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Autonomous things

Autonomous Things (AuT), or the **Internet of Autonomous Things (IoAT),** are devices that work on specific tasks autonomously without human interaction thanks to AI algorithms.

These devices include robotics, vehicles, drones, autonomous smart home devices and autonomous software.

Autonomous Things is about enhancing machines with sensors, AI and analytical capabilities so that machines make data based decisions and autonomously complete tasks.

Autonomous things, abbreviated AuT, or the Internet of autonomous things, abbreviated as IoAT, is an emerging term for the technological developments that are expected to bring computers into the physical environment as autonomous entities without human direction, freely moving and interacting with humans and other objects. The sophistication of the intelligence varies, but all autonomous things use AI to interact more naturally with their environments. Autonomous things exist across five types:

⇒ Robotics
⇒ Vehicles
⇒ Drones
⇒ Appliances
⇒ Agents

Those five types occupy four environments: Sea, land, air and digital. They all operate with varying degrees of capability, coordination and intelligence. For example, they can span a drone operated in the air with human-assistance to a farming robot operating completely autonomously in a field. This paints a broad picture of potential applications, and virtually every application, service and IoT object will incorporate some form of AI to automate or augment processes or human actions. Collaborative autonomous things such as drone swarms will increasingly drive the future of AI systems Explore the possibilities of AI-driven autonomous capabilities in any physical object in your organization or customer environment, but keep in mind these devices are best used for narrowly defined purposes.

P. Kishore
I M.Voc.(SD)

From the Editor-in-Chief's Desk

Editor-in-Chief
Dr. B.Dharmalingam
Professor & Director
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I am happy to present this issue of **ALU AISD SofTact** (Volume-4, Issue-1). This quarterly Magazine is a platform for our B.Voc and M.Voc Software Development Students to exhibit their technical writing skills. This issue is covered with current technology trends like, Cubinote, Key (X), World's Smallest Astronomy Camera and Bose Noise-Masking Sleepbuds, etc. Recently, we have organized a wo-day workshop on Opportunities in Digital Imaging Business in collaboration with UBCC of our University on 27th-28th Feb. 2019. I am also happy to appreciate our students' contribution to get Overall Championship in Inter-Departmental Sports Meet-2019 of our University.
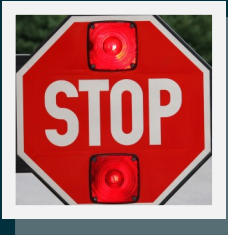
3-step method to stop making careless mistakes at work

1. Do a gut check. When you begin a task at work, you probably have a gut feeling about how important it is.

2. Write a checklist, go through it, then take a break to revisit your work. This part's super easy you just need a piece of scrap paper.

3. Ask yourself and your organization if you're working efficiently.

Triaxial Wireless Accelerometer

A Wireless Accelerometer is a device that converts motion or vibration into a voltage signal which is then transmitted to a receiver using a wireless protocol. Wireless accelerometers are used in industry to avoid the usage of cables which can be expensive or difficult to install.

Our Triaxial Wireless Accelerometer is a vibration sensor specially designed for vibration analysis with universal compatibility in mind. WiSER 3x is a wifi accelerometer that sends 3 axis vibration data + 1 additional channel simultaneously to any data collector on the market. Also, WiSER 3x is a wireless ultra-low noise accelerometer with 10 kHz bandwidth that exceeds the characteristics of most conventional accelerometers.

Key Features

- Compatible with any data collector device
- Full bandwidth 10kHz
- Long distance range up to 20m
- Stainless steel housing
- Operation temperature up to 185ºF (80ºC)
- Stand-by Mode

M. Nilani

Autonomous vehicles

Autonomous vehicles (AVs) use technology to partially or entirely replace the human driver in navigating a vehicle from an origin to a destination while avoiding road hazards and responding to traffic conditions. The Society of Automotive Engineers (SAE) has developed a widely-adopted classification system with six levels based on the level of human intervention.
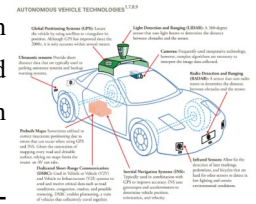

Metrics and Associated Impacts

Congestion: Congestion is predicted to decrease, reducing fuel consumption by 0-4%.

Eco-Driving: Eco-Driving, a set of practices that reduce fuel consumption, are predicted to reduce energy consumption by up to 20%.

Platooning: Platooning, a train of detached vehicles that collectively travel closely together, is expected to reduce energy consumption between 3-25% depending on the number of vehicles, their separation, and vehicle characteristics.

Vehicle Right-Sizing: Vehicle right-sizing has the potential to decrease energy consumption between 21-45%, though the full benefits are only likely when paired with a ride-sharing on-demand model.

Higher Highway Speeds: Increased highway speeds are likely due to improved safety, increasing fuel consumption by 7-30%.

Travel Cost Reduction: AVs are predicted to reduce the cost of travel due to decreased insurance cost and cost of time due to improvements in productivity and driving comfort.

Changed Mobility Services: Ride-sharing on-demand business models likely to utilize AVs due to the significant reduction of labor costs.

M. Angappan

Blockchain

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved.

Significance of Blockchain:
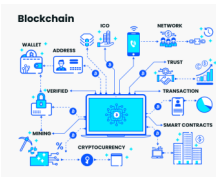
The faster information is received and the more accurate it is, the better. Blockchain is ideal for delivering that information because it provides immediate, shared, and observable information that is stored on an immutable ledger that only permissioned network members can access. A blockchain network 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, and new efficiencies and opportunities.

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. It can even record the condition, such as the temperature of a food shipment.

Each block is connected to the ones before and after it. 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. Rendering the blockchain tamper -evident, delivering the key strength of immutability. Removing the possibility of tampering by a malicious actor, and builds a ledger of transactions you and other network members can trust.

Immutable records. No participant can change or tamper with a transaction after it's been recorded to the shared ledger.

Smart contracts. To speed transactions, a set of rules that are called a smart contract is stored on the blockchain and run automatically.

Types of Blockchain networks:

There are several ways to build a blockchain network. They can be public, private, permissioned, or built by a consortium.
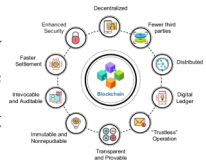
Public blockchain networks

A public blockchain is one that anyone can join and participate in, such as Bitcoin. Drawbacks might include the substantial computational power that is required, little or no privacy for transactions, and weak security. These are important considerations for enterprise use cases of blockchain.

Private Blockchain networks

A private blockchain network, similar to a public blockchain network, is a decentralized peer-to-peer network.

Permissioned Blockchain networks

Businesses who set up a private blockchain will generally set up a permissioned blockchain network. It is important to note that public blockchain networks can also be permissioned.

Consortium Blockchains

A consortium blockchain is ideal for business when all participants need to be permissioned and have a shared responsibility for the blockchain.

Blockchain security

Risk management systems for blockchain networks. When building an enterprise blockchain application, it's important to have a comprehensive security strategy that uses cybersecurity frameworks, assurance services, and best practices to reduce risks against attacks and fraud.

Gadgets

Lumen Metabolism Tracking Device

Connecting to an app, this clever device takes all the guesswork out of your nutrition. Lumen works by analyzing your breath. With a single breath, Lumen can tell if you're burning carbs or fat. In addition, the app prompts you to continue your progress. It'll give you tips such as doing a boot camp workout, adding some extra sleep into your day, and more.
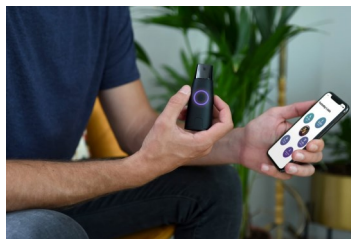
Ember 14 oz. Temperature Control Mug

This mug is a godsend to people who can't function without morning coffee (as in, a large segment of the population). All it does is use internal heating technology to keep your caffeinated beverage hot—for an hour. You can nurse coffee without repeated trips to the microwave, or steep tea to the ideal temperature (all controlled via a Bluetooth-connected app). And that's all it needs to do. While Ember debuted these mugs awhile back, the 14-ounce version is new to 2019, and extremely helpful to your morning routine.

DJI Smart Drone Controller

This device comes with a 5.5-inch 1080p screen that displays incredibly bright and clear images in any condition. In fact, you can even view your live feed in direct sunlight. Compatible with the DJI Mavic 2 and other drone aircraft, the Smart Controller's intuitive controls make handling a breeze. Additionally, the controller automatically switches between 2.4 and 5.8 GHz thanks to OcuSync 2.0 Full-HD video transmission technology.

Robot/coding toy

UBTech's robot is aimed at children aged eight and upwards and, once assembled, gives them the chance to learn basic coding – you can program the bot's movement and behaviour, including the colour of its LED horn.

Mani Prasath M
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Internet of Behaviors

The **Internet of Things** has played an explosive role in the technological revolution of today, which has led to the creation of smart systems and environments. Today individual activities of 40% of the global population are tracked digitally in order to understand and possibly influence our behavior. With billions of IoT devices currently deployed all over the world, there is enormous amount of data generated by these IoT devices. Much of this data can be used to understand human preferences and behavior, which paved the way for the **Internet of Behaviours (or Behavior)**.

Internet of Behavior can be defined as the collection and use of data to drive behaviors. Wearable technologies, individual online activities, and household electrical devices collect this data, which can provide valuable information about user behavior and interests. It is based on human psychology perspectives such as purchasing or following a specific online brand to track and interpret those behaviors using emerging technological innovations and developments in machine learning algorithms.

The Internet of Behaviors (IoB) is an area that seeks to understand how, when and why humans use technology to make purchasing decisions. IoB combines three fields of study: *behavioral science*, *edge analytics* and the *Internet of Things (IoT)*. Through this amalgamation, the system is able to predict human behavior, draw insights from available data, and even influence human behavior based on the activities and interests of persons collected from their interactions. Organizations that are looking to sell products or services can influence our behavior based on targeted content that has been curated specifically for an individual based on their preferences and interactions.

The IoB is poised to become as widespread as artificial intelligence, IoT devices, and customer relationship man-

agement (CRM) systems. The impact of the IoB could fundamentally change the way businesses and governments interact with and influence people—for better and for worse. As the pyramid the IoT surely converts data to information but the IoB translates knowledge into real wisdom.
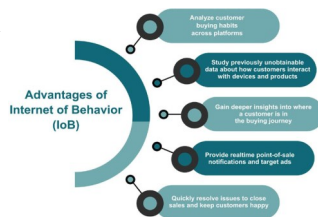
Behavioural Data

Basically IoB is a process where an user data is analyzed in terms of behavioral psychology. So, the important point is collecting each digital activity data of user and finally to use this information to influence behavior.

The data is collected using the same methods that IoT uses to collect data. Although most IoT devices seem to work on a surface level where they collect data from sensors and other connected devices, IoB collects information from transactions, geo-tagging activities to relate particular locations to certain interests, browser history and cookies, social media interactions to understand what every user relates to, and other online activities that reflect personal behaviour.

IoB Usage

The primary benefit of using IoB technology is improved efficiency and productivity gains from automation enabled by predictive analytics. Leveraging AI algorithms for analyzing behavioral patterns in real time can help organizations make better decisions faster while reducing costs associated with manual labor or inefficient processes.

IoB can capture, analyze, understand and respond accordingly to all the behavior in a way that allows tracking and interpreting the behavior of people. It helps to study the previously unobtainable data about how customers interact with devices and products and thus gain deeper insights into customers interests and their buying experience. The Internet of Behaviors is expected to play an important role in e-commerce, health care, customer experience management (CXM) and search engine optimization (SEO).

M. Vinothkannan
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Digital Twins

A digital twin is a virtual representation of an object or system designed to reflect a physical object accurately. It spans the object's lifecycle, is updated from real-time data and uses simulation, machine learning and reasoning to help make decisions.

How does a digital twin work

The studied object—for example, a wind turbine—is outfitted with various sensors related to vital areas of functionality. These sensors produce data about different aspects of the physical object's performance, such as energy output, temperature, weather conditions and more. The processing system receives this information and actively applies it to the digital copy.

After being provided with the relevant data, the digital model can be utilized to conduct various simulations, analyze performance problems and create potential enhancements.

Digital Twin, is not a single technology play, rather it is realized through an amalgamation of a multiple of technologies and essentially it consists of functional building blocks that address specific business aspects: Sensors and Assets capable of transmitting telemetry/data/ real-time data ingestion gathered from physical asset/ objects related to state, conditions and events.
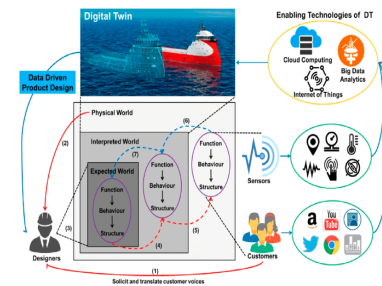
Connectivity between platform and sensors (Internet, 3G/4G, CDMA, LoRa, …)

Data Platform core system for a) data management — To integrate, persist, transform and govern the data collected; b) analytics — Using machine learning framework and analytics to make real- time decision based on historical and streaming data; c) user experiences — combines the data and insights to present, advise and interact with the user or other machines

Digital Twin core capabilities that uses the managed data obtained by the Data Platform to create Applications for the Use Cases. Creates a digital thread based on semantic model, data dictionary and knowledge graph

Benefits of digital twins:

The use of digital twins enables more effective research and design of products, with an abundance of data created about likely performance outcomes.
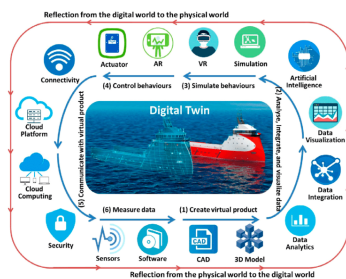
Even after a new product has gone into production, digital twins can help mirror and monitor production systems, with an eye to achieving and maintaining peak efficiency throughout the entire manufacturing process.

Digital twins can even help manufacturers decide what to do with products that reach the end of their product lifecycle and need to receive final processing, through recycling or other measures.

The future of digital twin:

A digital reinvention is occurring in asset-intensive industries that are changing operating models in a disruptive way, requiring an integrated physical plus digital view of assets, equipment, facilities and processes.

Digital twins are constantly learning new skills and capabilities, which means they can continue to generate the insights needed to make products better and processes more efficient.

Kaveri
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8 **ways to improve you attitude and personality**

1. Always act with a purpose
2. Stretch yourself past your limits every day.
3. Take action without expecting results.
4. Use setbacks to improve your skills.
5. Seek out those who share your positive attitude.
6. Don't take yourself so seriously.
7. Forgive the limitations of others.
8. Say "thank you" more frequently.

— M. Padmanaban
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Quantum Computing
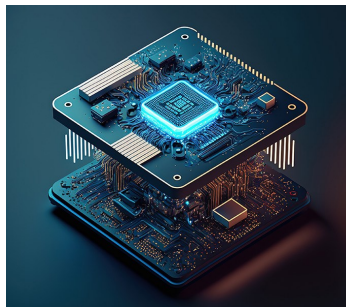
Quantum computing:

Quantum computing is a multidisciplinary field comprising aspects of computer science, physics, and mathematics that utilizes quantum mechanics to solve complex problems faster than on classical computers.

The field of quantum computing includes hardware research and application development. Quantum computers are able to solve certain types of problems faster than classical computers by taking advantage of quantum mechanical effects, such as superposition and quantum interference. Some applications where quantum computers can provide such a speed boost include machine learning (ML), optimization, and simulation of physical systems.

Advantage Quantum computing

Currently, no quantum computer can perform a useful task faster, cheaper, or more efficiently than a classical computer. Quantum advantage is the threshold where we have built a quantum system that can perform operations that the best possible classical computer cannot simulate in any kind of reasonable time.

Components of a quantum computer

Quantum computers have hardware and software, similar to a classical computer.

Quantum hardware

Quantum hardware has three main components.

Quantum data plane

The quantum data plane is the core of the quantum computer and includes the physical qubits and the structures required to hold them in place.

Control and measurement plane

The control and measurement plane converts digital signals into analog or wave control signals. These analog signals perform the operations on the qubits in the quantum data plane.

Control processor plane and host processor

The control processor plane implements the quantum algorithm or sequence of operations. The host processor interacts with the quantum software and provides a digital signal or classical bits sequence to the control and measurement plane.
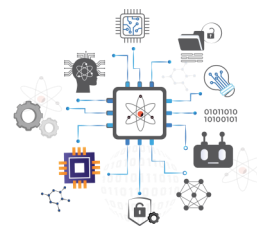
Quantum software

Quantum software implements unique quantum algorithms using quantum circuits. A quantum circuit is a computing routine that defines a series of logical quantum operations on the underlying qubits. Developers can use various software development tools and libraries to code quantum algorithms.

Companies use quantum computing:

ML

Machine learning (ML) is the process of analyzing vast quantities of data to help computers make better predictions and decisions.

Optimization

Quantum computing can improve research and development, supply-chain optimization, and production.

Simulation

The computational effort required to simulate systems accurately scales exponentially with the complexity of drug molecules and materials.

Getting started with quantum computing:

If you want to try quantum computing, you can get started with a quantum hardware emulator on your local machine. Emulators are regular software that imitates quantum behavior on a classical computer. They are predictable and allow you to see quantum states. They are useful if you want to test your algorithms before investing in quantum hardware time. However, they cannot recreate real quantum behavior.

Priyadharshini M
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Edge Computing

Edge computing is an emerging computing paradigm which refers to a range of networks and devices at or near the user. Edge is about processing data closer to where it's being generated, enabling processing at greater speeds and volumes, leading to greater action-led results in real time.
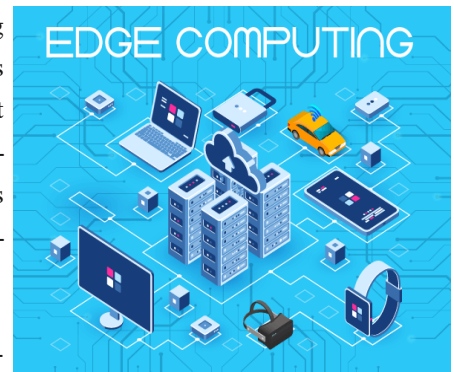
It offers some unique advantages over traditional models, where computing power is centralized at an on-premise data center. Putting compute at the edge allows companies to improve how they manage and use physical assets and create new interactive, human experiences. Some examples of edge use cases include self-driving cars, autonomous robots, smart equipment data and automated retail.

Possible components of edge include:

Edge devices: We already use devices that do edge computing every day—like smart speakers, watches and phones – devices which are locally collecting and processing data while touching the physical world. Internet of Things (IoT) devices, point of sales (POS) systems, robots, vehicles and sensors can all be edge devices—if they compute locally and talk to the cloud.

Network edge: Edge computing doesn't require a separate "edge network" to exist (it could be located on individual edge devices or a router, for example). When a separate network is involved, this is just another location in the continuum between users and the cloud and this is where 5G can come into play. 5G brings extremely powerful wireless connectivity to edge computing with low latency and high cellular speed, which brings exciting opportunities like autonomous drones, remote tele-surgery, smart city projects and much more. The network edge can be particularly useful in cases where it is too costly and complicated to put compute on premises and yet high responsiveness is required (meaning the cloud is too distant).

On-premises infrastructure: These are for managing local systems and connecting to the network and could be servers, routers, containers, hubs or bridges.

R. Rathaprakash

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BOSE NOISE-MASKING SLEEPBUDS

Today, Bose announced the availability of its revolutionary noise-masking sleepbuds which is tiny. The wireless earbuds that combine an ultra-comfortable design with soothing sounds to block, cover, and replace the most common noises that interfere with sleep. Bose® Sleepbuds are the smallest Bose product ever made and are packed with proprietary technology. They come with 10 pre-loaded "sleeptracks" that mirror the frequencies of snoring, neighbors, dogs, traffic, and more-hiding them beneath a layer of relaxing audio. They feature new patented ear tips for a snug, soft, barely-felt fit, and can run for up to 16 hours. And they solve a problem for millions of people that's vexed a multi-billion dollar industry. Bose sleepbuds are the first Bose product to use Bose noise-masking technology for better sleep, all night, and every night.

Technology

"Noise-masking is a science," said Daniel Lee, systems engineer for Bose sleepbuds. "It's more than ambient sound or white noise. The user can't achieve it by simply turning up the volume on calming songs. And depending on the situation, it's more effective than active noise cancelling even ours. During the day, Quiet Comfort headphones improve focus and productivity, or let the user can hear their playlists and calls clearly in loud places. But at night, they are trying to shut down completely, and the world is naturally quieter and when it's quiet, even the slightest sound seems loud. Bedside machines can't cover it, earplugs can't block it, and earbuds meant for sitting, standing, or moving can't be worn for hours laying down-especially on your side. But Bose sleepbuds can. And if the user someone who's tried everything and nothing's worked, or haven't tried anything believing nothing will, we made them for the user."

An Engineering Breakthrough

Bose® sleepbuds™ are a sophisticated engineering feat. Each bud weighs just 1.4 grams, and measures just over 1 centimeter wide and high. On their exterior is a laser-etched antenna for reliable connectivity to a phone or tablet. Inside, there's a rechargeable silver-zinc battery, a miniscule transducer, and a micro-circuit board with flash memory to store the pre-loaded noise-masking sound files.

Both attach to a new noise-isolating StayHear+ Sleeptip-another line of defense that creates a physical barrier to unwanted sound. StayHear+ Sleep tips are included in three sizes. They're soft, pliable, and virtually weightless. And their materials, shape and form were optimized specifically for

rest, so they feel great and stay in all night, regardless of sleep position.

The Bose Sleep App and Sleepbud Charging Case

Bose sleepbuds use low-energy Bluetooth®, are iOS and Android compatible, and come with the Bose Sleep app that makes it easy to update, control, and select preferences. Users can set an alarm for the morning, choose the sleeptrack and volume that works best for their environment and instantly hear gentle waves instead of a noisy partner, rustling leaves instead of the party next-door, smooth-turning wind turbines instead of busy city streets, and more.

Bose sleepbuds come in a brushed aluminum charging case that provides up to 16 hours of battery life unplugged perfect for travel and overnight stays.

Priyadharshini M
II M.Voc. (SD)

Ravivarman G
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Impacts of COVID-19 on the Information Technology (IT) industry

The COVID – 19 Pandemic has caused drastic changes in many industries, and Information Technology (IT) industry is the major among them. The negative impacts during this situation are more compared to positive effects.
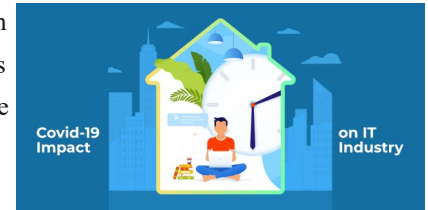
Effect of Lockdown on IT sector:

The significant weaknesses the IT industry is facing now is due to the fall in the economy, as a lot of companies are forced to ask their employees to work from home (remotely) keeping in the account of the public health concerns. Due to this, there is a massive loss in opportunity for many companies who have international dealers. For example, Apple Inc. is estimated to have at least 10% fall in its shares because of the lack of availability of iPhones in the market. The parts that are required to build the iPhones are supposed to come from China, and it is facing a major lockdown.

The spread of this deadly virus has caused a lot of tech conferences to get cancelled, which could have been a great partnership opportunity for many companies to expand their horizons.

Disguised benefits in this pandemic:

Even after all this, compared to many other industries, the IT industry is expected to have an enormous market boom from US$ 131 Billion in 2020 to US$ 295 in the next five years by 2025. The main reason for this increase in the economy for this industry is the increased demand for software and social media platforms such as Google Hangouts, WhatsApp Video call, Zoom, and Microsoft Teams. The economy will also blossom because, during these crises, people understood the importance of the internet and technology as this is helping us stay safe and helping in the communication between the doctors and the public.

Some smart solutions around the world:

Many countries who are facing the shutdown have invested in smart city solution such as the cops in China are using drones attached with thermal sensors to identify the symptoms for coronavirus and get immediate medical help. In Australia, the government had launched a chat-bot to keep the citizens up to date with the situation and answer their questions so that they will be able to decrease the spread of misleading information and stop the panic that could be created in public.

In January, in China, the telecom AHS designed a 5G powered system to enable the consultations and diagnoses of people affected by the virus by connecting the physicians at West China Hospital to 27 other hospitals in the area to treat the illness affected people. This not only helps doctors to communicate faster and come up with a diagnosis but also helps to keep track of the emergency patients who need immediate medical help and if a hospital is not able to provide that the patient could immediately be shifted to the nearest equipped hospital for assistance.

Blooming Opportunities and Threats in the IT industry:

Due to the coronavirus, a lot of opportunities opened up in the IT industry, such as the growing need for the 5th generation (5G) technology. This will help increase connections that support the primed remote interactions. This has become the top priority for many organizations due to the pandemic. There are many patients who are in self-quarantine who need medical supervision and medical assistance every day, and these applications could help them achieve that.

There are a few threats too, such as after the pandemic is over what would happen to the IT sector? May exporters in this industry feel that it will not be able to stabilize after the downfall, unlike the 2008 global economic and financial meltdown. Back then, the central banks helped to improve the stability of the market, but now even the central banks are helpless.