoT and industrial operations alike, is Industry 4.0 – the next evolution of smart manufacturing and digital technologies.

What is Industry 4.0?

The term "Industry 4.0" is used to signify the beginning of the fourth industrial revolution – the previous three being mechanical production, mass production, and then the digital revolution. It could be argued that Industry 4.0 is simply an amalgamation of the three previous eras in manufacturing, but Industry 4.0 is poised to be much more impactful than that.

Outlined in the book The Fourth Industrial Revolution by Professor Klaus Schwab, Industry 4.0 encompasses "new technologies that combine the physical, digital and biological worlds, impacting all disciplines, economies and industries. These technologies have great potential to continue to connect billions more people to the web and drastically improve the efficiency of business and organizations."

In its application and universal understanding of Industry 4.0, this term is most directly related to the world of manufacturing – you could even call it Manufacturing 4.0. In return, this industry is seeing growth and transformation unlike ever before. In its application to manufacturing, Industry 4.0 is: The growth of automation and data technologies powered by the internet of things (IoT), the cloud, advanced computers, robotics, and people. The seamless integration of software, equipment, and people increases the speed, reliability, and flow of information between all systems of a manufacturer.

Industry 4.0 Technologies

Industry 4.0 has made the smart factory reality, thanks in part to the widespread use of digital technologies in formerly manual processes. Connectivity, automation, and optimization are driving the Industry 4.0 digital transformation. But many technologies are working together to realize the full potential of the manufacturing 4.0 movement.

1 Industrial Internet of Things (IIoT)

IIoT is when interconnectivity and collaboration of data, machines, and people in the world of manufacturing. Essentially, it takes IoT – sensors, machines, and data all connected and interfacing seamlessly – and applies it to manufacturing. Every aspect of the manufacturing operation can be connected to the IIoT, and the data it creates can be leveraged into optimizing efficiencies across the manufacturing operation.

2 Automation

The ultimate goal of a connected factory is to maximize efficiency, therefore maximizing profits. To achieve that, automation must be adopted into some or all of the manufacturing processes. Automation, via robotics or AI, is made possible by the interconnectivity and communication that occurs across an Industry 4.0 optimized facility.

3 Artificial Intelligence

Artificial Intelligence and its subset of machine learning are practically a requirement for an Industry 4.0-enabled smart factory. The whole premise around this new industrial revolution is to take out manual processing, and AI is the primary tool to use in its place. AI can use the data generated from a connected factory to optimize machinery, reprogram workflows, and identify overall improvements that can be made to drive efficiencies and ultimately revenue.

4 Big Data & Analytics

Because every function of the manufacturing operation is being monitored and generating data, there are tons of data to sift through. However, big data analytics systems can utilize machine learning and AI technologies to quickly process data and give decision-makers the information they need to make improvements across an entire manufacturing operation.

5 The Cloud

Manufacturers don't have or want to use the massive amount of space required to physically store vast volumes of data created in an Industry 4.0 operation. This is what makes cloud storage and computing an absolute necessity and key cog in a connected factory. Cloud usage also allows for a single source of truth and data sharing across the company, at lightning speed. Lastly, cloud storage also allows for remote access and monitoring of all data and machine operating systems, giving great visibility into operations and efficiencies.

6 Cybersecurity

Because every touchpoint in the manufacturing operation is connected and digitized in Industry 4.0, there is an extra need for robust cybersecurity. Manufacturing machinery, computer systems, data analytics, the cloud, and any other system connected via IoT should be protected.

7 Simulations

Having the ability to forecast outcomes is one of the biggest game-changers in the age of Industry 4.0 and manufacturing. Before the digitization of the factory, changing over a product line and optimizing its speed and production was somewhat guesswork and always imperfect. With today's advanced simulation models powered by IoT data and AI, manufacturing operations can optimize machinery for their next product run, thereby saving time and money.

Industry 4.0 Outcomes

Industry 4.0 is having an international impact, in terms of connectivity across continents and the way it's transforming our global economies. Deloitte Insights reported that these new technologies helped to create 3.5 million new jobs between 2001 and 2015 in the United Kingdom alone.

These changes are helpful to understand on a wide-reaching scale, but how do they impact the individual manufacturer? Here are five of the biggest and most noteworthy benefits manufacturers can expect from Industry 4.0.

1 Optimized Processes

All of the Industry 4.0 connectivity – sensors, IoT, AI, etc. – services one primary purpose: optimizing manufacturing processes. Automation allows manufacturers to work faster, data analytics empowers leadership to make data-driven decisions to increase efficiency, predictive maintenance means less downtime for machines, and monitoring systems provide real-time yield optimization across the operation.

What does optimized processes and maximized efficiency actually mean to a manufacturer? In the case of Industry 4.0 and digital transformation, it translates to revenue increases and improved customer service. When manufacturers are able to get the most out of their production with sensor-monitored machines, all while giving personalized attention and fast service to customers via AI and field service, they can truly see the benefit of the connected factory.

2 Greater Asset Utilization

Industry 4.0 allows for greater flexibility across the manufacturing operation, which translates to better asset utilization and therefore a potential for revenue increases. Think of automation – autonomous mobile robots (AMR) can handle menial tasks such as product transportation, leaving skilled human workers to do more higher-value tasks.

3 Higher Labor Productivity

When employees feel more secure on the job, they can focus better and accomplish more tasks during the day. Worker safety is one of the biggest benefits of IoT solutions on the manufacturing floor – sensors on site and worn by workers are monitored constantly to ensure a safe and healthy work environment.

Industry 4.0 is also expanding the skills repertoire of many manufacturing workers. As new technologies come into the operation, workers are learning new skills that improve operational efficiency and their skillset. Think of cobots (collaborative robots) – people and robots working alongside each other in manufacturing workflows, maximizing efficiencies and revenues.

4 Supply Chain and Inventory

IoT-enables sensors and data analytics give manufacturers insight into the entire supply chain and production process. This level of visibility combined with AI and machine learning capabilities means that supply chain optimization can be achieved in real-time. Some are even calling it Supply Chain 4.0, defined as "the application of the Internet of Things, the use of advanced robotics, and the application of advanced analytics of big data in supply chain management: place sensors in everything, create networks everywhere, automate anything, and analyze everything to significantly improve performance and customer satisfaction."

5 After-Sales Services

The predictive analytics, virtual reality, and remote monitoring that are pillars of Industry 4.0 also translate to the consumer space after manufacturing. While this doesn't directly impact a manufacturer, if they create goods that are capable of IoT connectivity, they can drastically improve customer and field service offerings.

Top-notch customer service is a competitive differentiator for many companies, and connected equipment in field service is helping to improve the levels of customer satisfaction. With connected devices, manufacturers can monitor product performance, scheduling maintenance before an issue arises and therefore preventing any sort of customer dissatisfaction.

Role of IT in Agriculture

Swati Bhavasar

Agriculture is a major sector which is vital for the survival of modern man. Plants are the producers in the food chain, and without them, the life cycle would just not be possible. Agriculture is a wide field which requires the support of disciplines from other sectors for it to fully thrive. Such disciplines include,Economics,Management,and technology which play an integral part in the sector. In this article, I focus on technology, and specifically we narrow down on the information and communications technology which is essential for provision of information across the agricultural value chain; right from production to marketing.

What is information technology?

Information technology refers to the utilization of computers along with other telecommunication equipment for the storage, retrieval, transmission, and manipulation of data, among other tasks, which are aimed to improve the efficiency of different sectors. Among the sectors that utilize IT Is agriculture.

How does IT play a role in the Agricultural sector?

Well, many people wonder how information technology and agriculture are related, yet they are totally different disciplines. Agriculture has been there for several centuries, on the contrary, IT is a young discipline which was discovered some decades ago. However, IT plays a big role in the agricultural sector.

Some of the roles of Information technology in the agricultural sector include :

Improved productivity.

Farmers need information on latest varieties, changing weather patterns, crop production techniques and improved agronomic practices for them to produce. Information technology plays a vital role in ensuring the farmers get access to this information, regardless of their agro ecological location. Through IT, Farmers in Africa are able to read what farmers in other areas of the globe are doing. Through this gained knowledge, the farmers improve their farming skills thus improved farming which eventually result to high yields.

Community involvement .

There are several programs which are made possible by IT applications, and community involvement in agriculture can be increased as well. When a community adopts modern methods for agriculture, the production of local goods can be increased. There are some places where people greatly benefit from the land and their resources for agriculture, and with IT, there can be improved union in local farmers which can lead to their community's overall improved production that may lead to better income for everyone involved.

Good post-Harvest practices and Value addition of farm produce.

Most farmers after good crop husbandry, get a lot of crop yields after harvesting, However, few months later they incure losses due to poor storage. But this does not happen in some Parts of the globe, especially the developed countries which have good storage structures.Infornation technology has provided the avenue where farmers are able to see and learn about latest post-harvest handling and storage techniques used in other countries, thus they learn and also utilize them, this helps to reduce the losses of their crops.

Improved decision making by the farmer.

Through the use of information technology, It is easier to develop farm records and follow up on the daily events of the farm. This will enable the farmer to make the correct decisions when it comes to types of fertilizers' to be used, the variety of seeds to be planted, when to market his/her produce and how to employ the best farming techniques.

Improved efficiency and service delivery at the farm.

Crop data, Animal data or any other farm data can be generated and kept much easier with the use of information technology, than manual processes. Information technology has also been utilized in automated farm machines which are scheduled to carry out activities such as irrigation or spraying even in the absence of the farmer, thus it makes service delivery very effective.

Weather forecasting and climate smart farming.

The climate and weather play a vital role in farming. With the use of IT infrastructure, farmers are able to receive weather forecasts, and therefore they plan when to irrigate, or when to plant, and how much water should be used for irrigation. This plays a vital role in the agricultural production.

Remote sensing and GPS location.

This are very key in farming. The location of a farm is very important, as it dictates the varieties of seed to be used, the amount of irrigation to be used and above all the type of crop to be planted. With the use of IT, It is easier to locate a farm, even if it is miles away. This is made possible by the use of Information technology through the global positioning system (G.P.S)Which has also enabled professionals in the agricultural field to be able to classify different areas into different agro ecological zones

Conclusion.

It can therefore be concluded that information technology is an integral part of farming, thus it should be embraced fully, we need to move away from the local and traditional way of farming.IT integrated farming has the possibility to give higher yields as compared to the traditional farming we are used to.

Impact of Technology in Service Sector *Shital Wagh*

1. Services on easy access

With the introduction of technology in services eases the work and makes quick and reliable service to the customer. Automated work at every step saves a lot of time and human effort, as well as, enhances the overall customer experience. With the introduction of technology, a lot of services are now available at customers finger-tip.

As the digital transformation makes easy access to any information. Customers can look for any service just by searching on their smart phone with Internet service. As a result, you can get all the relevant results over the search and even save a lot of time.

2. Enhanced way to deliver services

After a period of time every person whether it is customer or seller requires some changes in daily work. Here comes the use of technology. It could upgrade the activities involved between the service user and provider both. With the technology adoption, it is appropriate to say that technology facilitates basic customer service functions like bill paying, seeking information, checking accounts records, tracking orders, etc. However, the introduction of automated voice response system has also improved the customer service in telecommunication sector. Likewise, almost in every sector the technology has been upgraded and changed a whole lot of delivery service as well.

3. Cordial Relationship with Customers

Public or Private sector companies are using technology greatly and trying hard to build a cordial relationship with their customers. Companies involved in goods distribution usually install inventory control terminals, order terminals, and other technological equipment at their customers' premises. This provides a great experience to the customer and supports the company in integrating a customer relationship.

Every company provides a variety of services and facilities for its customers to promote their business. However, with the help of technology the services can be availed by the customer at their door-step and without any delay or standing in a queue.

4. Global Reach of Services

As the introduction of technology in service industry, the global reach of customer has been increased enormously. The Internet is a wide network which takes no boundary and connects every single individual with the available services. Internet connectivity allows transfer of Information, Customer Service, and Global Transactions which allows to move across countries. Technology allows employees to work for any international company while sitting at their home place. The technology based service has expanded the customer living by many folds.

5. Expense Management

The quick availability of services resulted into the high expectation of customers, especially from some selected companies. Usually, now the customer looks for reasonable or cheap service but with good quality. However, with the reach of technology, it can replace less skilled employees from the front line service jobs. As a result, this reduces the cost of providing the service from the perspective of the company. In addition to this, the person can even search on the Internet about any disease in terms of the symptoms.

6. Great Quality of Service

Technology allows availability of customized services to the specific customer as per the requirement. This establishes a great customer relationship and develops a faith for the company and its services. The easy access of services and quality services makes customers more reliable over accessing services through technology instead of manual access.

Blockchain overview — *Punam Dholi*

Blockchain defined: Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding). Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved.

Why blockchain is important: Business runs on information. The faster it's received and the more accurate it is, the better. Blockchain is ideal for delivering that information because it provides immediate, shared and completely transparent information stored on an immutable ledger that can be accessed only by permissioned network members. A blockchain network can track orders, payments, accounts, production and much more. And because members share a single view of the truth, you can see all details of a transaction end to end, giving you greater confidence, as well as new efficiencies and opportunities.

Key elements of a blockchain

Distributed ledger technology

All network participants have access to the distributed ledger and its immutable record of transactions. With this shared ledger, transactions are recorded only once, eliminating the duplication of effort that's typical of traditional business networks.

Immutable records

No participant can change or tamper with a transaction after it’s been recorded to the shared ledger. If a transaction record includes an error, a new transaction must be added to reverse the error, and both transactions are then visible.

Smart contracts

To speed transactions, a set of rules — called a smart contract — is stored on the blockchain and executed automatically. A smart contract can define conditions for corporate bond transfers, include terms for travel insurance to be paid and much more.

How blockchain works

As each transaction occurs, it is recorded as a “block” of data

Those transactions show the movement of an asset that can be tangible (a product) or intangible (intellectual). The data block can record the information of your choice: who, what, when, where, how much and even the condition — such as the temperature of a food shipment.

Each block is connected to the ones before and after it

These blocks form a chain of data as an asset moves from place to place or ownership changes hands. The blocks confirm the exact time and sequence of transactions, and the blocks link securely together to prevent any block from being altered or a block being inserted between two existing blocks.

Transactions are blocked together in an irreversible chain: a blockchain

Each additional block strengthens the verification of the previous block and hence the entire blockchain. This renders the blockchain tamper-evident, delivering the key strength of immutability. This removes the possibility of tampering by a malicious actor — and builds a ledger of transactions you and other network members can trust.

dvanced computing is a broad term used to describe either a specific type of high-end computer and the processes undertaken on it, or a set of skills used on **personal computers**. Both meanings are quite different, and there is no strict definition of the phrase, so that what one person means when they say advanced computing might be very different than what another person says. Generally, if a course is offered in this subject it is referring to advanced computer skills, while an agency that promotes advanced computing is likely talking about high-end computing.

Advanced Computing

Pravin Aaandhale

Advanced computing can describe a specific set of skills used on personal computers.
High-performance computing, or HPC, is one meaning of advanced computing. In this sense, it refers to the use of supercomputers, or computer clusters functioning as a supercomputer, to undertake massive projects. Even though modern computers have a great deal of processing power, all but the most powerful still can take long periods of time to undertake the most complex functions. Generally, this type of computing is used for simulations, often in the field of engineering.

A local community college may offer an advanced computing class.
For example, an engineering group working on a new wing design might use advanced computing to simulate the fluid dynamics involved. With a strong enough simulation, they can therefore prototype new designs virtually, tweaking small changes until they find the ideal design, at which time they can actually start producing the product. Similarly, astrophysicists might use advanced computing to model something they believe takes place within stars. Or chemists and biologists might use advanced computer to compute new protein structures or map a genome.
A totally different use of this phrase refers to those computer skills that the majority of users don't have. Many skills that fall under this subject would not actually be considered advanced by high-level computer users, but courses offered as regional occupancy programs or colleges will often use the phrase anyway.
For example, the majority of computer users do only a few things with their computer: write documents, send email, listen to music, browse the web, and play with photos. Within each of these things, they likely only know how to do the bare minimum they need to in order to get the result they desire. Advanced computing would teach a broader range of skills, and would go into more depth with each.
A class offered at a local community college that teaches students how to use Photoshop, for example, might be referred to as an advanced computing class. Similarly, a class that goes into depth on how to get the most of the Windows Operating System might also refer to itself that way. Interestingly, much more advanced skill sets, such as programming, or large-scale network configuration, would rarely, if ever, be referred to as advanced computer usage, as users of these skills would likely use a more specific term. An advanced computer user might sometimes also be referred to as a *power user*, indicating that they get more power out of their machine.

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