India's Trillion Dollar Opportunity in SaaS

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The current size of India's IT Industry is $167 billion and it is growing at 8% year-on-year. (Source: NASSCOM). At this rate of growth it will take us another 25 years and up until 2042 to get to $1 trillion. That's because not all revenues are created equal.

Revenue vs Enterprise Value

The quality of revenue is always measured by a revenue-to-value arbitrage. Most of the IT industry revenue for India comes from IT Services. The revenue-to-value multiple for IT Services revenue is between 1.5x-2.0x. The best companies are valued at 2x-3x revenue, such as Cognizant's enterprise value multiplier of 2.52.

Let's fast forward and look at a different kind of company, Freshworks. While the company's revenue is about $100 million, it's enterprise value is $1.5 billion. That is a revenue-to-value multiplier of 15, or ten times more than a typical IT services revenue multiple.

This is an order of magnitude of difference. If you use this 15X multiple and do the math, to make $1 trillion in enterprise value, we need is **66 companies with $1 billion each in revenue.** While a trillion dollars might have looked impossible initially, it doesn't seem as such when you only need to create 66 $1 billion dollar companies. This equation shift can happen because of the high quality of SaaS product revenue.

The Road to a Trillion

Still, building 66 $1 billion revenue SaaS companies isn't easy. You can't just build them directly. To do that would be like trying to directly jump to the 15th question in a game of "Who Wants to Be a Millionaire". To get to this target, we need to build a pyramid of large SaaS companies.

During a conversation with Shekhar Kirani (Partner, Accel India) and 5-6 other SaaS founders at SaaSx4, Shekhar said, "I am not sure that if Girish (Founder of Freshworks) had to start his journey all over again, he would be able to repeat the same kind of success." This wasn't meant to take anything away from Girish, as we all have incredible regard for him and what he has achieved. What Shekhar was really trying to say is that there is no formula to make a billion dollar company, and I totally agree with him. All we can do is increase the odds of success by creating a larger pool of probability to make this happen. To do that, we need to start at the bottom of this pyramid.

We should build a large base of small companies that start out doing a million dollars in revenue. By probability, some of them would scale up to about $10 million, and eventually a small percentage of these would go on to become billion dollar companies.

Where do we start?

To achieve this kind of goal, you need to create a completely new ecosystem. According to the Startup Genome Project Report - 2018, "An ecosystem should focus on a startup sector most closely related to its strongest traditional strengths relative to global competition."

The key questions we must ask are, "What is the traditional strength of our country?" and "How does it relate to the global competition?"

There are four major global technology ecosystems in the world: the United States (primarily Silicon Valley), China, Israel and India. Let's look at how each one positions itself. The US showcases itself as the place for cutting-edge technologies and goes after everything new. China seems to be constantly looking at how they can replicate Silicon Valley inventions faster and cheaper. (In fact China is getting so good at this, that the number of unicorns and patents in AI/ML that China has produced is exceeding if not equally that of Silicon Valley.) And Israel has positioned itself as a leader in deeptech, encryption, security, and military technology.

However, when it comes to India, there is no clear positioning or messaging. There is a lot of confusion around what our strengths are. We talk about Artificial Intelligence and Machine Learning, but those are the same things that China and the US are going after!

This reminds me of a scene in the movie "A Beautiful Mind", where a beautiful, tall, blonde girl and her friends walk into the bar where John Nash and his friends are. Every guy in the group wants the blonde. But Nash comes up with this theory that the only way for all of his friends to get a date is to ignore the blonde and go after her friends instead, doing what is best both for the individual and the group.

AI and ML are deeply rooted in data, and companies like Google and Facebook are the current lords of data. So going after the AI and ML tag without having this data can be suicidal unless you are in an extremely niche field. So if AI/ML are the tall blonde, who are the friends India should be focusing on?

India's Best Bet

In my view, the next best thing for India is SaaS and we should heavily bet on it. It also plays to the strength of India. Over last 30-40 years, due to the IT services boom, our country has built deep domain expertise in basically every industry vertical. It is that expertise that needs to be productized to make India a global SaaS hub.

Although India hasn't positioned itself well in the global SaaS space, it can take inspiration from what Chennai has done. Chennai has already established itself as the SaaS capital of the country. How did Chennai do this?

Chennai does more than a billion dollars in SaaS revenue. This is high quality revenue unlike ecommerce companies whose top line numbers are essentially gross merchandise value. SaaS revenues are in the range of 80-90% gross margin. The CoGS for SaaS is close to zero or negligible.

The Chennai ecosystem has about 10,000 people working in SaaS. The talent pool is not just purely coders, but a well-rounded pool of product management, UX designers, inbound marketers, inside sales, and of course programming talent.

How can India replicate Chennai's success in SaaS in other cities like Pune, Indore, Cochin, Hyderabad, Vizag, and position itself in the global marketplace?

Busting Some Myths

The first myth is that we think success in SaaS is always about funding. But for SaaS to take off, investor funding is inconsequential. In the below quadrant, there are more than four companies going after the global SMB market. There are unicorns such as Freshworks who have $260 million in funding, while Zoho is four times bigger in revenue and got there with ZERO external funding. KiSSFLOW, with just $1 million in funding has been able to build a comparable business with Chargebee which received $25 million. So it's been proven that both models actually work, whether you are building a unicorn like Freshworks or a multi-million dollar success story like KiSSFLOW and funding isn't a deal breaker or game changer in the SaaS marketplace.

The next myth is location. People generally think you need to be in the most happening place to make it. So we have large numbers of professionals and entrepreneurs leaving smaller towns like Indore and Vizag to go to Bangalore or Mumbai to make it big.

It may seem counterintuitive, but SaaS actually requires a quiet place away from a lot of noise and distraction of a city like Bangalore where your team members are churning every 12-15 months. The first 18-36 months of a SaaS company are critical and you need a quiet place and an undistracted team. There is enough proof that SaaS companies can be built from '*dokku*' places (a Tamil word meaning 'middle of nowhere') like Tenkasi, Renigunda, and Jallandhar.

The next common myth is we won't get talent out in the middle of nowhere. A SaaS business in the early stages requires only a team of 10-15 to make it big. So a founder needs to simply worry about putting a solid founding team together, and not so much about the next 100 hires all at once. Most of the initial success for KiSSFLOW was done with a small team of 15 people. So the location and the team size are inconsequential too.

In the image above, I want to focus on what it takes to be successful in the Global SMB market. While these principles can apply in many situations, the steps to success can be seen in this flywheel image.

It all starts from building a really fantastic product that is offered at an affordable price point. To sustain low prices, you need high volumes. High volumes can only be achieved if the software is sold to pretty much everyone in your target segment irrespective of whether they are small, medium or big. The only way to sell to everyone is to go online. To sell online, you need transparent pricing and the ability to experience the product, which also means you need good support collecting feedback. This makes the product better and you are back to the beginning.

This is the recurring loop that moves a SaaS company forward and makes it unstoppable.

Small Steps to a Trillion

A trillion dollars in value for a single sector of an economy may seem very lofty, but that doesn't mean that it is impossible. By creating a thriving ecosystem across the country and leveraging the skills we have learned over the last few decades, we can build thousands of very profitable companies. Using the multiplying power of SaaS and excellent products, we can even grow to the point where $1 trillion is a legitimate possibility. Let's take this vision as a reality and move forward!

About the author

Suresh Sambandam is the Founder & CEO of OrangeScape, makers of KiSSFLOW, a disruptive, SaaS-based enterprise-level work automation and collaboration platform with more than 10,000 customers across 160 countries. He is an expert and renowned entrepreneur on a mission to democratize automation and create immersive work experience for enterprises of all sizes. Suresh is passionate about entrepreneurship and technology startups, and spends a significant amount of time in the startup ecosystem mentoring young founders. He received the prestigious "Entrepreneur of the Year Award" for 2018 from the Confederation of Indian Industries (CII).

Building SaaS products from India for the world: Chennai conclave SaaSBOOMi shows the way

SaaSBOOMi is an initiative created by successful Chennai-based SaaS founders to help SaaS-focused entrepreneurs learn the ropes about creating technology for customers in the country, and beyond. With Chennai strengthening its position in the SaaS domain, with around 30 SaaS companies offering employment to 10,000 techies, these founders have crafted SaaSBOOMi to be a platform to educate and inspire the next set of SaaS founders so that they can ride the SaaS wave.
https://yourstory.com/2019/01/saas-chennai-conclave-saasboomi

Digital Plantation story of RGE

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Abstract – This article highlights the digital plantation story of Asian Agri palm plantation business. The focus of this article shall be on the key challenge faced by the Asian Agri in the management of ganoderma fungi infestation in its palm plantation, and the current utilization of digital technologies and further possible enhancements to enable earlier detection of the ganoderma infestation so that better treatment and overall containment of the infestation can be performed to significantly minimize the impact to harvest yield.

Index Terms—digital plantation, digital agriculture, plantation management system, plantation, palm tree, hyperspectral imaging, ganoderma.

1 INTRODUCTION

Established in 1979, Asian Agri spearheads Royal Golden Eagle (RGE)'s palm oil operations and is currently one of Asia's largest palm oil producers with an annual production capacity in excess of 1 million tons, and manages more than 160,000 hectares of palm oil plantations. The findings and recommendations of this article are done via interviews with relevant mill personnel and palm management system owners, as well as other relevant research on the topic of early detection of ganoderma fungi infestation and its management. [1]

2 KEY CHALLENGE OF GANODERMA INFESTATION AND ITS IMPACT

Managing more than 160,000 hectares of palm oil plantations, Asian Agri faced a number of key challenges, the most critical of which is the management and containment of the Ganoderma fungi infestation.

There are several different species of Ganoderma fungi, such as Ganoderma Heterobasidion, Pleurotus, Lentinus, but it is Ganoderma boninense which has been identified as the major cause of the fungi disease of oil-palm trees. The fungi causes the deadly Basal Stem Rot (BSR) disease, wood-decay and butt rot in oil-palm trees. It is known as the most destructive disease of oil palm plantations in Southeast Asia. It is responsible for a significant portion of oil palm losses, estimated at US$500 million a year in Southeast Asia. [2]

And as pointed out by (Camille et al, 2010), the detection of ganoderma fungi in crops such as palm trees, represents a major issue in palm estate management. Current detection & diagnostics method via direct visual symptom observation is difficult and time-consuming, while other methods such as those based on root or stem tissue chemical analysis are very expensive and damaging. [3]

3 CURRENT GANODERMA INFECTION DETECTION & MANAGEMENT

As part of its effort to track the results visual observation census, verification, final inspection and subsequent treatment & containment of Ganoderma infestation, Asian Agri has developed the Asian Agri Connected Plantation (AACP) digital platform [4]. The AACP include the field-force mobile data capture application using tablets plus dashboarding and alerts capabilities at the Plantation Operations Control Center.

Currently, the method to detect Ganoderma infestation is via direct visual symptom observation by plantation workers. Assigned plantation workers will inspect every tree within their assigned area / plots called afdeling. They will then record their visual symptoms observations into the AACP field force application using tablets. The visual observation that are recorded include the symptoms of a potential or confirmed ganoderma infection [5], such as:-

Tree Part	Visual Symptoms
Fruit	Reduced fruit size.
Leaves/Fronds	Abnormal colors, forms, necrotic areas on leaves, Wilting, yellowish fronds.
Roots	Fungal growth on root surface, wood rot, soft rot of cortex.
Stems	Bark discoloration, mold growth on lesion.

Table 1.0 – Types of symptoms due to Ganoderma infection.

Visual observation data that is recorded shall then be updated back to the server via wireless connection at the Plantation Operations Control Center. Updated data will then be visible via the AACP's Pest & Diseases (P & D) Control Dashboards. Fig 2.0 shows the P & D Control Dashboards dashboard with the blue bar indicating the total number of trees confirmed to be positively infected, while the red bar indicating the total number of trees that shows signs & symptoms of potential infection taking place.
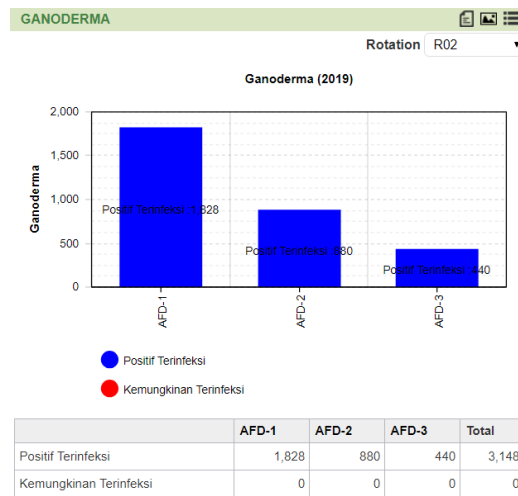

Fig 2.0 – Dashboard displaying the total number of trees exhibiting visual symptoms of ganoderma infection in each afdeling.

A tree is recorded as possibly infected if it shows 3 or more visual symptoms highlighted in Table 1.0, possible infection requires further verification to confirm there is a positive infection on those trees, the result of the verification and whether the symptoms show that the tree has to be removed to contain the infection is also recorded via tablet and also displayed in the AACP P & D Dashboard, refer Fig 3.0.
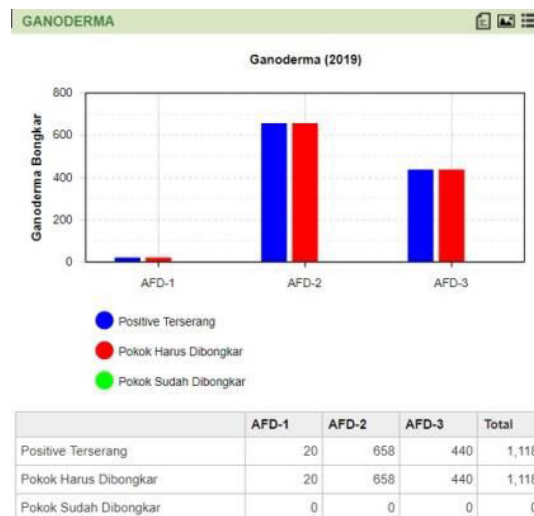

Fig 3.0 – Dashboard displaying the total number of trees confirmed to be infected by Ganoderma (blue bar) and number of trees to be removed to contain the infection (red bar) in each afdeling.

Although, the AACP digital platform enabled Asian Agri to track the trees infected by Ganoderma based on visual symptoms, those visual symptoms such as the appearance of the fruiting body, refer Fig 4.0, is difficult to spot and only appears at a late stage of the infection. Once the fruiting body is visible, the infection has reached a late stage where the entire palm tree has to be removed in order to contain the disease from spreading to surrounding areas as a result of the spores released by the fruiting body. Furthermore, even the stump and root system needs to be removed together with the tree, to further contain the infection.

Fig 4.0 –Fruiting body observed on the trunk of the tree from Ganoderma infection

If not detected early, death may occur to trees infected by the Ganoderma, within 6-12 months, with the fatality rate of up to 80% of affected trees. Due to Ganoderma infection, the Fresh Fruit Bunch (FFB) yield is estimated to be reduced by an estimated 0.04t/ha to 4.34t/ha, refer Fig 5.0. Also, the fungi survives in the soil even when treated, continuous monitoring is crucial because as many as 30% of the replanted areas may be affected within 1-2 years of replanting. [6] Thus it is crucial to employ alternative methods, which we shall look at in the subsequent section, to detect the infection earlier so that effective management of the infection can be performed.
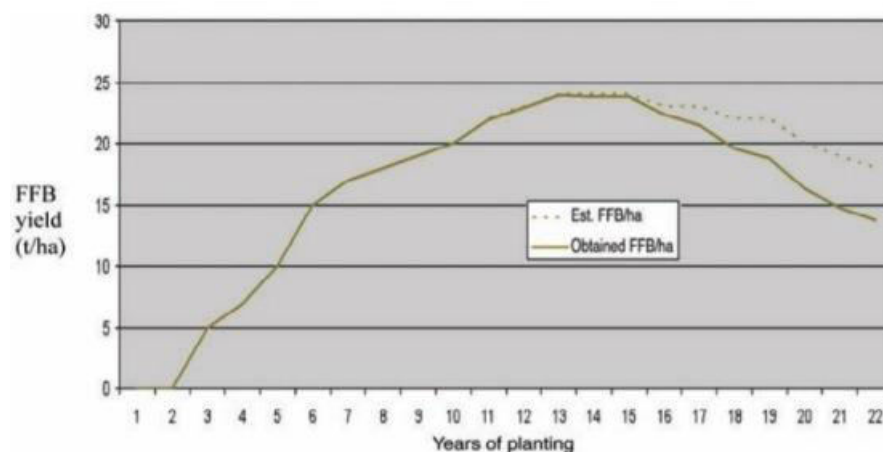

Fig 5.0 – Reduction in FFB yield due to Ganoderma infection.

4 EARLIER DETECTION OF GANODERMA INFECTION

Currently, there is no single method that is able to halt the continuing spread of this deadly disease. It is therefore crucial to identify and select the methods for early detection of the fungi infection. Currently, there are a few early detection methods [7], such as:

- Hyperspectral Imaging (via remote sensing using digital imaging and spectroscopy).
- Biochemical method.
- Chemical method (via the detection of the presence of the Ganoderma chemical compound in the trees).

4.1 Hyperspectral Imaging for ganoderma detection

Hyperspectral imaging (or remote sensing) combines digital imaging and spectroscopy (the study of the interaction between matter and radiated energy). Hyperspectral imaging involves capturing images over several spectrums, for example: visible light, Near Infrared, Infrared. Using hyperspectral imaging tools, the image and reflectance data captured exhibits a clearly distinguishable difference, refer Fig 6.0, and Fig 7.0, in between healthy trees and those infected by the Ganoderma fungi.
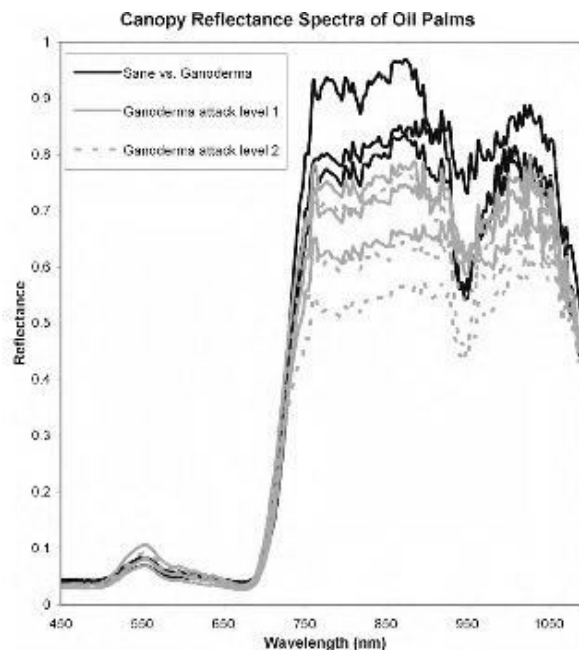
Fig 6.0 – Distinctive reflectance profiles generated from healthy and ganoderma-infected trees.
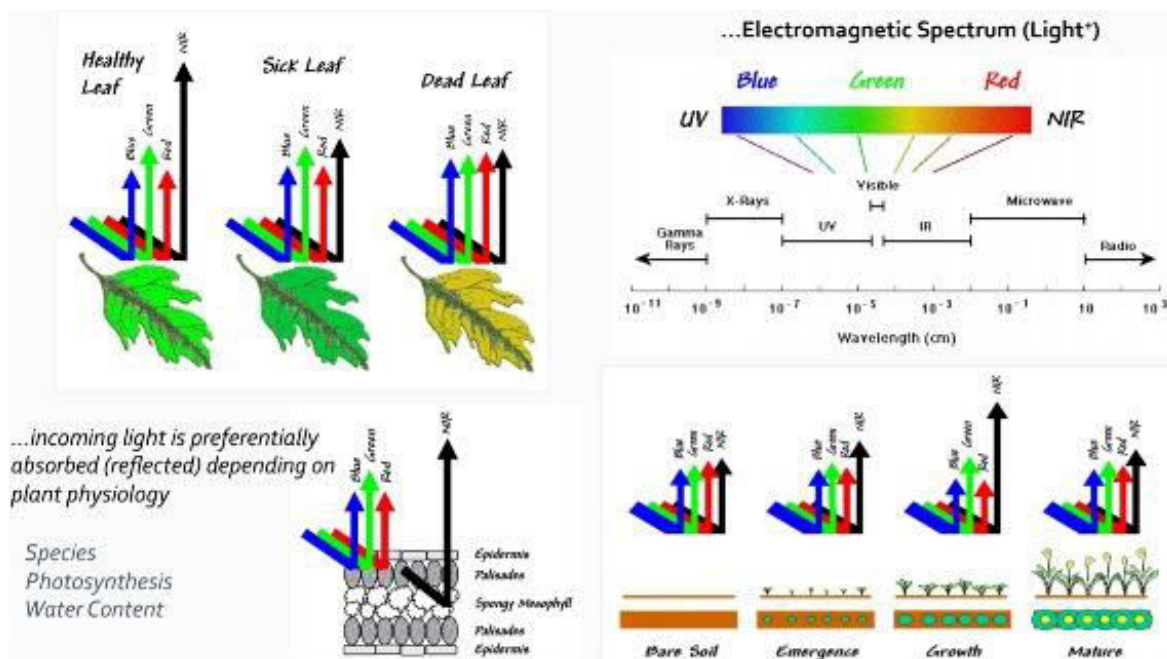

Fig 7.0 – Reflectance data captured using remote sensing enables early detection
of infection symptoms such as sick or dead leaves.

As imaging and data acquisition tools, plus other technologies like Unmanned Aerial Vehicles (drones) gets more reasonably priced, the tools used to capture the data has gone from using handheld spectroradiometer (a device to measure spectral reflectance ratio of incident-to-reflected light measured from an object over specified wavelengths) in 2008, to Hyperspectral Data acquisition using UAV (drones customized to carry sensors for hyperspectral data acquisition sensors) on young and mature palm, over large plantation areas [8].

Fig 8.0, adapted from various sources [9],[10], highlights the key technologies used for Hyperspectral Imaging (remote sensing):
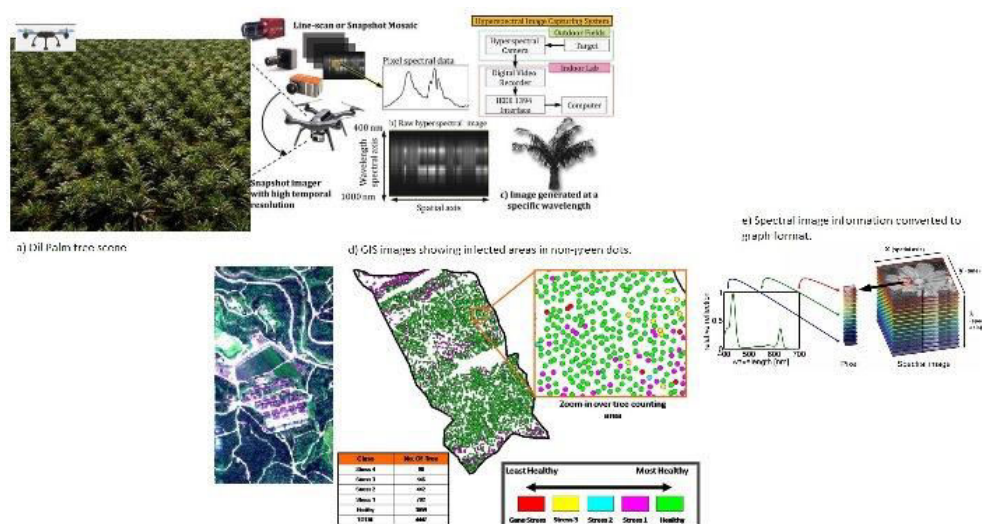
Fig 8.0, highlight the key technologies used for Hyperspectral Imaging (remote sensing)

(a) Hyperspectral data UAV (drones) fitted with Hyperspectral Cameras and Geographic Information System (GIS) technologies shall capture the required data based on the flight path planned.

(b) The resulting data in the forms of raw hyperspectral image are then made available when synched back to the Plantation Control Center servers.

(c) An image of the tree is also made available based on the different wavelengths captured (e.g. Near Infrared or NIR).

(d) Together with GIS data, the overall infected vs. healthy areas of the plantations can be plotted.

(e) Hyperspectral information in the form of hyperspectral data cube (data in 3-dimension: x and y spatial information, plus spectral wavelength information), can also be converted to graphs for deeper analysis.

The rapid progress of Hyperspectral imaging or remote sensing method & technologies for ganoderma infection, coupled with more competitively-priced UAVs fitted with advanced hyperspectral cameras, and leveraging on GIS technology allows for faster imaging and data-capturing rate of estimated 500 ha/day for 1 UAV), the data provides quick visualization and also opportunities to perform advanced data analytics on them to make prediction and to guide future actions in disease management in the plantation. Based on an earlier study, it is possible to detect ganoderma infection in trees in more than 90% of the cases with the hyperspectral imaging method [11], thus this method should be considered based on the various benefits it has over the others.

4.2 Biochemical Method for ganoderma detection

Biochemical method based on immunoassays called enzyme-linked immunosorbent assay (ELISA). Using this method, biological substances (antigens) specific to G. boninense taken from the tree sap, reacts with antibodies that are made to detect it, and a detectable signal is emitted usually in the form of color change. This method suffers from reliability issues as there are major drawbacks such as the high rate of obtaining false positives (due to reaction of antibodies happens even with antigens from unrelated fungi species) or false negatives. [12]

4.3 Chemical method for ganoderma detection

Ganoderma infection can be detected via the presence of ergosterol (a type of chemical compound that are part of the cell membrane of the ganoderma fungi) in the infected tree. To do this, a small sample can be taken from the tree stem or trunk by drilling. Next, there must be a way to extract the ergosterol (which is invisible to the eye), and then proceed to separate it from the other organic molecules using a combination of physical and chemical method. Once separated, the presence of ergosterol can then be detected. Although there is an ergosterol detection kit which employs the Thin Layer Chromatography (TLC) method to detect the presence of ergosterol via immersing the crushed samples into a special solvent, which together with the TLC plate will show the presence of ergosterol under the ultraviolet (UV) lamp. [13] The challenge of this method is that it requires quite a huge amount of physical work to extract the samples from each tree by drilling (which is also destructive), and then further work would be required to perform the separation via chemical work by trained personnel before the detection of ganoderma through the presence of ergosterol is possible.

5 CONCLUSION

The Basal Stem Rot disease caused by Ganoderma infection is deadly to oil palm trees, so it is crucial to identify and select effective early detection methods & technologies that are fast, accurate, reliable, reasonably-priced & practical on the field. Once detected, proper treatment has to be carried out and post-treatment monitoring measures, such as via Internet of

Things (IoT) sensors [14], needs to be in place to ensure that the treatment is effective. In summary, there is work to be done in the selection and implementation of effective detection & post-treatment monitoring methods and technologies. The methods & technologies chosen should integrate well with the AACP digital platform, for earlier detection, better treatment and overall management of the disease. And this will ensure the sustainability of the palm oil plantations managed by Asian Agri.

ACKNOWLEDGMENT

- Dr. Simon Hoh Tsu Hoon (Head of Architecture and Research, Ace Resource Advisory Services Sdn. Bhd).
- Mr. Jimmy Mak Yi Ming (Deputy Head of IT & Digital, APRIL Group).
- Ms. Mille Tham Yee Kuan (Senior Consultant Project Management, Ace Resource Advisory Services Sdn. Bhd).
- Mr. Lee Teck Tze (Data Scientist, Ace Resource Advisory Services Sdn. Bhd).

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Corporate Placements

HR Agency: "Sir, we have selected few candidates as per your requirements. Now how do you want their placements sir?"

M.D and CEO: "Put about 100 bricks in a closed room. Then send the candidates into the room & close the door, leave them alone & come back after a few hours and analyse the situation:-

1) Any candidates counting the bricks, Put them in Accounts deptt.

2) If they are re-counting the bricks, Put them in Auditing.

3) If they have messed up the whole room with the bricks, Put them in Premises.

4) If they are arranging the bricks in some strange order, Put them in Planning.

5) If they are throwing the bricks at each other, Put them in Operations.

6) If they are sleeping, Put them in Security.

7) If they have broken the bricks into pieces, Put them in Information Technology.

8) If they are sitting idle, Put them in Human Resources.

9) If they say they have tried different combinations yet not a single brick has been moved, Put them in Front office in Treasury.

10) If they have thinking of going out for the day, Put them in Marketing.

11) If they are worried about how to use bricks, Put them in Risk Management.

12) If they are staring out of the window, Put them in Strategic Planning.

And.......

13) If they are talking to each other and not a single brick has been touched, Congratulate them and put them in Senior Management

Leet Speak

Leet speak, also known as leet, leetspeak, leetspeek, or hakspeak, is a way of writing words by substituting numerals or special characters for some of the English letters. "Leet" derives from "elite," which refers to hackers, who were among the first to use it and who elevated it to a sort of cult language.

Do you recognize these words? |-|4(k3r, 1337, 3D170R — respectively, they're leet versions of hacker, leet, editor. If a computer program doesn't know they're a kind of code, it's not likely to recognize the words in the midst of other text. However, a program designed to translate leet would have no problem.

Leet Speak Converter: http://www.brenz.net/services/l337Maker.asp

Leet password generator -- http://www.whatsmypassword.com/

Move over, *Pessimists* - Emerging Top 50 Technologies Offer a Gold Mine of Opportunities

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In their book "abundance," Peter H. Diamandis and Steven Kotler give us plenty of hope that every basic need will soon be met if not done yet! The exhaustive research into it depicts how our minds get clogged with loads of information, portraying challenges that are likely to cause significant devastation in our daily world. However, many such outlandish challenges have indeed remained on paper rather than actually affecting any of us.

In fact, we live in a world of opportunities and thanks to extensive research conducted across various stakeholders, there are a lot of benefits that can be reaped, regardless of the outlook projected by pessimists.

To characterize the opportunities available, we at Frost & Sullivan, believe that we are at the cusp of a technology-driven ecosystem that is not restricted to just one branch of ICT-based innovations which find mention and examples on the Internet. We cover a wide spectrum of industries that include materials, energy, medical devices and several more that are driving transformational change. So what are they? The Top 50 Technologies, the leading research offering of the TechVision group, the global emerging technology, innovation, and convergence-focused practice of Frost & Sullivan, offers strategic guidance and actionable ideas on the hottest 50 technologies that pack maximum potential to fuel global innovation; spawn innovative products and services; and drive wholesome commercial growth. The Top 50 Technologies are key beacons that will guide the strategic moves of innovation-driven organizations in the near future.

Environment and Sustainability
- Agriculture 4.0
- Battery Recycling Technologies
- Carbon Upcycling
- Clean Coal Technologies
- Next Gen Desalination Technologies

Energy and Utilities
- BIPV
- Digital Oil Fields
- Distributed Energy
- Grid Edge Energy Storage
- Thermal Energy Storage

Chemicals and Advanced Materials
- Advanced Ceramics
- "Clean" Ingredients
- High Performance Polymers
- Nanohybrids
- Self-healing Technologies
- Sustainable Packaging
- Ulti-metals

Information and Communication Technologies
- Augmented Analytics
- Cognitive Security
- ConvNets
- Extended Reality
- Fog Intelligence
- Hybrid Blockchain
- Platform-itization

Advanced Manufacturing and Automation
- Automated Optical Metrology
- Cognitive Manufacturing
- Collaborative Industrial Robots
- Extreme Ultraviolet Lithography
- Metal 3D printing

Sensors and Instrumentation
- Millimeter Wave Sensors
- Printed Sensors
- Sensor Fusion
- Solid State LiDAR

Health and Wellness
- Biomanufacturing
- CRISPR Therapies
- Immuno-oncology
- Microbiome Enablers
- Multiomics
- Protein Engineering
- RNA Drugs

Medical Devices and Imaging
- Electroceuticals
- Magnetic Resonance Elastography
- Molecular Radiotherapy
- Radiomics
- Telerobotic Surgery

Microelectronics
- 5G Chipsets
- AI Accelerators
- GaNtronics
- Multi-core SoCs
- NVMe-oF

GLOBAL TOP 50 TECHNOLOGIES

In the 2019 edition, as many as 40 new technologies made it to the list out of the 50, giving us a perspective that newer solutions are emerging from across the different clusters that will have a positive impact on every industry. These positives will also have an influence on the different megatrends, which are macroeconomic forces that are likely to have huge ramifications on businesses, economies, and people. A trend, such as Urbanization, Smart is the New Green, and Innovating to Zero, are concepts on which numerous solutions are built. These trends give rise to novel business models that were not otherwise thought of. Slowly, we are witnessing the influence of society on different areas, creating radical change. A decade ago, no one would have thought that most businesses will be moving towards "Uberization," which Uber has shown the world. We are transcending toward experiential living. These business models have given rise to a number of potential convergences across different industries. We are witnessing the coming together of automation, energy, and ICT industries to provide us with serendipitous innovations that disrupt traditional models. The influence of all these innovations has led to the emergence of a new breed of techno-philanthropists who are shaping the development of the "long-tail" economy. The new wave of emerging options is fuelling heavy investments from governments, venture

capitalists, evangelists and several others in the ecosystem, giving birth to the popular theme we are all excited about – Disruptive Innovations!

We now draw your attention to some of the innovations we came across that we believe will be of significant interest. These are depicted in the Top 50 chart that you see.

Within the materials realm, steady progress in R&D has propelled the development of hybrid, self-healing, nano and other materials that are likely to have an impact on sustenance, improving energy efficiency, and performance. This will result in extending the lifespan of various products and components. The broader medical devices space is leveraging developments in the domain of digital technology and creating a visible impact on technologies, such as radiomics and telerobotic surgery, which deliver a core medical value proposition through cutting-edge IT platforms and tools. In the environment space, circular and low-carbon economy principles are expected to see an upsurge in adoption in the near future as they help various industries to improve their environmental performance while simultaneously providing additional revenue streams.

Our increased focus on connected technologies brings to the fore significant developments in the field of cognitive security. The market is attractive for technologies with near-term adoptability in the area related to fog intelligence.

In the microelectronics arena, the evolution of the Internet-of-Things (IoT) and connected living could be expected to create a major stir in the smart devices market in the future due to the deployment of billions of devices. A key trend related to this development is the ever growing customer needs. Miniaturization will be a key driver as end users are constantly inclined to have electronic gadgets that are smart, handy, power efficient and, of course, economical. The spike in adoption of smart devices, smartphones in particular, has encouraged product developers and consumer electronics manufacturers to invest heavily on the research and development initiatives of technologies. High adoption of smartphones and rapid network infrastructure development are expediting the growth of smart homes (connected homes) and smart appliances. Advancements in smart home automation have assisted in navigating everyday chores efficiently. Apart from the reduction in workload, connected homes increase performance and offer optimized output. For instance, an automated solution with connected appliances would optimize the usage of appliances, thereby leading to reduction in cost and time, which will be a major boon for end users.

Key Strategies to Capitalize on Market Opportunities

In the electronics sector, the race to constantly innovate has pushed manufacturers to actively pursue partnerships, joint ventures, and collaborations to stay ahead in today's ultra-competitive marketplace.

The current stakeholders in the electronics industry are largely consumer electronics and display manufacturers, wireless communication and semiconductor developers, technology developers, research institutes, and universities. Consumer electronics companies, such as Apple and Samsung, are some of the forerunners in the electronics industry that are displaying keen interest on advancement of technologies. Automotive OEMs are also looking for potential collaborations with technology developers to incorporate the technologies in their products to offer an enhanced experience to end users.

Collaborative research initiatives and technology acquisitions are some of the key growth strategies witnessed in the electronics space. For instance, in 2014, LuxVue, a microLED company was acquired by Apple in order to use the patented microLED technology in its smartwatch.

Participants from the display, lighting, and automotive industries are expected to be the forerunners in adopting and commercializing microLED and screenless display-based solutions. Healthcare industry participants can be expected to investigate the possibilities of transient electronics and test its commercialization feasibility. Advancements in stretchable electronics would also encourage the development of flexible and transparent electronics.

2020 Scenario

By 2020, microLED is expected to be a commercially available technology in the display industry. Advanced manufacturing processes, improved efficiency, and robustness would be the key factors encouraging display manufacturers to adopt microLED as a replacement for LEDs and OLEDs. MicroLED has the potential to create an impact on the lighting industry based on developments in flexible electronics and transparent electronics.

Transient electronics would be in the final stages of research, and commercialization of the technology can be expected in the long term. Post commercialization, the technology is expected to be disruptive, particularly in the healthcare segment.

By 2020, petahertz electronics would be in the research phase and the potential for commercialization would be identified. Based on further R&D, it does have the potential to be commercialized in the long term (5-10 years).

Stretchable electronics has been in the research phase for over a decade. By 2020, some commercially available solutions may emerge due to advancements in flexible and transparent electronics. Stretchable electronics can be expected to be commercialized in the long term and have a high impact on the healthcare and consumer electronics space.

Currently, most of the screenless display initiatives are in the research phase. By 2020, holographic 3D techniques and heads-up displays are expected to be commercially available and deployed across multiple applications. Smart eyewear and brain-computer interface-enabled screenless displays would be in the research phase and their commercialization will hinge on health and safety regulations.

While each domain represents an area of intensified research & development, top-tier investments, and tremendous market potential, the possible convergence of several of these technologies opens up unprecedented opportunities for new revenue models and the next generation of innovative products and solutions.

In conclusion, we can rest assured that technologies emerging out of the innovations that we see in the Top 50 chart are poised to propel the markets forward for the next 100 years and more. They offer a gold mine of opportunities to be tapped that are both unique and abundant. Move over, pessimists.

About the author

Anand Subramanian is the Vice President with the TechVision business unit of Frost & Sullivan based in Chennai, India. Mr. Anand manages the group's overall business which includes consulting and is also responsible for providing the business unit's syndicated reports to clients. At Frost & Sullivan, Anand has focused on engagements and issues that deal with evaluation of emerging technologies and business models, their impact on market terrain and the firms that operate within it. He manages the Profit & Loss of the business unit in Asia and is the firms representative within India.
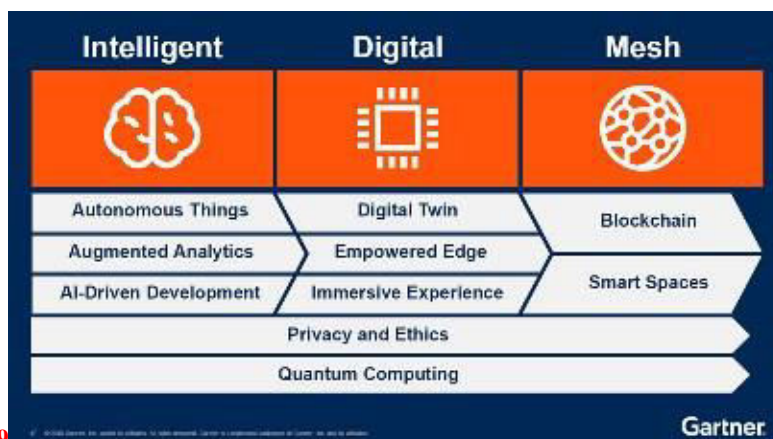
Anand has been involved with numerous proprietary engagements in North America, Europe and Asia-Pacific with Fortune 50, Fortune 500 and numerous start-ups. Anand has participated in several engagements with leading clients to help them leverage global market and technology opportunities and establish strategic partnerships. He has participated in strategic assignments for Procter & Gamble, General Motors, Lockheed Martin, Boeing, and IBM. Over the years, he has also participated in initiating and managing the production of hundreds of emerging technology studies.

Prior to his current role, Anand has worked as an analyst, project manager, and technology market consultant. He has written multiple research reports, white papers and technology articles that have been published in global research journals and prominent business magazines.

Anand has been quoted in Forbes, Washington Post and other key business dailies. He has also been invited to speak at multiple conferences as the guest of honor, thought leader and as an expert on issues related to Business Strategy, and emerging technologies in the business domain.

Anand also is the Head of Frost & Sullivan's – Global Innovation Center in India. He manages Frost & Sullivan's internal captive center which is the nerve center of all activities supporting the global offices. Anand is with Frost & Sullivan since March, 2001.

Gartner's Top 10 Strategic Technology Trends for

2019

Source & Courtesy: https://in.pcmag.com/feature/126328/gartners-top-10-strategic-technology-trends
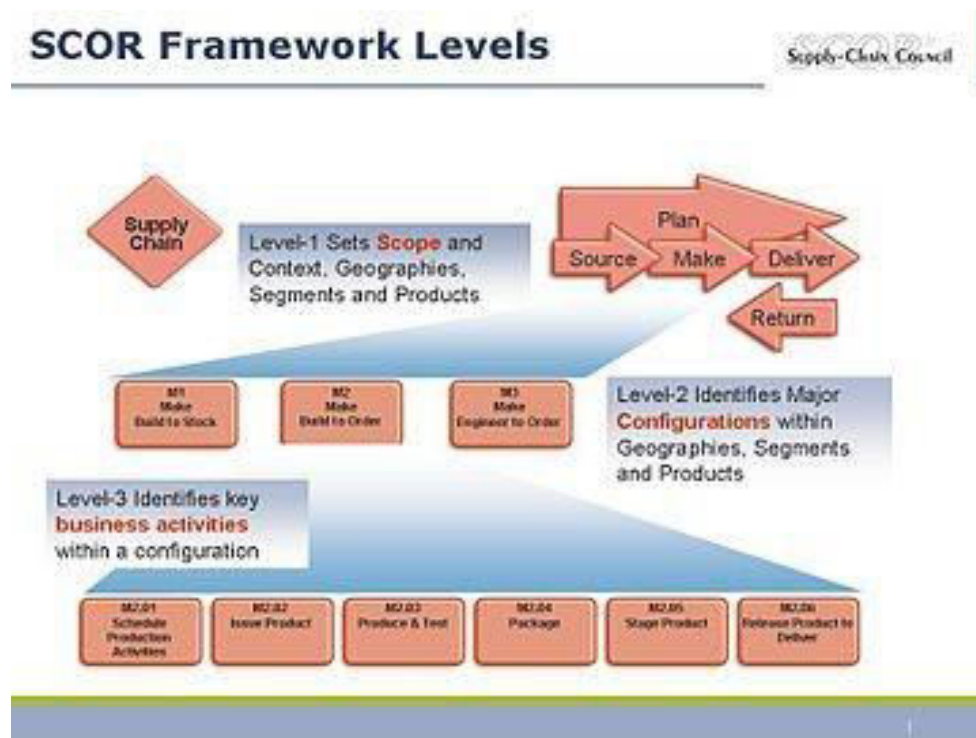
Supply Chain Management Practice in India

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Definition of Supply chain management and its evolution

The entire field of supply chain management has emerged from the contribution of supply chain working professionals such as procurement executives, stores managers, shipping and logistics trackers, inventory controllers, production planning personnel and many more who are either directly or indirectly involved in the manufacturing planning process. There is no common definition of supply chain management across the industry and each industry body, defines it in its own way. Associations alike claim supply chain management as their expertise. And to be fair, APICS, (**American Production and Inventory Control Society**) ,in its 13th edition, defines supply chain management as "the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally."

SCOR Model

This is one of the simplest and tested theoretical framework for supply chain. Supply-chain operations reference (**SCOR**) model is a process reference model developed and endorsed by the **Supply Chain Council** as the cross-industry, standard diagnostic tool for supply chain management. The **SCOR** model describes the business activities associated with satisfying a customer's demand, which include plan, source, make, deliver, return and enable. Use of the model includes analyzing the current state of a company's processes and goals, quantifying operational performance, and comparing company performance to benchmark data. **SCOR** has developed a set of metrics for supply chain performance, and Supply Chain Council members have formed industry groups to collect best practices information that companies can use to elevate their supply chain models.
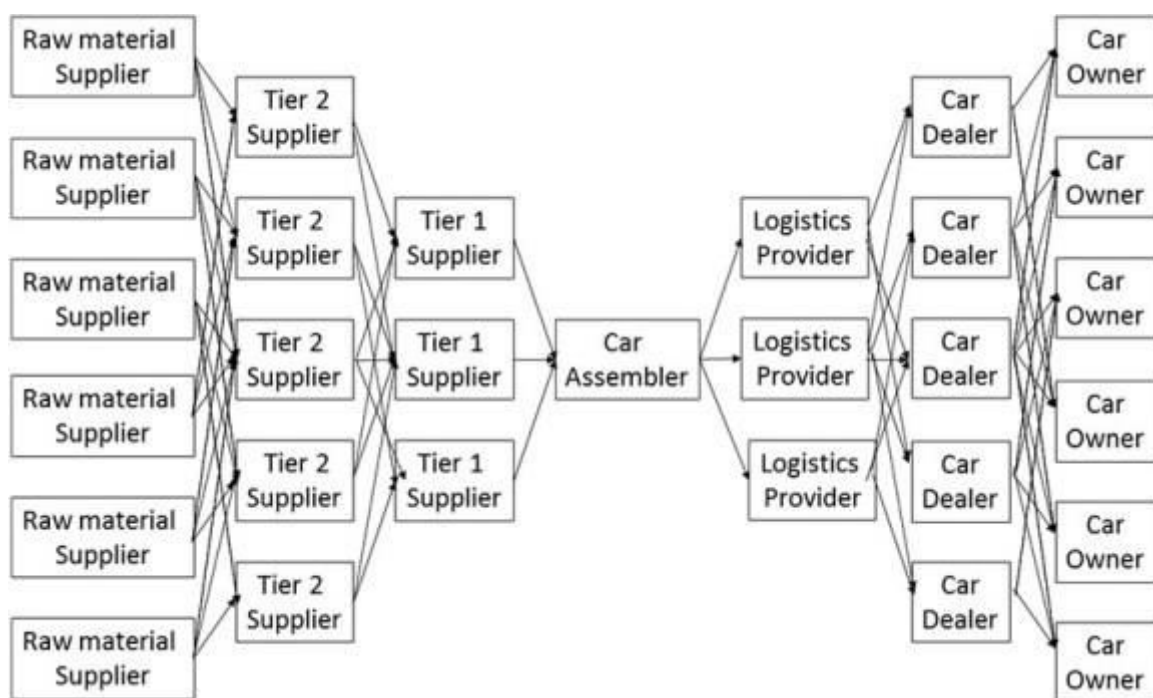
Treatment of logistics function

The *APICS Dictionary* also considers **logistics** which is a part of supply chain, as a physical activity of delivering goods, which is a part of end to end circular supply chain. Logistics in future would cover both forward and return logistics and the latter is likely emerge as a major area with increasing customer expectations and environmental norms. In essence supply chain management links, all activities to bring all stake holders together, in a circular loop. This can be seen from the following illustration

Usually it covers raw material movement from supplier and tracks till it reaches the customer, as a final usable product. This would also include information flow and money flow.

End to end supply chain

For example, in an automotive supply chain almost as a standard across the globe, the end to end supply chain begins from a car owner and the process is linked through the automobile dealerships distributed across the geography. These dealers are serviced through the logistics provider for getting the physical supply of products like cars in showroom condition by the car assembler. The assembler in turn is primarily supported through components and supplies from the sub-assembly vendors like alternator, starter motor, fuel pump suppliers who specialize in a particular component assembly. These suppliers are termed as Tier 1 suppliers. They have backward linkage with Tier 2 suppliers who in turn provide the required parts for making the sub-assemblies. Sometimes it can also extend to Tier 3 and Tier 4 suppliers in few cases before reaching the last stage, i.e raw materials supplier. An intricate web of a number of players dealing with a variety of materials, ranging from steel, aluminum, copper, rubber, plastics, chemicals and consumables together contribute to this value-adding chain. Many of the subassemblies themselves involve an intricate design and in quite few cases patented processes such as in the case of exhaust mufflers in the modern cars also exist. An illustration of this network of supply chain players is given below

Circular concept in supply chains

A typical buyer of a new car in a developing nation like India looks for many technical parameters in the purchase decision, such as styling, ergonomics, , ease of servicing and performance on road. They also consider commercial parameters like brand image, purchase funding options and after market value for making a purchase decision. Increasing awareness and pressure from regulatory agencies to protect the environment is pushing the manufacturers to reuse or refurbish the
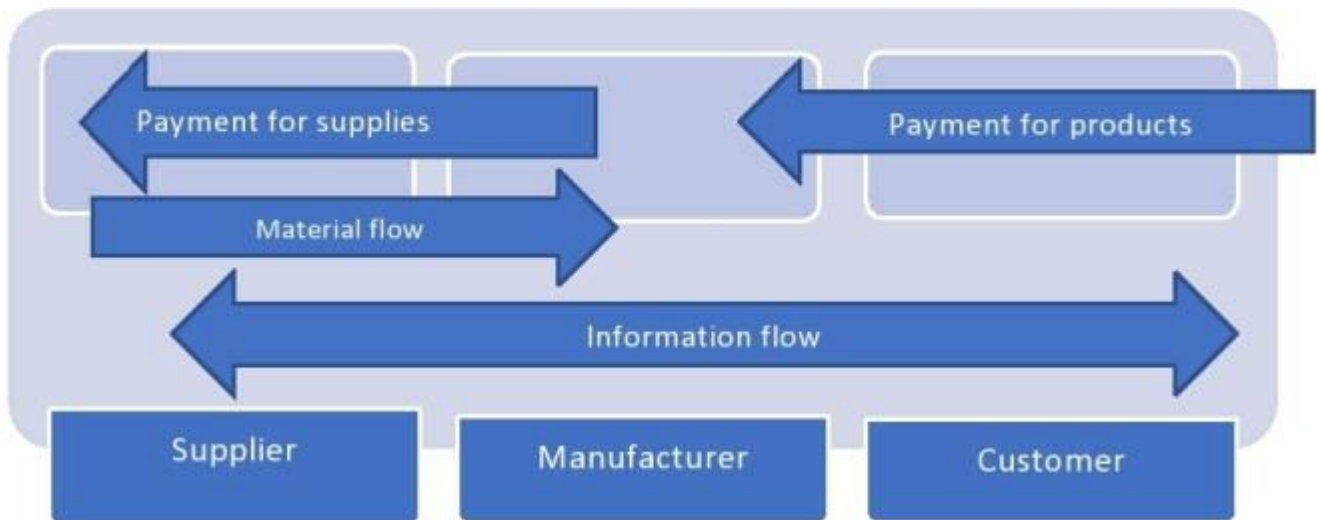
components to lessen the harmful impact on environment. Therefore, it can be said that the emerging supply chains of the future will start with the customer and end with the customer, **i.e circular supply chains.**

Illustrative examples

To illustrate with an example, a Swedish OEM uses one third of recycled re-cycled materials in assembling a new truck by their designs with 90% recyclability. Another OEM uses recycled aluminium which reduces energy consumption by 95%. A French OEM leases battery for electric cars. In India aluminium, is almost recycled fully as it has a well -developed scrap collection and disposal from both domestic and industrial waste. Even plastics are recycled but their waste collection is not as rigorous as aluminium.

Supply chain management essentially has three flows namely

Supply chain management essentially has three flows

- the product and services flow which is normally unidirectional except in case of product returns and rejections
- the fund flow, i.e payment for the products and services received from the customer and in turn, payments effected to suppliers
- the information flow, which can be two directional i.e between the customer and manufacturer and supplier and manufacturer

Supply planning process

The first phase in supply chain management starts with supply planning process. In the supply chain operations, there exist three different environments, among the different products and services that are offered to end customers. They correspond to **Made to Stock (MTS)**, **Made to Order (MTO)** and **Continuous (Process)** methods of production. There is also a small variant in the Made to Order Category in cases where high level of design and customization are involved, which is termed as **Engineer to Order (ETO)** environment. Products like soaps, shampoos, consumer durables like Television, washing machines fall under the MTS category. In these categories demand is totally dependent on the manufacturers plans to utilize the available production capacity to the hilt. Even then, there is a complex product mix planning. This is necessitated due to varying consumer demands for various product lines and individual products. These are based on their brand image and seasonal demands due to factors like weather etc.

Normally, for MTS product category, batch production schedules are prepared and the products produced in batches are kept in inventory to meet the demand during the non-production period. In most cases, the products will be highly standardized without any customization and have low value per unit. The physical size also will be small which enables quick movement of inter depot transfers in case of sudden spurt in demand in certain locations. For supply planning, in such chains, there is very little involvement of the front-end customer facing dealer except to provide logistics services and commercial billing and delivery. Economical production in batch quantities and capacity utilization are the driving forces for supply planning in MTS environment.

Unique case of automobile industry

In the case of automobiles, even though, they technically fall under MTS category, the product mix variants can create lot of mismatch between customer demand and production plan, such as in the preference for a specific color, add-ons like power steering etc. In such cases, the data on anticipated demand from customers is continuously collected from dealers based on the footfalls in the car showroom, which is aggregated across the country. In all car companies in India, the demand for product mix is calculated in real time and countrywide ERP implementation across all selling points is considered as a must. Most companies have direct EDI interface with their Tier 1 suppliers and are gradually extending the electronic data interface to Tier 2 suppliers as well. This method of production, for stock purpose is called "**push" method in manufacturing**

Scheduling with Tier 1 suppliers

It may be noted that the supply chain planning process for a Tier 1 supplier does not follow automatically from the car assemblers plan. The reason is that the supplier in Tier 1 needs to cater to the dependent demand from the car manufacturers, which are mostly in the form of firm schedules specifying products, their quantities demanded and required delivery. However, the Tier 1 suppliers also cater to the independent demand that arises from the after-market. While it would be easy to forecast requirements for say the number of steering gears required for a new car under manufacture, as it is dependent on the production schedule of a car manufacturer, the same is not possible for the requirement of after-market for steering gear. The wear and tear in usage causes independent demand and is unpredictable as such. Besides the preference for the users of cars will vary widely with regard to utilizing the car due to individual perceptions and preferences, to replace them instead of repairing etc. In certain geographies, non-availability of skilled personnel to provide service could also affect the demand for spare parts in the after-market.

Preference for Pull manufacturing

This leads to a high level of uncertainty in demand planning for the after-market and coupled with early product obsolescence by the designers, can make the independent demand highly dynamic. In all such cases, the demand is directly linked to the customer pull or customer need. Planning accordingly is based on customer need which is either directly measured like in the case of firm orders or expected demand for example in a textile showroom, during peak festival season. Such methods of production are termed as "**Pull" manufactured** wherein, the manufacturing is initiated whenever there is a **customer pull**.

One of the key complexities in planning for supplies is due to the reducing product life cycles. Earlier, many decades back, typical Indian customers preferred to maintain their cars over 10 years, whereas the emerging customers keep changing the cars, between 3 to 5 years. Even the design of cars has provided for lowering of overall life of a car, since the older products may not be able to meet statutory compliance such as new emission norms like BSVI etc, in future, as they become dated.

Make or buy decisions

The second phase in supply planning is to decide between making the component inhouse or procuring it from outside. This is termed as make-or-buy decision, which indicates the strategic choice between producing an item internally (in-house) or buying it externally (from an outside supplier). The buy side of the decision also is referred to as outsourcing. There can be number of reasons for either making a product or buying it from outside. As a general rule, most companies want to focus their efforts on core activities to sharpen their core competence. Therefore, non-core activities become obvious candidates for outsourcing. However it does not always explain why some of the core components like a crankshaft or axles in the automobile industry are still outsourced. Make-or-buy decisions usually arise when a firm that has developed a product or part wants to move away from that product and assign the supply to a reputed supplier so that they can move higher in the value chain.

Automobile industry practice in India

Make-or-buy analysis is conducted at both the strategic and operational levels. Obviously, the strategic level is the more long-range of the two. Variables considered at the strategic level include analysis of the future, as well as the current environment. Issues like government regulation, competing firms, and market trends all have a strategic impact on the make-or-buy decision. Of course, firms should make items that reinforce or are in-line with their core competencies. These are areas in which the firm is strongest and which give the firm a competitive advantage.

It can be seen that the following core factors generally cause a decision to make a component or product themselves. They are some and not fully exhaustive.

- ✓ When cost is a significant factor in business the less expensive route of making is chosen
- ✓ Use of excess capacity so that part of fixed costs such as overhead can be shared
- ✓ Direct control over production/quality is needed to sustain the quality or brand image
- ✓ Protecting the proprietary design or technology from spreading over
- ✓ Unreliable supply market and questionable level of competence of key suppliers
- ✓ Control of lead time, transportation, and warehousing costs
- ✓ Greater assurance of continual supply and leveraging of stable work force

Issues in core technology in automobile industry

Lead time issues: Development of technology in automobile components in India, is beset with getting a joint agreement from different stakeholders like public authorities and Governments as it uses the roads which are public owned. It also requires approval from the apex regulatory agencies like ARAI Pune for getting in principle approval for newer technologies as the apex approving body, acceptable to all stakeholders. The automobile OEMS who carry the last word of approval, need to create space in the crowded market place in their product mix. They also need to match various subcontracted aggregates to perform in unison to deliver the final vehicle performance. In most cases it is the time that is more critical than the cost, as can be seen in the slow shift that has taken place in India towards higher performance vehicles as compared to bare basic products like the recently phased out Maruti 800 cc car by the manufacturer, as an example, which had ruled as the single largest product over last 30 years.

Development cost implications: In every case of product development, a component supplier in India, unlike his Japanese counterparts may not have the requisite funding base for new technology. Therefore, in many cases even when the stakeholders are well aware of the limitations of the existing product, for example in the carburetor driven gasoline engines system, a full-scale shift to fuel injection pumping, a technologically superior method may not take place, quickly. The larger issue of servicing the geographically thinly spread after-markets for supply of spare parts and training of the service personnel in the unorganized sector with new technology can really become a nightmare in logistics. This is one of the reasons that currently, the battery technology in vehicle operations is taking roots slowly even with a high level of interest by major manufacturers and Federal Government, to protect environment.

Supplier organization issues: Most suppliers in India have started their business operations from a small-time business startup or with limited public participation in the initial stages of business. Except few of the second or third generation established Tier 1 suppliers in the field like TVS business group in the southern India and Anand business group in northern India, many suppliers are located near their single major customer like Gurgaon in Delhi, where the first plant of the single largest manufacturer of cars in India- Maruti Udyog Ltd began their operations in year 1983. The next level of Tier 2 suppliers has difficulties in running their organization with professionals, as their ability to attract skilled talent in India is limited. The younger generation managers also tend to shift towards career in non-auto fields like information and communication technologies which offer quicker growth and shorter lead times to acquire new skill-sets needed for that sector. In a typical automobile Tier 2 supplier organization, a freshly inducted executive becomes really productive only after a number of years as he/she requires ability to operate under scaled down conditions like managing limited supply base, geographically spread markets, stifling local regulations such as labor market hiring inflexibility etc., which are unique to Indian market.

Outsourcing decisions

The decision to outsource is strongly preferred when

- The part is not essential to the firm's strategy and lack of expertise to make it in-house
- Suppliers' research and specialized know-how exceeds that of the buyer and at lower cost
- Limited production facilities or insufficient capacity inhouse
- Difficulties in procurement and inventory considerations
- Supplier company has strong brands

Outsourcing due to unrelated technology

Many times, technology itself becomes an issue. Even in the same category of a product, take the case of tires, their application varies widely from a simple bicycle to most advanced aircraft landing gear tires. While they may have few common material ingredients, the technology is quite different and it varies across different products. For example, in the case of cars which operate under high road speeds continuously, with limited load, the cornering characteristics of tire are most critical and hence radial tires as compared to cross-ply tires in principle, may get a preference by the automobile manufacturers in procurement. Whereas in the case of bicycle tires the market for which is fully distributed across the Indian retail space, price is the single most determining factor. Therefore, in the case of cycle tires manufacturers, necessarily they have to outsource to get the entire product supplied by a least cost vendor and the other factors like quality, delivery and service in the supply chain take secondary importance. In the case of SUV vehicle tires, the quality assumes

the highest significance as the products are under keen public eye and most of SUV vehicles are used as status symbol brands in India and the best brand available is procured

In the case of car tires, the major delay in India in introducing radial tires in a big way was due to the resistance from the after-market which had significant volumes and had high preference for the older technology. The reason is that the older technology of cross-ply tires enables reconditioning of used tires with retreading to extend their economic life. Due to strong patronage for this feature by a number of users, for retreaded tires in preference to higher cost new tires, the after-market shift to radial had been slow. This preference is not applicable to both bicycle and aircraft tires in principle itself, as retreading in both cases have no takers.

In- between category in outsourcing decisions

The most difficult part in the make or buy decision by Indian automobile assemblers, is the in-between category. While the crank shaft for example, a highly technology driven and capital-intensive component is fully outsourced, the gear manufacturing an equally critical component is mostly manufactured in-house, as the criticality of performance of later is immediately visible in the market and that acts as the single-most important factor. The in-between category say camshaft which is not as critical technically as a crank shaft (as it does not take direct explosion of the combustion process in engine) it may make sense to outsource, but the commonality of process with crank shaft may result in manufacturer to make it in house as well.

Few products like auto-electricals for example require a high degree of technical specialization which is possible only by those who are competent in it. That is why companies like Bosch, Lucas TVS are used as vendors for electrical components who have the technology, global spread and volumes to supply.

Now we come to another in-between category in low value addition. In the case of automotive chains, it is a critical performance product with low technology. For two wheelers it is most critical for performance and without exception only the technically sound vendors like TI Diamond Chain and LG Rolon Chains are the known suppliers, preferred by the two-wheeler manufacturers. However, a number of processes, within the automobile chain manufacturing are labor intensive in the various stages of chain manufacturing. While it may be desirable to outsource the entire product line, to a third-party manufacturer, they would not be able to match the quality standards of large organizations like Murugappa Group or LG group in India. Therefore, they leverage their existing competence in developing external supply network by permitting contract manufacturing in select areas like chain link assembly etc, within their manufacturing facilities using limited contract labor, which are labor intensive processes.

In the case of cycle frames, which is a super critical factor for bicycle performance, TI cycles of Murugappa group in their second manufacturing green field plant at NOIDA in UP near Delhi, have positioned their single supplier for cycle frame assembly in NOIDA, adjoining their manufacturing facility. In fact, the out gate of the supplier is positioned just in front of in-gate of TI cycles assembly line in the manufacturing plant. This not only makes material movement easier, but reduces inspection needs. It offers high flexibility in manufacturing to make instant changes in product mix planning in daily manufacturing schedules. Therefore, in automobile component and assembling industry in India, contract manufacturing has turned out to be an in between category of both Making (for some processes) and buying from outside (shifting part of work outside).

Value Analysis and Value engineering application

Most automobile OEMs jointly work with suppliers to ensure a year on year cost reduction agreement in procured components. This is possible only when value analysis is carried out continuously to explore minor changes in design parameters or in the manufacturing process. Since material cost accounts for more than 60% of the cost of component, reduction in material use or alternate material selection at a lower unit price or a change in design parameter either in the design itself or by changing processes this can be enabled. Sometimes the performance of two components can be combined by redesigning and replacing them with a single component, saving significant costs.

Strategic sourcing as a supply development strategy

Increasingly strategic sourcing is utilized as the best choice for the critical supplies of automotive components. Most manufacturers, operate with " Just In Time (JIT)"strategy for supply replenishments in their assembly lines. This is necessitated by the high speed of manufacturing wherein an assembly line almost produces one car every two minutes. In such a critical speed of operation, it makes sense to make institutionalized arrangements in purchasing with commitments made and executed on a long-term basis. Many critical components, that require high capital investment may not undergo significant design changes and a continuous improvement by an existing supplier can meet the requirements over a period of time. But that requires commitment from both buyer and seller and strategic source as a strategy helps in this process. Many times, strategic sources are also single sources creating mutual dependence and consequent trust-building.

Conclusion

To sum up automobile industry in India had to evolve its own processes in supply planning due to customer practices and supplier issues. This becomes more relevant even when new technologies like electric vehicles get introduced as a number of components like battery for example may require an understanding of user preference in advance in supply planning for manufacturing of these vehicles. This coupled with the issue of likely statutory regulations for used battery disposal will need to be addressed even at the concept planning stage in supply development.

About the authors

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7 Reasons Why the Supply Chain Matters to Business Success

Whether you are the CEO of an expanding corporation or the owner of a fledgling enterprise, its fortunes are subject to an undeniable truth. The success of your business links inextricably to the performance of your supply chain. If you want business success (and who doesn't?), you have to make your supply chain successful too. Of course, it is helpful to have some statistics on hand to validate the statement above. First though, since the topic is "business success", let's be clear on what that looks like.
https://www.logisticsbureau.com/7-reasons-why-the-supply-chain-matters-to-business-success/

Blockchain Technology is Set to Transform the Supply Chain

Supply chain has become complicated. Some would say cumbersome. It takes days to make a payment between a manufacturer and a supplier, or a customer and a vendor. Contractual agreements require the services of lawyers and bankers, each of which adds extra cost and delay. Products and parts are often hard to trace back to suppliers, making defects challenging to eliminate. Friction in the supply chain is a big problem. There are too many go-betweens. There is too much back and forth. The rise in uncertainty stops supply chains from working well. Suppliers, providers, and clients must interact via central third-party entities instead of directly with each other. Ostensibly simple transactions turn into lengthy multi-step procedures.

Blockchain could be the answer to many of these issues. This recent technology is what drives Bitcoin and other so-called cryptocurrencies. However, it goes much further than an unhackable way of holding and exchanging money. Blockchain can manage any form of exchange, agreement, or tracking process. In a supply chain, it can apply to anything from self-executing supply contracts to automated cold chain management.
https://www.logisticsbureau.com/how-blockchain-can-transform-the-supply-chain/

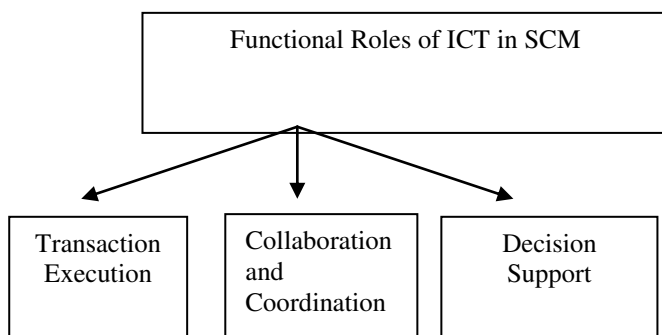# An Overview of ICT Tools for Supply Chain Management

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1. Introduction

Rapid technology advances and dynamic market forces have altered the business landscape as also fundamentally altered existing business models. Information and Communication Technology (ICT) usage and deployment has opened the doors for companies to compete in any marketplace. Even companies, which have been benefiting from protectionist policies by governments, are now exposed to the perils of increased competition due to liberalization, privatization, pricing pressures and globalization. This challenging and dynamic business environment is popularly referred to as VUCA short for Volatility, Uncertainty, Complexity and Ambiguity. Information sharing between partners in the supply chain is also crucial and these integration attempts are accompanied by ICT initiatives. Such ICT initiatives include:

- Use of bar-coding in logistics systems
- Use of EDI to communicate between branches
- Use of Material requirements planning
- Enterprise Solutions like ERP
- Internet and web services for communication between partners

Early studies on the impact of Electronic Data Interchange (EDI) on Just-in-Time (JIT) shipments in the automobile industry showed significant earnings with lowered shipment errors. Researchers have pointed out that it is necessary to develop a supply chain-wide technology strategy that supports multiple levels of decision-making and gives a clear view of the flow of products, services, and information. An interesting and inclusive attempt to outline the wide impact of ICT in SCM is the definition of functional roles of ICT outlined as follows:

Fig. 1: Functional Roles of ICT in SCM

2. Benefits of ICT Deployment for SCM

Many of the buzz words in SCM such as Vendor Managed Inventory, Point of Sale, Collaborative Planning, Forecasting and Replenishment and ERP stem from ICT usage. ICT tools are great enablers, enhancers, levelers and facilitators of enterprise operations and thereby have become a determinant of competitive advantage for enterprises. Fundamental changes have occurred in today's global economy. These changes alter the relationship that we have with our stakeholders, our customers, our suppliers, our channel partners, and our internal operations. ICT deployment for SCM results in a shift from the linkage between physical processes such as inventory, warehouse or shipping to information-based processes across supply chain operations ICT advances generate new opportunities when suppliers, business partners and customers work together to co-create and co-produce value

ICT deployment significantly improves supply chain process integration, which leads to better enterprise performance. Improving buyer-supplier relationships and accessing actionable knowledge in a suitable manner as also managing dialogue and coordination among various stakeholders are other benefits. This greatly increases the ability of the enterprise to respond to market dynamics. Seamless access to the information as also the visibility and transparency of the information increases the efficiency of different supply chain processes.

Deployment of ICT for various processes can bring about spectacular improvements in efficiency. Auto-ID technologies such as bar coding and RFID have rendered inventory management effective and brought about inventory visibility and transparency, transportation management systems have optimized routes for shippers; Internet-enabled services have brought about better communication, collaboration and dialogue among various stakeholders. Other benefits outlined by

researchers include cost savings; improved operational efficiency, inventory visibility & control; quality, reliability & accuracy of information; improved communication, collaboration & customer-connect and innovation & differentiation of products or services.

According to a study be published in Harvard Business Review, ICT deployment in SCM helps enterprises achieve competitive advantage through improvement in adaptation, alignment and agility in their supply chains. Information technologies and information sharing are also described as key constructs to achieving to achieving supply chain integration. ICT competences are likely to improve an organization's ability to innovate and respond to customer requirements. In other words, ICT impacts all 4Rs of the supply chain namely responsiveness, reliability, resilience and relationships.

ICT can also be classified as ICT advances and ICT alignment. ICT advancement measures the extent to which a firm applies the state-of-the-art technology to augment its supply chain capabilities while ICT alignment reflects a firm's strategic emphasis in coordinating and integrating its own IT with that of its supply chain partners.

3. ICT value-add for enterprises

In 1994, an early study done on 193 automobile suppliers with respect to EDI usage for Just in Time shipments demonstrated encouraging outcomes. EDI application dramatically brought a reduction in the shipment errors thereby brining about substantial savings for the EDI-enabled enterprises. Cisco estimated savings of US $500 million leveraging web-services for its supply chain integration. Major suppliers of Wal-Mart such as Proctor & Gamble (P&G) have direct access to Point of Sale (POS) information from Wal-Mart retail outlets. By migrating placing of orders to an online application, Intel could eliminate hundreds of order clerk positions. Celestica, one of the world's largest electronic manufacturing services companies, has applied a web-based ICT tool to manage its network of suppliers across the globe. Thereby, the company could improve its customer-responsiveness, primarily helping its customer, Dell to maintain its delivery promise to end-users. Motorola used collaborative planning forecasting and replenishment tools and dramatically improved their supply chain visibility by ensuring that shelves are fully stocked and inventory levels are reduced. Seven-Eleven Japan used 70,000 interconnected Point-of-Sale (POS) terminals in stores, and computers at headquarters and supplier sites to capture real-time information and to track inventory so as to achieve greater supply chain transparency, enabling store owners to strategically stock and price items thus changing the nature of retailing in Japan

4. Overview of ICT tools for SCM

Several ICT tools are well-entrenched and widely deployed in the supply chain context. These include:

- Electronic Data Interchange (EDI)
- Bar coding and Scanner
- Enterprise Resource Planning (ERP) Systems
- Warehouse, Transportation and Inventory Management Systems

However several ICT tools for SCM are not widely deployed. We refer to them as fast emerging ICT tools. Emerging ICT tools like software agents, RFID, web services, electronic commerce, cloud computing, social media, mobile technologies, high performance computing, business analytics and decision support systems hold tremendous promise for improving supply chain performance and integration. These tools are being deployed to aid various operations for supply chain planning and execution. The rapid adoption of the Internet for communication with all stakeholders seems to reflect the potential of the new-age communication media. The impact of various emerging tools and their application domains in SCM are listed as follows:

- RFID: RFID enables managers to capture and deliver information necessary to make good decisions. This Auto-ID technology offers businesses increased supply chain and inventory visibility for greater operational efficiency, better tracking of transportation and warehouse channels with reduced inventory RFID is widely being deployed for various SCM processes like inventory management, asset tracking, VMI, demand shaping, production workflow and customer relationship management. RFID is now very popular in retail establishments all over the world.
- Decision Support Systems (DSS): Supply chain partners increasingly have to resolve conflicts among themselves in the face of extreme cut-throat competition. Decision Support Systems (DSS) is a potent tool that can be deployed for conflict-resolution in such situations and also designed to provide analysis and comprehension of complex supply chains effectively. DSS are being used to IT-enable strategic supply chain activities like inventory & transportation management, capacity & demand planning, production & distribution planning and sales forecasting.
- Software Agents: A decentralized approach to SCM using software agents has the benefit of solving the tasks by various participants in the supply chain network through their local intelligence and problem-solving paradigms. Using agent-based technologies, suppliers and manufacturers can negotiate through interaction mechanisms and

distribute various activities in a decentralized manner more efficiently. Software agents have made inroads in various activities of the supply chain like production planning, production monitoring, workflow modeling, negotiation, logistics, scheduling and transportation management.

- Cloud Computing: Cloud computing and associated technologies like virtualization, and software as a service is touted as the next 'big' thing and game changer for enterprises. With several enterprises off shoring their manufacturing and service operations to low-cost hubs in Asia with poor infrastructure and transportation networks, visibility has become a major challenge. Cloud computing can integrate all partners in this increasingly global extended supply chain into an online social network like community with real-time information on all elements in the supply chain. Several solutions are now available and many enterprises have made the shift with good results. Application areas where cloud-based solutions are available include demand forecasting, demand planning, e-procurement, distribution, inventory, warehouse and transportation systems.

- Web Services: Web services are application interfaces accessible via Internet standards that use XML and that employ at least one of the following standards: Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL) or Universal Description, Discovery and Integration (UDDI). These standards, and the next-generation standards that are being built on them, are defining the way that forward-thinking enterprises manage lightweight integration tasks. To fulfill orders, the retailer has to manage stock levels in warehouses. The stock re-ordering and replenishment are automated using web services to spectacular results.

- Business Analytics: Business analytics aims at building fresh perspectives and new insights into business performance using data, statistical methods, quantitative analysis and predictive modeling. Advanced analytics is being employed for several processes in supply chain planning and execution like demand forecasting, inventory management, production & distribution in planning.

- High Performance Computing: High Performance Computing (HPC) systems bring additional benefits of scalability, integration, portability, processing power, storage and interoperability for SCM. Mega corporations and retail giants like Wal-Mart and Pratt & Whitney have deployed HPC for SCM and thereby achieved efficient and effective data administration and analysis.

- SMAC stack: An integration of disruptive and game-changing technologies in the form of the SMAC - Social, Mobile, Analytics and Cloud stack promises to be the next wave in enterprise computing. By 2020, IDC estimates that ICT spending worldwide could touch US$5 trillion mark with fourth-fifth of this driven by the SMAC stack, which is the seamless intersection of the SMAC technologies. Technologies within SMAC complement each other and combined together deliver a force-multiplier effect to transform supply chains into value chains. The resultant value chain would boast of the advantages of robustness, agility, responsiveness, scalability, transparency and visibility. Mobile technologies and cloud computing can easily integrate diverse hardware and storage devices. Social media can facilitate instant dialogue collaboration. Business Analytics provide dashboards after mining the enterprise Big Data available through several sources. SMAC technologies can be easily accessed by all with the recent trend of enterprises encouraging their employees to Bring Your Own Device (BYOD). Various application areas of SMAC stack in SCM could include inventory management, supply chain planning & execution, optimal use of legacy applications, collaboration and customer engagement.

- Industry 4.0: This is a recent buzz word given to the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, Internet of things (IoT), robotics, Artificial Intelligence (AI), machine learning, 3D printing and cloud computing and is popularly referred to as the fourth industrial revolution. Industry 4.0 fosters what has been called a "smart factory" and also Industrial IoT (IIoT). Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, i.e. connectivity of physical assets, cyber-physical systems communicate and cooperate with each other and with humans in real-time and with humans in real-time both internal & cross-organizational services are offered & utilized by participants of the value chain. The value chain thereby becomes more agile, collaborative, visible and responsive. An example would be a totally connected and retooled supply chain, which can reconfigure itself on receipt of any new data point. If weather delay ties up a shipment, a connected system can proactively adjust itself and modify manufacturing priorities. With respect to SCM, there are some recent studies on challenges and risks of the Internet of Things (IoT) in SCM.

5. Assessment Framework for measuring impact of ICT in SCM

While most researchers and industry practioners are unanimous about the fact that ICT positively impacts SCM performance and improves supply chain capabilities, there an identified gap in terms of assessment and measurement of these ICT benefits and capabilities in SCM. This is despite the fact that there are several SCM performance measurement frameworks. There is also lack of clarity on the magnitude ICT has improved the competitive advantage of enterprises through improvement of supply chain.

Research is underway to develop an empirical model and assessment framework of the benefits of ICT deployment in SCM and its dovetailing into APICS Supply Chain Operations Reference (SCOR) model. This inter-disciplinary research effort by the author is under the guidance of Dr. S.P. Anbuudayasankar, Associate Professor, Department of Mechanical

Engineering, Amrita Vishwa Vidyapeetham, Coimbatore campus. The rubrics and performance indicators of various constructs for measuring of the impact of ICT in SCM are being used to provide enterprises with an ICT capability index metric for SCM. Well-defined metrics and constructs from the SCOR process reference model namely reliability, responsiveness & agility, which are considered customer-facing and cost & assets, which are internal process-facing are used for the same. Validation of this assessment framework has the potential to open new vistas on selection of appropriate ICT tool after measurement of its impact on the supply chain paradigm and understanding success factors and operational challenges for adoption of these tools. This can translate into immense potential and savings for Indian industry, both large and Micro, Small and Medium Enterprises (MSME) standing to gain considering the fact that global supply chain losses amount to over 100 billion dollars annually.

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13 Essential Types of Supply Chain Management Tools

As Amazon continues to raise the bar, the margin of error within supply chain management gets thinner and thinner. A simple mistake could easily cost your business thousands of dollars and allow your competitors to get ahead. But thanks to supply chain management software, it's never been easier for companies to avoid such pitfalls. Supply chain management tools and techniques make it possible for users to reduce errors and costs while optimizing the entire supply chain. Here are 13 different types of supply chain management tools that make these SCM software packages valuable to companies:
https://selecthub.com/supply-chain-management/13-essential-supply-chain-management-tools/

Top Supply Chain Analytics: 50 Useful Software Solutions and Data Analysis Tools to Gain Valuable Supply Chain Insights

Supply chain managers cannot afford to operate in the dark as global operating systems, pricing pressures, and increasing customer expectations become the norm, as Paul Myers, professor of practice in supply chain management at Lehigh University explains. Various economic factors such as rising fuel costs, changing supplier bases, increased competition from low-cost outsourcers, and the continuing global recession significantly impact the supply chain and create waste. Supply chain analytics is the solution to these issues because using data helps companies make more informed decisions with a greater level of insight and have access to better models and simulations.

As data analytics becomes critical in supply chain operations and management, supply chain analytics software solutions and tools have become must-have technologies. Many supply chain analytics tools feature improved forecasting and sales and operations planning to give supply chain managers the business intelligence they need to streamline operations, lower costs, and improve customer service.

We have rounded up 50 of the top supply chain analytics tools to help busy supply chain managers find those that will be of the most value to them. The tools that we chose to include are from some of the leading software and analytics companies, and they all include features to deliver value and improve operational efficiency. Many of the following tools include inventory analysis, transportation analytics, demand forecasting capabilities, and predictive analytics to serve as comprehensive solutions for supply chain analytics. Some of our tools also are supply chain management (SCM) solutions with built-in analytics to give companies a more cost-effective solution. Please note, we have listed our 50 top supply chain analytics tools here, in no particular order.
https://www.camcode.com/asset-tags/top-supply-chain-analytics/

Supply Chain Management Products & Buyers Guide

While the supply chain management software market is relatively small (compared to many other markets), the vast disparity in functionality between different SCM programs makes buying decisions much more complicated. Some programs concentrate on business intelligence, others focus on inventory control or transportation management and there are full-suite systems that do all of the above and more. This product & buyer's guide is designed to identify the features associated with supply chain management systems to help navigate the selection process.
https://www.softwareadvice.com/scm/

AI for All

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What is AI

Many problems in the world that once seemed impossible for a computer to tackle without human intervention are solved today with Artificial Intelligence. We are witnessing the second major wave of AI, disrupting a plethora of unrelated fields such as health, ethics, politics, and economy. These intelligent systems prove that machines too can learn from experience, adapt, and make meaningful decisions. While the first wave was driven by rule-based systems where experts in performing a task handcrafted a set of rules for machines to follow, thus emulating intelligence, the second wave is driven by huge amounts of data, coupled with algorithms that enable machines to recognize patterns and learn from experience.

Impact

Though at a very early stage, AI has already made a profound impact on our lives. However, the nature of the impact it has made on different establishments is as unique as itself.

On Enterprises

Enterprises are seen to make the best out of the second wave of AI, primarily owing to the abundance of data they already collect every second. Deep Learning - a subset of Machine Learning, that allows recognizing and learning from complex patterns in data - feeds on huge magnitudes of data in the order of millions of samples. Large enterprises have the benefit of being capable of collecting such data in-house for their own systems, products, and services. Today, numerous such organizations that operate at scale are starting to use AI to automate workflows, streamline their operations, and optimize production.

On Startups

Realising AI's massive potential to solve problems, entrepreneurs have been quick to adopt new strategies and launch startups with AI at its core. Usually, startups are always at the risk of being copied, and hence are in need to continuously evolve and innovate. With AI, startups enter a new paradigm of competition. The ones with better methods to acquire quality datasets come up with better AI models, and hence better products and services. Today's AI startups are helping established companies easily adopt AI. By providing AI models that power chatbots, predict and optimize resource consumption, and much more, these startups have become exemplaries to make use of state of the art AI algorithms and methods like transfer-learning and federated-learning.

On Society

The inception of the Internet gave birth to a new community of problem-solvers, who utilized technology to address many pressing problems in society. With recent advancements in AI and availability of cheap computing resources, a whole new dimension of problems is being solved with AI. From providing better insights to farmers by processing aerial footage and satellite imagery of the field to counselling people under depression through a friendly conversation, AI is helping save lives, cut down cost, reduce waste and make a positive impact on billions of people. Of course, more than any technology adoption in the past, AI will demand an enormous cultural change. Humans have always been skeptical in depending on technology and let it control their lives. We are already witnessing such moments, an example being self-driving fleet that is a reality today. Questions of ethics and decision making in AI still remain unanswered. AI is as much a weapon as it is a tool, and a strong government regularisation and policy making is going to be essential.

Future of AI

All the recent buzz around Artificial Intelligence and its advancements fall into a specific class of AI called Artificial Narrow Intelligence (ANI) or Weak Artificial Intelligence. These are AI systems designed and trained for a dedicated task which it performs with incredible accuracy. We are seeing a record-making number of research publications and breakthroughs in this field, and technology companies are embracing its power to unlock new possibilities. Yet, they fail to sound like the AI we know from the movies. That's because those fall into a different class of AI called Artificial General Intelligence or Strong Artificial Intelligence. These are systems that can perform multi-domain tasks and generalize its learnings to perform new tasks just like humans. There has been very little progress in this field, and only a handful of organizations around the world are working to push its boundaries. The future of AI lies in the advancements in this field, and we won't be seeing AI surpassing human intelligence anytime soon.

Why Democratize AI

In an ideal world, elegant AI solutions should be equally accessible by people of all backgrounds. Bias is inevitable, but what's important is that these solutions should be equally biased by all. Additionally, any organisation of any size should be able to build their own AI based solutions. True democratization of AI happens in three layers - Data, AI Skill, and Infrastructure.

Data

AI models are trained on large datasets from which the model "learns". Hence for any organisation to build its own AI models, availability of quality open datasets for a variety of tasks is crucial. These datasets should consist of samples that apply to a generic audience, and should be reusable to build models for similar but different tasks. Recognizing the need, many tech giants, large firms and government organisation have started opening up their datasets. Transfer learning allows taking a pre-trained model and re-training it with application specific data, hence being able to build a model with a very small dataset.

AI Skill

Acquiring datasets, cleaning and pre processing them, feature engineering, building models incorporating different types of neural networks, deploying them and building a pipeline to continuously optimise and retrain the model - all these demand experts highly skilled in Machine Learning and AI. Democratising AI involves granting anyone access to resources for mastering these skills. The exploding demand for internal AI skilling has lead many universities and companies to provide both free and paid courses for AI. Many machine learning open-source frameworks are now bringing AutoML functionality to help automate the entire process of applying machine learning to perform a task. These methods, though more compute hungry, take a huge step forward in democratizing AI and making it possible for smaller organisations to build AI models. Many cloud based out-of-the-box ML solutions for specific tasks like natural language processing, object detection, etc are also made available, that enable integrate the power of AI into their products and services with minimal effort.

Infrastructure

Machine Learning, and more specifically Deep Learning, is extremely compute intensive. Training Neural Networks with datasets containing millions of examples takes days or sometimes weeks even with powerful computers. Rapidly trying out things and experimenting, which are critical for perfecting a model, is almost impossible without access to necessary computing power. Deploying a trained model for users to make real-time inference demands computation resources as well. Democratizing AI also means democratizing compute resources so that any organisation can use them on demand at a low cost. Cloud Computing is cheaper than ever today, and many Cloud Service Providers provide specialised solutions for training and inference on the cloud powered by hardware accelerators that are custom designed ASICs for neural networks. With these offerings, any small startup or organisation with zero infrastructure of their own can build and deploy state of the art ML models.

Inspiring Stories of Democratizing AI

These days, we come across numerous inspiring stories of people, companies and organisations involved in doing their bit to democratize AI. Below are a select few:

AI4ALL

AI4ALL is a US-based non-profit founded with the mission to make Artificial Intelligence more diverse and inclusive. The organization has its origin in SAILORS – a summer outreach program for high school girls to learn about human-centered AI – founded in 2015 by renowned AI researcher, Dr. Fei-Fei Li, along with Dr. Olga Russakovsky and Dr. Rick Sommer of Stanford University. Through its partnerships with Boston University, Carnegie Mellon University, Princeton University, and Simon Fraser University, AI4ALL conducts summer programs to help students underrepresented in technical careers to excel in the field of AI.

National Strategy for Artificial Intelligence #AIForAll

Recognizing the need to devise a common strategy that could help build a strong AI ecosystem in the country by collaborating with the various experts and stakeholders in the field, National Strategy for Artificial Intelligence is an initiative started by the Government of India through NITI Aayog. This strategy is expected to be premised on a framework that is aligned to the country's unique needs and aspirations. The identified focus areas for AI intervention in India include healthcare, agriculture, education, smart cities & infrastructure, and smart mobility and transportation.

DeepLearning.ai

Deeplearning.ai is an initiative focused in making a world-class AI education accessible to people around the world. It is a venture by Andrew Ng, an AI pioneer, co-founder of Coursera and Director of Stanford Artificial Intelligence Lab. Deeplearning.ai offers one of the best online specialization courses in deep learning. "AI for Everyone" is another course aimed at educating non-technical business professionals on how to adopt AI in their organization by building a sustainable AI strategy. Deeplearning.ai is also collaborating with Laurence Moroney, a developer advocate at Google, in launching its new Tensorflow specialization.

OpenAI

OpenAI is an AI research organisation aiming to advance in Artificial General Intelligence with emphasis on safety and control. It democratizes AI by open sourcing its efforts and making many amazing AI tools publically available to researchers around the world. It has published more than 76 research publications, each making considerable improvements and delivering innovations in Reinforcement Learning, Robotics, Natural Language Understanding, Generative AI, One-

shot Learning, Meta-learning and much more. OpenAI envisions bringing human-level intelligence to machines, which can benefit all of humanity.

H2o.ai

H2O.ai is an open source software company that aims to democratize AI at all levels. Its H2O machine learning platform makes state-of-the-art AI algorithms accessible to all. H2O also has its own AutoML platform called H2O Driverless AI that enables data scientists easily create AI models without putting effort on data pre-processing, visualization, feature-engineering, and many other tasks in building AI models that otherwise require considerable expertise.

Google

Google has one of the strongest AI research teams in the world. With most of its products running with AI at its core, Google has set an example of how something as compute intensive as AI can effectively scale to billions of people. Google has a range of software that helps democratize AI end-to-end. Its open-source platform, Tensorflow, is the most popular machine learning framework, and enables developers and data-scientists do everything from quickly prototyping ML models to deploying them to production, all without leaving the Tensorflow ecosystem. Google Cloud, their cloud service platform, offers PaaS and IaaS that are already optimised to work best with Tensorflow models. Google Cloud also offers a whole range of ML services. Its AutoML services allow companies to make use of their pre-trained models for image recognition, speech recognition, and other common tasks without writing a single line of code. The most recent service to join the AutoML family is AutoML Tables that lets companies and enterprises simply upload their datasets and start using an ML model that has been built specifically for them.

Facebook

Facebook uses AI throughout its platform, and has made it what it is today. Accurate search results, image captioning, face detection and friend suggestion - all these features are made possible by extensive research in AI that Facebook invested in. Joining the tech culture to help fellow companies and startups grow with them, Facebook publically shares some of the state-of-the-art research publications in machine learning. From efficient vector search algorithms that scale to billions of records to data visualisation libraries, their open libraries and tools have rendered to be of great value even to developers outside Facebook. Facebook's open source machine learning framework - PyTorch - is rapidly gaining traction among machine learning researchers, as it is easier to debug and experiment.

Microsoft

Microsoft's Azure Cloud Services has its own offerings for organisations looking to train and deploy their Machine Learning Models. With Azure Machine Learning Studio, Microsoft is making a massive move in democratising AI, letting users build ML models right from their browser with a friendly GUI interface. Azure's Cognitive Services consist of numerous pre-trained models working together to perform common AI tasks such as sentiment analysis, image and speech recognition, search, recommendation engines, etc. Microsoft also has its own open source deep learning framework called Microsoft Cognitive Toolkit previously known as CNTK. Through Microsoft Research, the tech giant has opened up a lot of its cutting edge AI research to the public. Being a cloud service that many enterprises already use, Azure makes AI adoption as easy as possible.

Amazon

Being a technology company with most products having AI and cloud at its core, and scaling its services to billions of people, Amazon has perfected its cloud service - AWS - over the years to become one of the most popular cloud service among enterprises. Like Google cloud and Azure, AWS provides a range of scalable and flexible services for AI and Machine learning. AWS's DeepRacer is an innovative product to help developers learn to apply reinforcement learning to train autonomous driving vehicles in simulated environment and then transfer that learning into real world. The market for autonomous vehicles is expected to see massive growth in the near future, and Amazon is pushing the world from its end to proactively make that skill set available.

About the author

S. Arjun is a young entrepreneur, Founder & President of LateraLogics Innovations LLP (www.lateralogics.com), a technology solutions company. He has several awards & recognitions to his credits that include the National Child Award for Exceptional Achievements 2014 for Computer Technology (Govt. of India), Young Innovators Award 2017 from Dr. V. A. Shiva Ayyadurai, the inventor of e-mail, Google Web Rangers Award 2018, Google Code to Learn Contest 2014, MIT App Inventor Bug Finding Contest 2014 (First Prize Winner), and MIT App Inventor App Contest 2013 (First Prize Winner). He was also felicitated jointly by CSI, IEEE CS & IEEE PCS in 2015. He has been featured in numerous regional, national and international magazines and TV programs (including National Geographic Society's Magazine). Arjun is presently pursuing 'B.Tech in CSE (Hons)' at Lovely Professional University. More at www.arjuninventor.com.

Machine Learning via Genetic Algorithm Demystified for Today's Era

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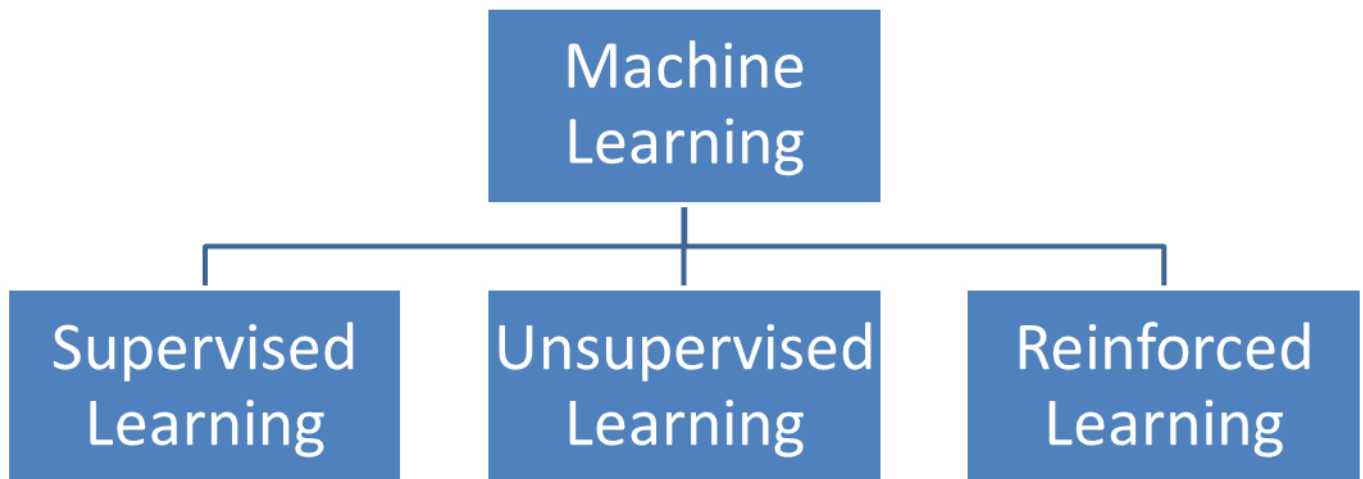Execom Member, CE,TEMS Bangalore Chapter
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In last couple of years Machine learning and Artificial intelligence is gaining prominence and we keep hearing these terms daily. It offers a great career option today. This promises to solve problems and also benefit companies and individuals by making predictions for helping them make better decisions. The objective of machine learning is to allow the computers learn automatically without human intervention.

There are 3 major learning algorithms to make the computers learn

Supervised Learning: For learning the pattern the data scientist has ground truth ie the expected outcome is always associated with data for learning. The learned network is then compared with the known outcome to check accuracy. These sort of learning is used in handwriting recognition, translation engines etc

Unsupervised Learning: For this sort of learning the data scientist has only specific signature for learning. Usually the network is learned via clustering. User can see applications in recommendation systems like Amazon and Netflix

Reinforced Learning: For reinforcement leaning we choose the learning via actions. The action is associated with a reward. Based on action and reward the network is learned. Typically used for games.

One of the important supervised algorithms is genetic algorithms.

Introduction

A genetic algorithm is a search heuristic that is inspired by Charles Darwin's theory of natural evolution. Genetic algorithm exhibits implicit parallelism and can retain useful redundant information about what is learned from previous searches by its representation in individuals in the population, but GA may lose solutions and substructures due to the disruptive effects of genetic operators and is not easy to regulate GA's convergence.
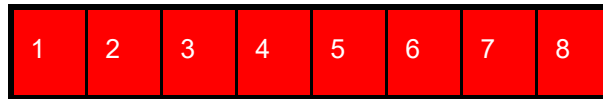
Genetic algorithms, as a member of the board class of evolutionary algorithms, are known as popular methods for global search or optimization. It is well established that it is hard and time consuming for a simple problem to find the best solution in case of complicated search spaces. To solve this problem, the members of population can grow up during their life time. For this purpose, the individuals should look for the best point in a relatively small neighbourhood using local search methods. However, using memetic algorithm has similar problem as side effects. The first one which is considered has the convergence of the population to local optimum points which decreases the efficiency of GA. The Monte Carlo method is combined with GA as a local search and it also diversifies the population when some individuals overlap on a local optimum is done in the past. But it does not perform any parameter optimization for the underlying local search which is another important challenge in memetic algorithm. As it's seen from above discussion GA with local search algorithms doesn't introduce significant difference in efficiency of prediction. However, the efficiency of prediction can be improved by dynamic adaptive techniques. However, another problem arises with cost and computational load when an advanced local search method is used to get a better efficient solution.
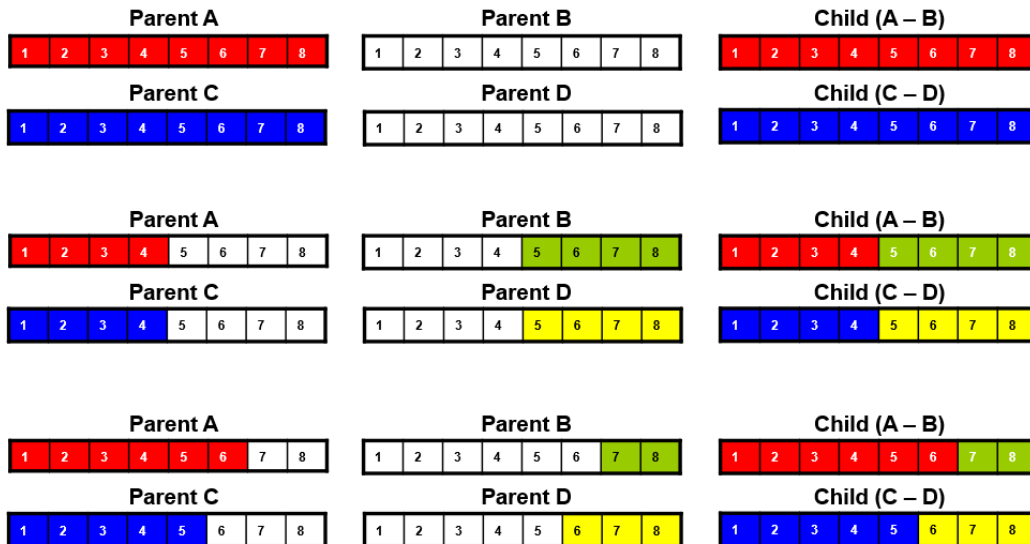
Glossary of terms

Population: Number of members in the sample space under consideration

Convergence: Tendency of members of the population to be the same.

Chromosome: Normally, in genetic algorithms the bit string which represents the individual as shown below.

1	2	3	4	5	6	7	8

Crossover: Creating a new individual's representation from parts of its parent's representations. Illustration of crossover

Generation: When the children of one population replace their parents in that population.

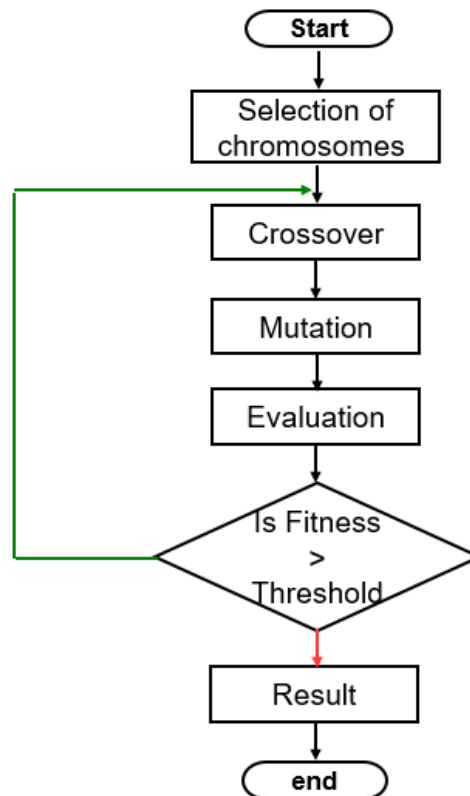**Mutation**: Arbitrary change to representation, often at random. Illustration of mutation

Fitness Function: A process which evaluates a member of a population and gives it a score or fitness.

Termination The algorithm terminates if the population has converged (does not produce offspring which are significantly different from the previous generation).

Most of the times the termination occurs and still we don't reach the optimum. The ML scientist would use Simulated Annealing to reduce the energy of the individuals.

Five phases are considered in a genetic algorithm.
1. Initial population
2. Fitness function
3. Selection
4. Crossover
5. Mutation

Figure 1 GA basic flow

Description of Genetic Algorithm in nutshell

An initial population is created containing a predefined number of individuals, each represented by a genetic string.

Everyone has an associated fitness measure, typically representing an objective value. The concept that fittest individuals in a population will produce fitter offspring is then implemented to reproduce the next population.

Selected individuals are chosen for reproduction at each generation, with an appropriate mutation factor to randomly modify the genes of an individual, to develop the new population.
The result is another set of individuals based on the original subjects leading to subsequent populations with better individual fitness. Those with lower fitness will get discarded from the population.

When to stop the Genetic Algorithm

This iterative process continues until one of the possible termination criteria is met:

> if a known optimal or acceptable solution level is attained
> if a maximum number of generations have been performed
> if a given number of generations without fitness improvement occur

Basic concepts one must remember while solving Genetic Algorithm

The selection procedure randomly selects individuals of the current population for development of the next generation. The selection is based on the probability factor.

The crossover procedure takes two selected individuals and combines them about a crossover point thereby creating two new individuals.

The mutation procedure randomly modifies the genes of an individual subject to a small mutation factor, introducing further randomness into the population.

The evaluation procedure measures the fitness of each individual solution in the population and assigns it a relative value based on the defining optimization (or search) criteria
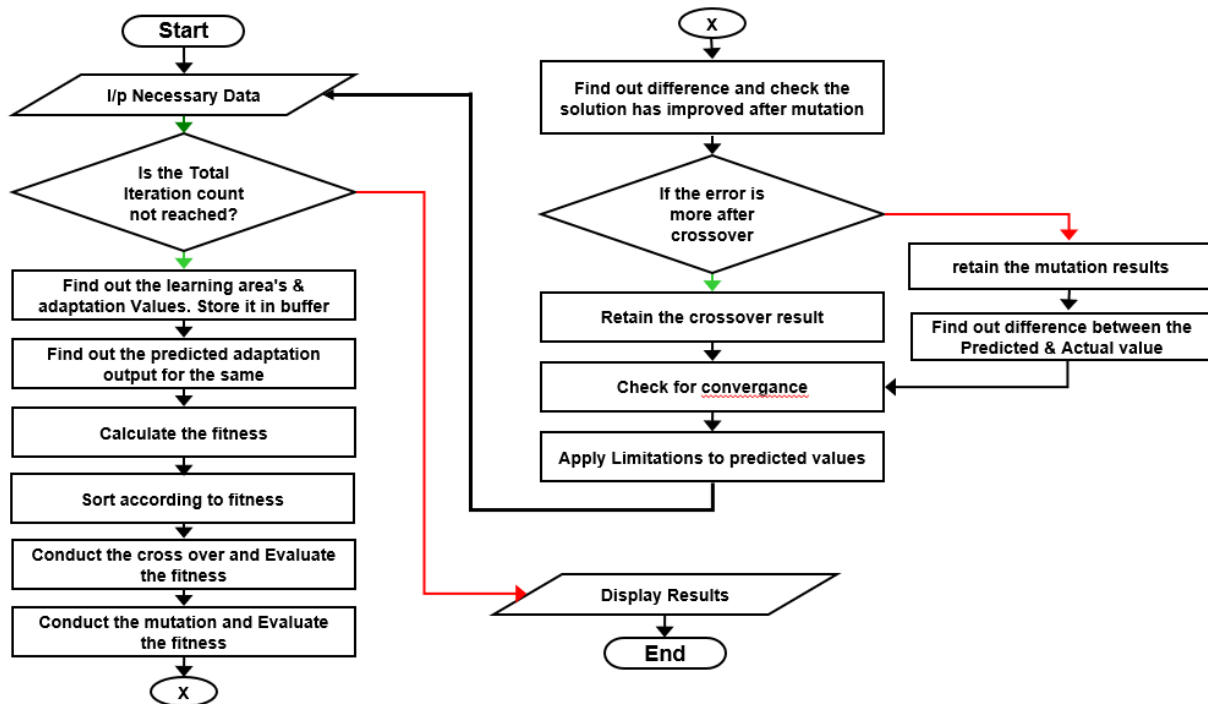
Figure 2: Detailed GA algorithm

GA Tradeoffs

Population size selection is probably the most important parameter, reflecting the size and complexity of the problem.

However, the trade-off between extra computational effort with respect to increased population size is a problem specific decision, as doubling the population size will approximately double the solution time for the same number of generations.

Other parameters include the maximum number of generations to be performed, a crossover probability, a mutation probability, a selection method and possibly an elitist strategy, where the best is retained in the next generation's population.

Advantages of Genetic Algorithm

When minimal region is identified during the search process, the GA method is not efficient, even sometimes impossible, in reaching its minimum. This is because GA is opportunistic not deterministic.

Dynamic adaptive methods are very efficient in this regard and can guarantee a local minimum, but not a global one.

Conclusion:

It requires a large computational time

There is always a tradeoff between the computational time and population.

A drawback of this algorithm is that a solution is "better" only in comparison to other, presently known solutions for solving nonlinear equations. A better solution may be obtained by using adaptive estimators like Kalman Estimators, Neural Networks etc

It can also seen that the error decreases substantially with the increase in mutation probability. But nature does not allow higher mutation probability with maximum probability can be 5%.

It is also seen that the error decreases marginally when there is a crossover. Typically, nature allows up to 90 to 95% of crossover.

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About the author

Vivek Venkobarao has 13 years' experience in leading Automotive tier 1 supplier in Bangalore India. He has a Ph.D in Electrical Engineering and Certificate(I&E) Stanford University California. Has 20 papers published in International journals and conferences as first author. He is also Co-Author "Handbook of Research on Emerging Technologies for Electrical Power Planning, Analysis, and Optimization" from international publisher. He is also reviewer in various SAE and IEEE conferences. He has 10 patents. His research interests include Control Systems, Mathematical model of real time systems, Neural Networks, Fuzzy logic, Bio Inspired Computing.

The 10 Algorithms Machine Learning Engineers Need to Know

It is no doubt that the sub-field of machine learning / artificial intelligence has increasingly gained more popularity in the past couple of years. As Big Data is the hottest trend in the tech industry at the moment, machine learning is incredibly powerful to make predictions or calculated suggestions based on large amounts of data. Some of the most common examples of machine learning are Netflix's algorithms to make movie suggestions based on movies you have watched in the past or Amazon's algorithms that recommend books based on books you have bought before.

So if you want to learn more about machine learning, how do you start? For me, my first introduction is when I took an Artificial Intelligence class when I was studying abroad in Copenhagen. My lecturer is a full-time Applied Math and CS professor at the Technical University of Denmark, in which his research areas are logic and artificial, focusing primarily on the use of logic to model human-like planning, reasoning and problem solving. The class was a mix of discussion of theory/core concepts and hands-on problem solving. The textbook that we used is one of the AI classics: Peter Norvig's Artificial Intelligence—A Modern Approach, in which we covered major topics including intelligent agents, problem-solving by searching, adversarial search, probability theory, multi-agent systems, social AI, philosophy/ethics/future of AI. At the end of the class, in a team of 3, we implemented simple search-based agents solving transportation tasks in a virtual environment as a programming project.

I have learned a tremendous amount of knowledge thanks to that class, and decided to keep learning about this specialized topic. In the last few weeks, I have been multiple tech talks in San Francisco on deep learning, neural networks, data architecture—and a Machine Learning conference with a lot of well-known professionals in the field. Most importantly, I enrolled in Udacity's Intro to Machine Learning online course in the beginning of June and has just finished it a few days ago. In this post, I want to share some of the most common machine learning algorithms that I learned from the course.

Machine learning algorithms can be divided into 3 broad categories—supervised learning, unsupervised learning, and reinforcement learning. Supervised learning is useful in cases where a property (label) is available for a certain dataset (training set), but is missing and needs to be predicted for other instances. Unsupervised learning is useful in cases where the challenge is to discover implicit relationships in a given unlabeled dataset (items are not pre-assigned). Reinforcement learning falls between these 2 extremes—there is some form of feedback available for each predictive step or action, but no precise label or error message. Since this is an intro class, I didn't learn about reinforcement learning, but I hope that 10 algorithms on supervised and unsupervised learning will be enough to keep you interested.
https://www.kdnuggets.com/2016/08/10-algorithms-machine-learning-engineers.html

Machine Learning Algorithms Tutorial: This Machine Learning Algorithms Tutorial video will help you learn you what is Machine Learning, various Machine Learning problems and the algorithms, key Machine Learning algorithms with simple examples and use cases implemented in Python.
https://www.youtube.com/watch?v=I7NrVwm3apg

Journey from Monolith Application to Microservices

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Traditional monolithic architecture

Any software application has three main components – an user interface, Data access layer and Datastore/database. A monolithic system is one large system that has all the three tightly coupled and deployed together. In a monolithic application, the application logic, user interface, backend tasks/jobs are all in one huge code base. While in certain circumstances monolithic applications are preferred, but there are many problems with them.

Problems with monolithic application

- Tight coupling between the different layers
- Resilience: If one part of the system fails, it could bring down entire system
- Scale: Scale everything even if a particular component needs improvement
- Deployment: Even if there is one-line of change, deploy entire system
- Complex development team structure
- Technology: Adopting newer technologies like programming languages, databases, framework

All the above problems make the software application inflexible for expansion, unscalable for complex applications and blocks continuous development.

What are microservices

At a very high level, microservices can be seen as a way to create independent applications, where applications are broken down into smaller, independent services based on domain and functionality. Each microservice is not dependent upon a specific programming language and hence allows different services to be developed with different technologies that gives best results. This makes each microservice independent and self-contained offering a single functionality in a bigger scheme of the whole application.
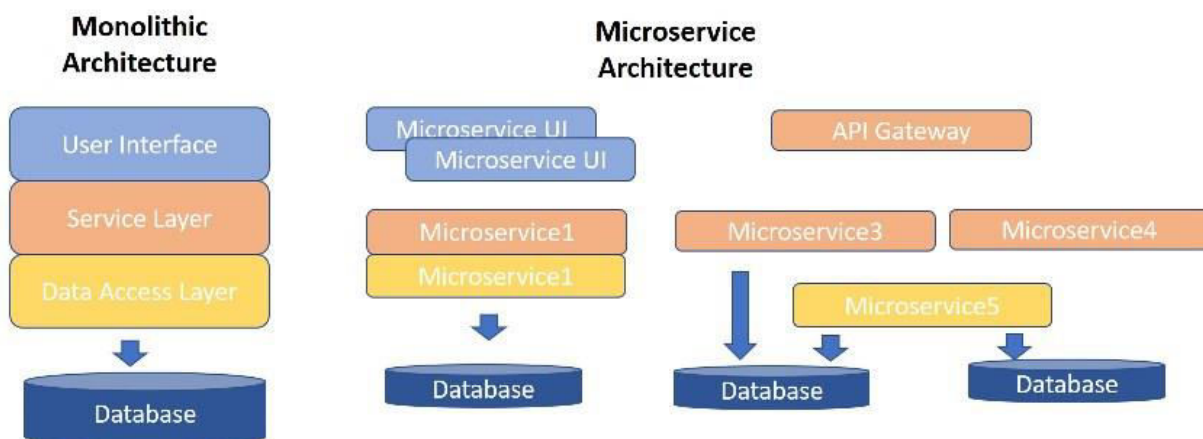
Monolithic vs Microservices architecture

Figure 1Monolith vs Microservices architecture

Benefits with Microservices

Decoupling
Microservices enables us to make different functionalities to be loosely decoupled. Each microservice use their own execution environment but communicate to each other through REST APIs or a Message Bus. Service Discovery helps to search and find the route of communication.

Granular Scaling

Individual services can horizontally scale up or down in seconds and in an auto-scaling manner. Since each service is independent, they can be independently built, modified and scaled without having to scale the whole application. This indirectly improves performance of particular functionalities with minimum investment in resources.

Business continuity and Fault isolation

Microservice architecture is built for isolating failures and respond to outages without hampering the whole system. If there is a partial functionality or defect in one microservice, the rest of functionalities of the application can still continue, thus helping to meet SLA's for most customers.

Composability

One of the key promises of distributed systems and service-oriented architectures is to open up opportunities for reuse of functionality. With microservices, we allow our functionality to be composed and decomposed in different ways for different purposes. Each service can be aggregated using Aggregator pattern (with or without proxy) or chained using Chaining pattern(with or without branching).

Technology Heterogeneity

The composable ability of microservices also provide us flexibility with technology and team structures. It allows us to choose different technology for different services allowing to pick right tool for the job instead of having to select a more standardized one-size fit all approach. This enables faster adoption of newer technologies and autonomous development teams.

Patterns for moving from Monolith to Microservices

Domain Driven Design (DDD)

Before beginning any refactoring, figure out the domains of the application that helps to componentize in terms of business logic.

Large problem domains can be decomposed into sub-domains to manage complexity and to separate the important parts from the rest of the system.
- **Core Domains:** Core Domains must have a fundamental competitive advantage in the system and it should be the reason for the success of the system.
- **Generic Domain:** This is not the core, but the core depends on it. Examples are an e-mail sending service, notification service.

Bounded Contexts

A *bounded context* clarifies, encapsulates, and defines the specific responsibility to the model. It ensures the domain will not be distracted from the outside. Each model must have a context implicitly defined within a sub-domain, and every context defines boundaries.

The idea is that any given domain consists of multiple bounded contexts, and residing within each are things that do not need to be communicated outside as well as things that are shared externally with other bounded contexts. Each bounded context has an explicit interface, where it decides what models to share with other contexts.

Decouple components (Loose coupling)

When services are loosely coupled, a change to one service should not require a change to another. The whole point of a microservice is being able to make a change to one service and deploy it, without needing to change any other part of the system. This is really quite important.

- Create decoupled and independent components for each defined domain
- Each component serves a separate business requirement
- Rewrite new code and retire old code
- Analyze dependency between components
- HTTP REST & Service discovery for communication between microservices for minimal direct communication between services to ensure it has no direct reliability

Minimize dependency back to Monolith

A major benefit of microservices is to have a fast and independent release cycle. Having dependencies to the monolith - data, logic, APIs - couples the service to the monolith's release cycle, prohibiting this benefit.

One should establish some hard and fast rules for the kinds of dependencies that you are prepared to support. If you really cannot avoid referring back to a feature in the monolith do it through a service façade. This can provide an architectural placeholder for a future service implementation or at the very least act as an anti-corruption layer.

Strangler Pattern

The Strangler Pattern is a popular design pattern to incrementally transform your Monolith application into Microservices by replacing a particular functionality with a new service. Once the new functionality is ready – the old component is strangled, the new service is put into use & the old component is decommissioned all together.

You can develop a new component, let both the new and the old component exist for a period of time and finally terminate the old component once the new component is stable.

- Initially all application traffic is routed to the Legacy application.
- Once the new component is built, you can also test your new functionality in parallel by enable for small set of users against the existing monolithic code.
- Both the monolith and the new built component need to be functional for a period of time. Sometimes the transitional phase can last for an extended duration.
- When the new component has been stable, you can get rid of it from legacy monolithic application.
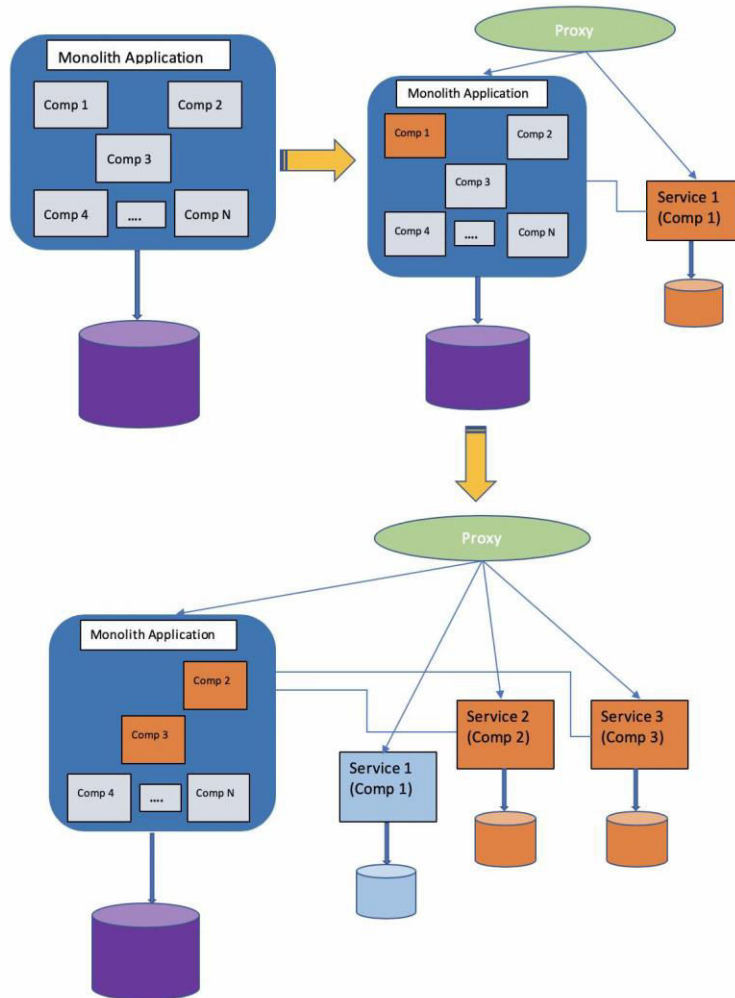

Figure 2: Strangler pattern

Feature Flag

With feature flags, engineering teams can have complete control over their various microservices. First, wrap the microservice with a feature flag, with all traffic going to the old version within the monolith application. Then, release the microservice with the feature flag ON, gradually put whatever traffic you want to the new microservice for only specific set of users, similar to a blue green deployment. Once the new microservice is stable, open up the solution for larger set of users However, feature flags can serve arbitrarily complex (or simple) variations of traffic to the new microservice.

API Gateway and Database per service

When a monolithic application is moved to microservice architecture, the database needs to be designed in such a way that it is forward looking. The best option is to keep the service self-sufficient and ensure it has its own data. This would mean that some parts of the data from the monolithic service needs to be moved. The advantage of this is that the service becomes a self-sufficient unit which can be accessed through

- API gateway - The application composes the whole by calling APIs from different services. Database transaction management can be done by Saga pattern.
- Materialized views using the CQRS pattern

Event publishing

Nearly every microservice needs to publish events when the data is updated. The Event Sourcing pattern provides a way to maintain a queue of events from the feeds that it receives. These feeds can be further aggregated in case a Domain Event model is suitable.

Challenges of Microservices

Monitoring

Breaking the system up into smaller, fine-grained microservices results in multiple benefits. It also adds complexity when it comes to monitoring the system in production. Monitoring an application based on a microservice architecture is different from monitoring a monolithic application

- Multiple servers to monitor with respect to CPU, Memory, health etc
- Multiple logs to sift through to point out where the error occurred
    - To grab our logs and make them available centrally
    - A solution could be to use Logstash or splunk along with Kibana elastic search for viewing logs. Kibana can even generate graphs from the logs you send it, allowing you to see at a glance how many errors have been generated over time
- Multiple places where network latency could cause problems
- Application metrics: These metrics relate specifically to your application. These top-level data are useful for development teams and the organization to understand the functional behavior of the system.
- Platform metrics

Monitoring requirements should be considered from the very beginning of an application's lifecycle. Systems monitoring requires contributions from both development and operations. It's a critical part of the operational support of any distributed system. Microservice architectures are even more distributed than a typical monolithic application. They require more real-time attention and proactive monitoring.

Authentication and Authorization

A common approach to authentication and authorization is to use some sort of single sign-on (SSO) solution. SAML and OpenID Connect both provide capabilities in this area.

Once Authenticated, the user principal will be provide information about all roles and access a user has. Some of the common solutions are:

Common Single Sign-On Implementations

- Identity provider could be an externally hosted system, or something inside your own organization.
- It is common to have your own identity provider, which may be linked to your company's directory service. A directory service could be something like the Lightweight Directory Access Protocol (LDAP) or Active Directory.
- SAML is a SOAP-based standard. OpenID Connect is a standard that has emerged as a specific implementation of OAuth 2.0.

Single Sign-On Gateway

- Each service could decide to handle the redirection to, and handshaking with, the identity provider.
- Gateway to act as a proxy, sitting between your services and the outside world
- The idea is that we can centralize the behavior for redirecting the user and perform the handshake in only one place.

Fine-Grained Authorization

In order to enforce resource protection of who can perform certain transactions or who can access and use specific data over an API channel, the API gateway solution should be complemented and extended with a fine-grained authorization solution. By extending the API Gateway with a dynamic policy based authorization solution, organizations will be able to enforce resource specific access control.

Service-to-Service Authentication and Authorization

Along with authenticating users, you might need to allow other services to interact with your API. While client applications can provide users with a web sign-in prompt to submit their credentials, you need another approach for secure service-to-service communication. Some of the standard methods are

- HTTP(S) Basic Authentication
- Use SAML or OpenID Connect
- Client Certificates
- HMAC Over HTTP
- API Keys

Do you really need microservices?

While microservices help with reducing the cost of application maintenance and time to production, there are cases when monolithic application is more suitable. Monoliths have fewer cross cutting concerns and less initial operational overhead. Since they are tightly coupled, they are easier to test and deploy and could also have advantage in performance. If your project is new and has lot of unknowns or if your project needs a faster time to market, then Monoliths are the way to go.

Prematurely decomposing a system into microservices can be costly, especially if you are new to the domain. In many ways, having an existing codebase you want to decompose into microservices is much easier than trying to go to microservices from the beginning.

All frameworks and patterns have their own pros and cons. We have tried to provide the necessary framework to help you apply the general principles and make a choice on what is best for your organization.

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Nithya is currently the Director of Engineering for Strategic Procurement related products in SAP Ariba. She is a technical leader is in cloud computing and machine learning. She has experience in various domains like Telecom, IoT, Procurement and Retail which accounts for the 7 patents that she has in her name. Her favourite hobby is birding and wildlife photography which she likes to do with her family. https://www.linkedin.com/in/nithyasprofile

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Microservice Architecture | Microservices Tutorial for Beginners

This Edureka's Microservices video at https://www.youtube.com/watch?v=L4aDJtPYI8M gives you detail of Microservices Architecture and how it is different from Monolithic Architecture. You will understand the concepts using a UBER case study. In this video, you will learn the following: 1. Monolithic Architecture; 2. Challenges Of Monolithic Architecture; 3. Microservice Architecture; 4. Microservice Features; and 5. Compare architectures using UBER case-study

Microservices

Microservices are a software development technique—a variant of the service-oriented architecture (SOA) architectural style that structures an application as a collection of loosely coupled services. In a microservices architecture, services are fine-grained and the protocols are lightweight. The benefit of decomposing an application into different smaller services is that it improves modularity. This makes the application easier to understand, develop, test, and become more resilient to architecture erosion. It parallelizes development by enabling small autonomous teams to develop, deploy and scale their respective services independently.It also allows the architecture of an individual service to emerge through continuous refactoring.Microservice-based architectures enable continuous delivery and deployment. http://bit.ly/2WCNFrB

Establishing Community Radio Station in India

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1. BACKGROUND AND OBJECTIVE

The first radio broadcasting in India was started by the Radio Club of Bombay in 1923 followed by Calcutta Radio Club in the same year and the Madras Presidency Radio Club in 1924. They all continued broadcasting service for three to four years and halted due to various difficulties. The Indian Broadcasting Company (IBC) started radio broadcasting in 1927 from Mumbai (then Bombay) and Kolkata (then Calcutta) and after three years IBC went into liquidation. In 1930, the Indian State Broadcasting Service (ISBS) under the Department of Industries and Labour started radio broadcasting and in 1936 the ISBS became All India Radio (AIR) with an objective to provide information, education and entertainment, for promoting the welfare and happiness of the masses by using AM broadcasting service (AM Radio).

The first FM broadcasting service (FM Radio) was started by AIR from Chennai (then Madras) in 1977. AIR was the only radio broadcaster in India till 1993 and AIR started to sell its time slots of FM channel to private parties, thus initiated the path to begin private FM. In 2000, FM spectrum (87 – 108 MHz) were auctioned by Government of India (GoI) to private parties with an objective to open up FM broadcasting for entertainment, education and information dissemination by commercial broadcasters; to make available quality programmes with a localized flavour in terms of content and relevance; to encourage new talent and generate employment opportunities directly and indirectly; and to supplement the services of AIR and promote rapid expansion of the broadcast network in the country for the benefit of the Indian populace. The first private FM radio broadcasting was started by Radio City at Bengaluru (then Bangalore) in 2001.

The Honourable Supreme Court of India delivered a judgement on 9th February 1995 that "The airwaves or frequencies are a public property…" and "The right of free speech and expression includes the right to receive and impart information…" which led GoI to provide permission for starting Community Radio Station (CRS). In 2002, GoI permitted well established educational institutions including IITs/IIMs to setup CRS within their campus with the objective of serving the cause of the community in the service area by involving members of the community in the broadcast of their programmes. Here community means the populace available in the serving area i.e., 10 km radius around the institution.

The first community radio broadcasting was started by Anna University, Chennai in 2004 at its Guindy campus. In 2006, GoI permitted non-governmental organizations also to establish CRS in their area of service and in 2014, GoI permitted State Agriculture Universities (SAUs), ICAR institutions and Krishi Vigyan Kendras (KVKs) to establish CRS.

The major difference in the content of private FM radio and CRS is that private FM radios transmit mostly film based entertainment programmes produced by professionals, but CRS transmit programmes mostly on development issues concerning the requirement of the community it addresses and also the programmes are made with the participation of the community. The CRS is expected to cover a range of 5-10 km radius with Effective Radiated Power (ERP) of 100 watts and the tower height between 15 to 30 meters.

2. ELIGIBILITY CRITERIA

An organisation desirous of operating a CRS must be able to satisfy and adhere to the following principles:

i. It should be explicitly constituted as a 'non-profit' organisation and should have a proven record of at least three years of service to the local community.
ii. The CRS to be operated by it should be designed to serve a specific well-defined local community.
iii. It should have an ownership and management structure that is reflective of the community that the CRS seeks to serve.
iv. Programmes for broadcast should be relevant to the educational, developmental, social and cultural needs of the community.
v. It must be a Legal Entity i.e. it should be registered (under the registration of Societies Act or any other such act relevant to the purpose).
vi. Applications of private institutions / organisations may come with the recommendation of district administration. Further, the private institutions / organisations desirous of setting up CRS in Left Wing Extremism (LWE) affected areas / border areas will also provide site security clearance for installation at the proposed geocoordinates from local administration.
vii. NGOs, registered societies and public charitable trusts shall be registered on NITI Aayog's NGO Darpan portal and the applicant shall provide its unique ID along with the application.

Eligible:

The following types of organisations shall be eligible to apply for Community Radio licences:

1. Community based organisations, which satisfy the basic principles listed above. These would include civil society and voluntary organisations, SAUs, ICAR institutions, KVKs, Registered Societies and Autonomous Bodies and Public Charitable Trusts {to be self-certified by trustee(s) that they are not blood relatives/members of family (wife or husband, son or daughter, parents, siblings)} registered under Societies Act or any other such act relevant for the purpose. Registration at the time of application should at least be three years old.
2. Educational institutions.
3. Preference may be accorded to KVKs (run by Government), to enable dissemination of information pertaining to agricultural methods, use of modern technology and practices for enhancement of output, consequently enhancing the income of farmers in line with the mandate of the Government.

Not Eligible:

The following shall not be eligible to run a CRS:

a. Individuals
b. Political Parties and their affiliate organisations [including students, women's, trade unions and such other wings affiliated to these parties.]
c. Organisations operating with a motive to earn profit
d. Organisations expressly banned by the Union and State Governments.

3. PRE-ASSESSMENT

An institution interested to apply for getting CRS license has to first gather information about whether any radio station or defence organisation or aviation is located in 10 km radius (it denotes air distance not road) exists around the institution. If no radio station exists, then the interested institution has to self-assess amongst the community about the need for setting up CRS and the requirements of the targeted community.

This self-assessment shall include the survey questionnaire recommended by the Ministry of Information and Broadcasting (MoIB) (for questionnaire visit https://mib.gov.in/sites/default/files/sur1.pdf). The survey has to be made with more than 1000 community members in order to assess the information such as the community's interest towards reading newspaper, watching TV programmes, listening to radio programmes, their interest towards participation in radio programmes and the problems faced by the community. It will ease to publicize and involve the community in CRS.

4. STEPS INVOLVED IN ESTABLISHING CRS

The eligible organisations and educational institutions desirous of establishing CRS have to obtain license to establish CRS and by purchasing equipment. The MoIB is the nodal point for dealing with the Community Radio (CR) licensing process, a five step procedure have to be followed by applicants desirous of obtaining a licence to set up a CRS.

Step 1: Application for permission for setting up CRS

For submitting the CR application to the MoIB, the applicants are encouraged to submit the application online through https://www.broadcastseva.gov.in by making processing fee of ₹2,500. Sometimes applicants may find difficult in submitting online application, in that case the applicant shall submit the application offline. The offline 'application form for permission to set up a new CRS' is also available at the above said website, the processing fee shall be paid through a demand draft in favour of "Pay and Accounts Officer, Ministry of Information and Broadcasting, New Delhi".

The following documents have to be uploaded in case of online application or to be enclosed along with seven original copies of the offline application,

For educational institutions

i. Recommendation from district administration (in case of private colleges/institutions).
ii. Site security clearance for installation at the proposed geocoordinates from district administration (in case of private colleges/institutions in LWE affected areas / border areas).
iii. Copy of Act under which university/institution has been set up.
   (Attested copy of the supporting document to state whether the institution is private or government aided)
iv. Recognition and affiliation certificates of the institution, wherever applicable.

(Attested copy of the supporting document regarding recognition of the institution from central or state government i.e., AICTE/UGC approval, University Affiliation, NAAC approval, NBA approval, Autonomous approval, etc)

v. Copy of the memorandum of association/ bye laws etc of institution/organization running the institution (in case of private colleges/institutions).
vi. Complete balance sheets with auditor's report for previous 3 years.
vii. Profile of the institution.
viii. Copy of the certificate under section 12 A of Income Tax Act or any other document in support of institution being non-profit.
ix. Map of the service area (including Geo-Coordinates (Latitude and Longitude) of the Location where antenna would be placed).
x. Profile of community.
xi. Details of All Governing Body Members of organization in the prescribed format (available in application) along with the bio data of authorised signatory and all governing body members.

For NGO / trust / registered society

i. Recommendation from district administration (in case of private organisations).
ii. Site security clearance for installation at the proposed geocoordinates from district administration (in case of private organisations desirous of setting up CRS in LWE affected areas / border areas).
iii. Copy of the registration certificate.
The registration certificate is issued by the Registrar of Societies or the competent authority for the registration of Society/ Trust/ NGO or organisation.
(If the registration certificate is in languages other than Hindi/English, kindly provide translation in Hindi/English)
iv. Copy of the memorandum of association/ bye laws etc.
(If it is in any other language than Hindi/ English, translation in Hindi/English should also be provided)
v. Complete balance sheets with auditor's report for previous 3 years.
vi. Attested copy of any grant received whose funds are to be utilised for CRS.
vii. Map of service area (including Geo-Coordinates (Latitude and Longitude) of the Location where antenna would be placed).
viii. Profile of organization.
ix. Profile of community.
x. Details of All Governing Body Members of organization in the prescribed format (available in application) along with the bio data of authorised signatory and all governing body members.

For KVK / ICAR institution

i. Recognition Certificate from ICAR.
ii. Profile of the institution (KVK).
iii. Map of the service area (including Geo-Coordinates (Latitude and Longitude) of the Location where antenna would be placed).
iv. Profile of community.
v. Details of All Governing Body Members of organization in the prescribed format (available in application) along with the bio data of authorised signatory and all governing body members.

Map of the service area:

The service area of the CRS is the coverage of broadcasting service of the radio station, usually the service area of a CRS is 10 -15 kilometres (air distance), however, depending on the terrain of the region this reach might differ. The Government approved maps are available at:

i) National Atlas and Thematic Mapping Organisation (NATMO)
Department of Science & Technology (DST), Govt. of India,
Technology Bhawan (Reception Area),
New Mehrauli Road, New Delhi – 110016
Tel - 011-26590227

ii) Survey of India
First Floor, Janpath Barracks 'A',
Behind Tibetan Market,
Janpath, New Delhi – 110001
Tel – 011-23322288

Service area maps can also be obtained from the local offices of the departments mentioned above. If maps from these offices are not available for your area, you can also use a tourist map, but it must have latitude and longitude marked on it by a certified geographer, surveyor or architect.

Profile of the institution / organisation:
Besides the vision and mission that the institution subscribes to, this should, broadly, tell about the members who constitute the organisation's governing body or board, about the history and work of the organisation and the area, the community and people it serves through its work.

Complete balance sheets with auditor's report:
Chartered Accountant audited balance sheets for previous 3 years e.g.: If you are applying in 2019 (before September month), you need to provide balance sheets for financial year 2015-2016, 2016-2017 and 2017-2018. If you are applying in 2019 (after September month), you need to provide balance sheets for financial year 2016-2017, 2017-2018 and 2018-2019.

Profile of community:
The analysis made in pre-assessment about the community residing within 10 Km radius of location of CRS along with the details of members took part in the assessment from community and their problems as separate report.

The applications shall be processed in the following manner:

a. Government Universities, Deemed Universities (central and state), Government Colleges, Government Schools and KVKs (run by Government) will have a single window clearance. No separate clearance shall be necessary. A meeting of Inter-Ministrial Committee shall be convened to consider applications from such organisations. After approval by Secretary, MoIB, Letter of Intent (LOI) shall be issued subject to allocation of frequency by Wireless Planning and Coordination (WPC) Wing.
b. In case of all other applicants, including private educational institutions, LOI shall be issued subject to receiving clearance from Ministries of Home Affairs, Defence & MHRD (in case of private educational institutions) and frequency allocation by WPC wing of Ministry of Communication & IT.

The MoIB shall forward the copies of the application (complete in all respects) to all concerned Ministries (including the Ministries of Defence, Home Affairs, Communications & Information Technology, Civil Aviation, Agriculture and Human Resource Development) for clearance and get their concern. Meanwhile the applicants are called to present their case at a Screening Committee Meeting (SCM) organised by MoIB. The SCM comprises of a group of CR experts from different organisations working in the field of CR. The members of the SCM assess the objectives of the organisation wanting to set up a CRS. The interview process helps them to evaluate the applicant's commitment and capacity to run a CRS, especially to serve the community.

The LOI shall be issued by MoIB to the applicant after getting clearance from all the Ministries concerned and based on the recommendation received from SCM. This whole process may take 3-6 months of time normally.

Step 2: Application for allocation of frequency and SACFA clearance for a CRS

The applicant has to apply for frequency allocation and Standing Advisory Committee on (Radio) Frequency Allocation (SACFA) clearance within one month of the issue of LOI, to the WPC Wing of the Ministry of Communications & Information Technology through online https://www.wpc.dot.gov.in by making processing fee of ₹1,000, which shall be paid through a demand draft in favour of "The Pay & Accounts Officer, Headquarters, Department of Telecommunication" payable at New Delhi.

The WPC website works properly only in Internet Explorer and is not compatible with other browsers. Visit the home page and select 'online filing of application' under SCAFA from the left panel to create new user id and to submit the SACFA application. The organisation details along with technical parameters of the antenna and CRS location have to be provided, while providing the details select "50W (Watts)" as 'transmitter output', "180KF3E" under 'class and bandwidth of emission', "Others" under 'type of equipment to be used' and provide "VHF FM broadcast transmitter" for others, "fixed service" under 'nature of service', and "FM two-way dipole" under 'type of antenna to be used'.

After submitting the SACFA application online, fill in the application for frequency allocation available at http://wpc.dot.gov.in/WriteReadData/userfiles/file/Generallicence.doc and submit two printed copies of SACFA online application, two printed copies of SACFA online acknowledgement, three original copies of frequency allocation application, demand draft, a copy of map of CRS location and a copy of LOI received to The Secretary (SACFA), WPC Wing, Dept. of Telecommunications & IT, Sanchar Bhavan, 20 Ashoka Road, New Delhi – 110001.

After the submission of the application along with all necessary documents, the WPC wing normally take six months to issue SACFA clearance and frequency allocated for transmission.

Step 3: Signing Grant of Permission Agreement (GOPA)

Immediately after the receipt of SACFA clearance and frequency allotment letter, the applicant have to submit a bank guarantee for a sum of ₹25,000 valid for a period of five years in the format available at https://mib.gov.in/sites/default/files/BANKGUARANTEE-NS250707.pdf along with two original copies (signed in all pages) of an agreement called GOPA on ₹100 stamp paper in the format available at https://mib.gov.in/sites/default/files/Revised%20format%20for%20fresh%20GOPA%20%281%29.pdf and a copy of LOI, SACFA clearance and frequency allotment letter to The Deputy Director (CRS), Ministry of Information & Broadcasting, 'A' Wing, Shastri Bhawan, New Delhi – 110 001.

The GOPA agreement contains all the terms and conditions to be followed by the applicant and normally MoIB takes two to five weeks to countersign the GOPA agreement and to return an original copy of GOPA to the applicant.

Step 4: Application for Wireless Operating License (WOL)

Immediately after the receipt of signed GOPA, the applicant has to apply for WOL, the CRS shall be made operational only after the receipt of WOL but CRS can begin its test transmission after the receipt of signed GOPA.

The applicant has to apply for WOL to the WPC Wing of the Ministry of Communications & Information Technology through online https://www.wpc.dot.gov.in by making annual (royalty and license) fee of ₹19,700 (for having one transmitter) or ₹20,200 (for having two transmitters), which shall be paid through a demand draft in favour of "The Pay & Accounts Officer, Headquarters, Department of Telecommunication" payable at New Delhi. It is normally recommended to have two transmitters, one for transmission and another as standby.

Visit the home page and select 'online filing of application' under 'license' from the left panel to submit the license application by using the login credentials created for applying SACFA clearance. After submitting online application, submit a printed copy of online license application along with the self-attested copies of LOI, frequency allotment letter, SACFA clearance, GOPA, copy of equipment invoice of transmitter and copy of dealer possession licence to The Assistant Wireless Advisor, WPC Wing, Dept. of Telecommunications & IT, Sanchar Bhawan, 20, Ashoka Road, New Delhi – 110001.

After the submission of the application along with all necessary documents, the WPC wing normally take two to four weeks to issue WOL for transmission. It is mandatory, that a copy of valid WOL is either pasted or kept within the CRS premises which is easily visible.

Step 5: Procurement and Installation of Equipment

Once receiving SACFA clearance and frequency allotment, the applicant shall start the process of purchasing equipment. It is mandatory to start broadcasting within three months from the signing of GOPA. Apart from the setting up of infrastructure and furniture for CRS, the minimum approximate investment cost upon equipment is 5 lakhs. The applicant is also eligible to get financial assistance from MoIB for the purchase of equipment. The standard technical compliance and application form for seeking financial assistance is available at https://mib.gov.in/sites/default/files/Application_for_Financial_Assistance_under_CRSS_0.pdf, the applicant is eligible to apply only after the receiving of LOI. Normally a radio station is expected to have recording studio, production studio and transmission studio with power backup facilities.

An applicant / organization shall not be granted more than one permission for CRS operations at one or more places. However, Central / State Universities, including autonomous bodies and Agricultural Universities set up under them, having more than one campus, may be allowed to operate CRS at more than one place, provided, the distance between two CR Stations established by same organization should not be less than 25 Kms.

Universities, Deemed Universities, Agricultural Universities & KVKs, Educational Institutions, and also branch campus, if any, shall be permitted to locate the transmitter and antenna within the geographical area of the community they seek to serve. The geographical area (including the names of villages / institutions etc.) should be clearly spelt out along with the location of the transmitter and antenna in the application form.

5. CONTENT PRODUCTION AND BROADCASTING

The CRS is allowed to produce content to match its objective as mentioned earlier and its motto "Voice of/to/for the voiceless". The content should be relevant to the community (their interest and needs) it serves and the importance should

be on developmental, agricultural, health, educational, environmental, social welfare, community development and cultural programmes. One CR can broadcast programmes of other CR's and AIR with permission, but 50% of the CR's programmes broadcasted should be generated with its community's participation and in local language of huge community.

The CRS shall guarantee that its programmes does not include the following,

- Offends against good taste or decency;
- Contains criticism of friendly countries;
- Contains attack on religions or communities or visuals or words contemptuous of religious groups or which either promote or result in promoting communal discontent or disharmony;
- Contains anything obscene, defamatory, deliberate, false and suggestive innuendoes and half truths;
- Is likely to encourage or incite violence or contains anything against maintenance of law and order or which promote-anti-national attitudes;
- Contains anything amounting to contempt of court or anything affecting the integrity of the Nation;
- Contains aspersions against the dignity of the President/Vice President and the Judiciary;
- Criticises, maligns or slanders any individual in person or certain groups, segments of social, public and moral life of the country;
- Encourages superstition or blind belief;
- Denigrates women;
- Denigrates children.
- May present/depict/suggest as desirable the use of drugs including alcohol, narcotics and tobacco or may stereotype, incite, vilify or perpetuate hatred against or attempt to demean any person or group on the basis of ethnicity, nationality, race, gender, sexual preference, religion, age or physical or mental disability.

The CRS shall take care its broadcasting contents with respect to religions and avoid exploitation of religious susceptibilities and committing offence to the religious views and beliefs of those belonging to a particular religion or religious denomination.

Unlike other radio's CRS is not permitted to broadcast news, current affairs and political information. However, CRS can broadcast news and current affairs contents sourced exclusively from AIR in its original form or translated into the local language/dialect. AIR shall source its news to CRS without any charges. It will be the responsibility of the CRS permission holder to ensure that the news is not distorted or edited during translation.

The broadcast pertaining to the following categories will be treated as non-news and current affairs broadcast and will therefore be permissible:

- Information pertaining to sporting events excluding live coverage. However live commentaries of sporting events of local nature may be permissible
- Information pertaining to Traffic and Weather
- Information pertaining to and coverage of local cultural events, festivals
- coverage of topics pertaining to examinations, results, admissions, career counseling
- Availability of employment opportunities
- Public announcements pertaining to civic amenities like electricity, water supply, natural calamities, health alerts etc. as provided by the local administration

In addition, CRS shall adhere to the delivery of the programme and advertising code of AIR which shall be monitored at different levels (details are available at https://mib.gov.in/sites/default/files/Monitoring%20Committees.pdf).

6. ADVANTAGES

CRS are non-commercial, so they are underwritten by local organizations, providing an outlet for those organizations to spread their message. For example, the local health department may underwrite public affairs programming and bring awareness to the public of the services they can provide. In India, most of the CRS are providing information on local engagements, power failures, water supply, local administration office announcement and recently CRS play a major role during natural calamities.

CRS can train people in radio for free and offer them vital broadcast experience and how to be a radio DJ, a radio reporter, a studio tech op and a programme controller. It can provide local musicians with valuable on air time and also promote local music.

CRS in educational institutions can change life of students as it develops verbal communication skills, teaches customer service skills, gives problem solving experience, teaches an appreciation for community issues, gives huge responsibility,

introduces to creativity in programmes and organising community events, provides better local image, improves multi-tasking and multi-talent, self-management and better access to your community.

The actual use of CRS is for the upliftment of the community by creating awareness and building self confidence among the community through its radio programmes and local events. The operational CRS are experimenting in content development, programming, community involvement and sustainability. They have succeeded in providing skill development training to community women for starting their own small enterprises, creating identity to the folk artists, train the community to develop and broadcast programmes, utilising the community to increase community participation and taking ownership in radio programmes, providing internship at CRS and more.

Apart from the above, CRS can empanel itself with the Directorate of Advertising and Visual Publicity and receive paid advertisements (details are available at http://www.davp.nic.in/writereaddata/announce/cm_g_rate_card.pdf) and also CRS is entitled to receive funding from the Department of Science & Technology, the United Nations Educational, Scientific and Cultural Organization, Agricultural Department, Local District Administration and few others for organising local events to create awareness and for broadcasting advertisements. In addition, CRS can attract local advertisements for generating revenue.

Transmission of sponsored programmes shall not be permitted except programmes sponsored by Central & State Governments and other organisations to broadcast public interest information. In addition, limited advertising and announcements relating to local events, local businesses and services and employment opportunities shall be allowed. The maximum duration of such limited advertising will be restricted to 5 (five) minutes per hour of broadcast.

7.   LIST OF CRS IN INDIA

The MoIB is constantly receiving applications to setup CRS as on 30-11-2018, MoIB has rejected 1163 applications, issued LOI to 583 organisations out of which 321 organisations have signed GOPA and as on 23-08-2018, 238 organisations (list at https://mib.gov.in/sites/default/files/List%20of%20238%20Operational%20CRS%20as%20on%2023.08.18.pdf) have established CRS and as on 25-09-2018, 9 CRS have obtained financial assistances from MoIB.

It is wise to visit at least three nearby operational CRS to know more about equipment, infrastructure, facilities, source of income and their activities towards encouraging the community participation.

8.   REFERENCES

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[5] Consultation Paper on Issues related to Community Radio Stations, Telecom Regulatory Authority of India 2014.
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About the author

Mr. G. K. Jakir Hussain received his bachelor's degree in ECE from Bharathiar University, Coimbatore in 2004 and master's degree in Wireless Communication from Karpagam University, Coimbatore in 2013. Since July 2017, he his working as an Assistant Professor (Selection Grade) in the Dept. of ECE at KPR Institute of Engineering and Technology, Coimbatore. He served as an Assistant Professor in the Dept. of ECE at SSM College of Engineering, Komarapalayam from July 2005 to June 2017 and also as the station manager at SSM Community Radio Station, Komarapalayam from January 2012 to June 2017. He also served as Executive Committee Member in Community Radio Association India from 2016 to 2018 and Secretary in Tamilnadu and Puducherry State Chapter of Community Radio Station India from 2014 to 2018. He is a licensee of Amateur Wireless Station issued by the Ministry of Communications & Information Technology, Government of India. He has 13+ years of teaching experience and 5+ years of radio broadcasting experience. His research interest includes image processing, signal processing, wireless communication and internet of things.

Glassless 3D Technology
A 3D Solution without glasses - the future of 3D Technology

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Today it's hard to find a person who's never heard about 3D technology. With the popularity of 3D tablets, 3D TV sets, 3D laptops and 3D smartphones on the rise it's no wonder that more and more people are getting interested in the nature of three dimensional technology. 3D vision has started with the invention of stereoscopic 3D concept and has gradually evolved to many modern methods of 3D technology. So if you can tell the difference between anaglyph red cyan, polarized and shutter 3D glasses, you definitely have a clear perception of what 3D is and how it works . Most of us associate 3D technology with the use of special glasses or virtual reality headgear to filter what image each of our eyes sees. But what do we know about 3D without glasses? Is it just a futuristic concept or already a reality?

How 3D without glasses works?

The technology of 3D without glasses is called **auto-stereoscopy**. Because this kind of three dimensional technology doesn't utilize special spectacles or headgear it became also known as **glasses-less 3D** or **glasses free 3D**.

Auto-stereoscopy is a method of displaying stereoscopic images (adding binocular perception of 3D depth) without the use of special headgear or glasses on the part of the viewer. Because headgear is not required, it is also called "glasses-free 3D" or "glasses less 3D".

The visible world around us has three dimensions: **width (X), height (Y) and depth (Z).**

In order to experience depth, we require information from the other two perspectives. Each of our eyes picks up a slightly different image and, thanks to this information, our brain is able to draw conclusions about how far away an object is from us and this allows us to experience 3D with auto-stereoscopy technology.

Glassesless 3D is based on two different approaches of viewing:

eye-tracking and **multiple views**. The **eye-tracking system** was first implemented in autostereoscopic 3D displays by Reinhard Boerner in 1985.

Those 3D displays with eye-tracking employed provided high resolution, but were limited to a single viewer only. That's why eye-tracking approach can't be widely used for consumer products. The alternative concept is **multiple views** technique that has swiftly become the next best thing in the development of glasses-free 3D. This particular approach is based on sending imagery to multiple regions of viewing at once, thus enabling several viewing zones. Today this concept is implemented in the most flat panel displays, because it allows simultaneous viewing for multiple spectators.

The methods of 3D technology without glasses include a parallax barrier, lenticular, volumetric and holographic techniques.

Glasses-less 3D Methods

1) Parallax barrier

This method is widely used in modern **3D liquid crystal displays**. **Parallax barrier** is a special device with a series of precision slits that's placed in front of LCD, serving as a filter for output image perception. The slits allow left and right eye to see their corresponding image, which is produced by a different set of pixels. That's how the illusion of 3D vision is created by parallax barriers. To have a clearer understanding of this method see the image - it should help a lot.

The **examples of parallax barrier** employed in consumer products are Nintendo 3DS game console, HTC EVO 3D and LG Optimus 3D smartphones. Also used in Range Rover's navigation system, the parallax method allows both the driver to view GPS directions and a passenger to watch movies from the same display simultaneously.

However, the parallax method is not perfect, because it has some **disadvantages**. First one is that in order to experience stereoscopic 3D effect the viewer must be positioned at a certain angle to the display. That's actually not a big problem if we're talking about video game consoles or smartphones, but not good when it comes to 3D TV sets, laptops etc. Another constraint is that the count of horizontal pixels that work to create a different image for each eye is limited to one half.

2) Lenticular lens

The second mostly used method of **glasses free 3D** is **lenticular lens** technique. You may have heard about lenticular printing that creates the illusion of depth, haven't you? If not then you should know that an autostereoscopic 3D display with lenticular lenses utilized is actually the same technique as lenticular printing. Generally speaking the **lenticular method** is based on the use of **magnifying lenses**. Those lenses are set in arrays to produce slightly different images when viewed from different angles. They are also constructed in such way that when you see the image from one angle and then move to another angle the image changes as well and even moves (see the image).

The technique of lenticular lenses as a method of receiving a glasses-free 3D image is executed in Nintendo 3DS and **iPhone** and **iPod touch** in the form of third-party hardware overlay & screens.
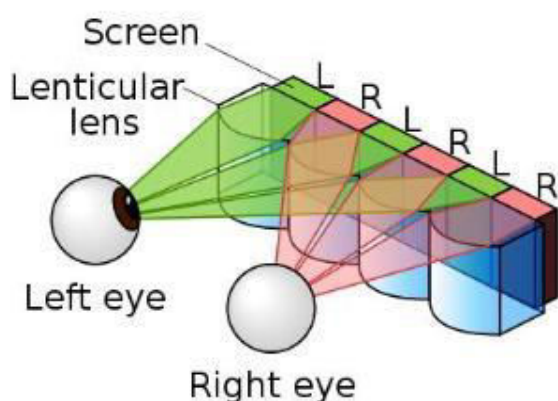
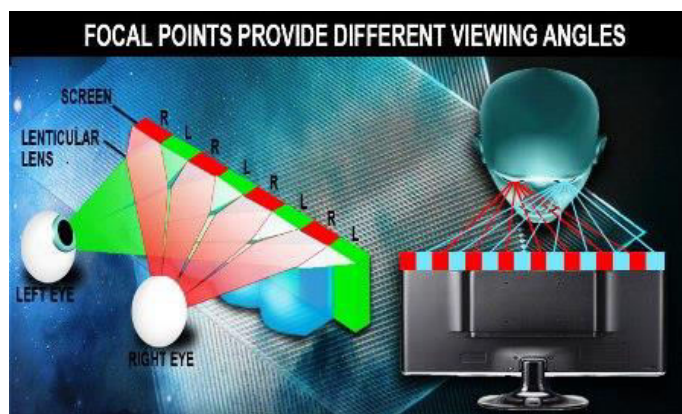**Lenticular lens Work method**

Image – 2a

Image – 2b

3) Volumetric displays

Another type of **autostereoscopic 3D** is a **volumetric display**. This method relates to the construction of three dimensional images by means of various physical mechanisms. Volumetric displays use **light fields** to reconstruct 3D object in the volume of space. The created 3D images are thus measured in **voxels** (volumetric pixels) and can be seen with the unaided eye. A good example of volumetric imaging devices are 3D displays used for **tomography** (see the image below).

The main advantage of volumetric displays is that they allow **automultiscopic** (autostereoscopic multiple viewing) 3D experience.

Image – Va1

Image – Va2

4) Holographic displays

The method of **holography** is based on reconstructing **3D objects** using **light recording**. A hologram is created when an interference of several electromagnetic waves with equal frequencies occurs. During a hologram recording two electromagnetic waves intersect: the main wave is emanated from the source while the second one is reflected from the object that's being recorded. A pattern of such interference leaves an imprint on some recording medium (photographic plate or other) placed in the interference area.

Holography today is used in modern holographic displays with **lasers** being the main light source. Lasers are utilized mainly because they are powerful light beams and have a fixed wavelength. The spreading of holographic 3D displays is wide in the artistic field; usually this process is combined with music and computer graphics.

The recent most notable **artistic use of holographic display** took place on April 15th earlier this year at 2012 Coachella Valley Music & Arts Festival.

The Tupac Hologram: The Act that Kick started the Hologram Trend

Image -- Th1

Image – Th2

There a hologram of deceased famous rapper Tupac Shakur was projected on the stage, giving a lifelike 3D music performance, soon many artists and groups recreated Holograms of Michel Jackson and other Artist in Musical concerts.

It's important to note that 3d technology without glasses isn't new; it has been used in a limited way with televisions. What is new with this research is its potential application to the film industry along with improvements in picture quality.

Market experts have stressed that "it remains to be seen whether the approach is financially feasible enough to scale up to a full-blown theatre", but went on to say "we are optimistic that this is an important next step in developing glasses-free 3D for large spaces like movie theatres and auditoriums."

It could take a while for the technology to get to a stage where it can be used in multiplexes, and the market may need convincing to adopt something which is expected to cost a lot of money. It could prove to be attractive to the advertising industry who may want to use it for billboards, allowing the technology to be introduced at incrementally larger stages.

The thought of seeing James Cameron's next Avatar instalment or the latest high-octane thriller played out in 3D without glasses could push the technology forward and get people to return in droves to the silver screen.

With the constant development of 3D technology and the new inventions of our technological age the 3D glasses as we know them will soon become a thing of the past. So whether you are a fan of 3D or not you simply can't deny that 3D without glasses is the future of 3D vision. When it becomes a common practice and employed in the most devices all the last doubts will fall away.

About the author

Mr. M. Venkatesan is a Media Technology Consultant & Entrepreneur. He heads the technology company, Sai Media Productions (www.saiproductionsindia.com) engaged in IT, Film Production Technology & Ad Media Industry projects in India & Canada. A professionally qualified person with D.F.M & PGD. D.F.Tech, and BSc-IT, he has represented India in various international forums and technology events and film festivals.

As an active technologist, writer & global entrepreneur and a key south Indian filmmaker in the Indo-Canadian international delegation to Canada, he has contributed and participated for the landmark Indo-Canadian Co-Production Pact "Audio-Visual Co-Production Treaty" signed between India and Canada, at Toronto in Sep 2015.

Currently he is engaged as Project Consultant & Designer and Media Producer across various international studios and agencies in India, Canada, USA and Europe. His current projects and research involves 3D Filmmaking & Auto-Stereoscopic 3D with Live Art & Media Campaigns in 3D, Auto-3D , AR/VR & Mixed Media.

His company, Sai Media Productions is involved in consulting, technology & creative services, production & propagation, implementation of new media technologies & film making in India and Canada with a strong technical team operating from Chennai, Mumbai, Bangalore and Toronto.

A guide to 3D display technology: its principles, methods, and dangers

Whether you buy into the hype or not, it's plain fact that 3D is everywhere these days. From movies and games to laptops and handhelds, pretty much every screen in the house is going to be 3D-capable in a year or so, even if you opt not to display any 3D content on it. Those of you who choose that path may stop reading now, and come back a little later when you change your mind. Because if you have kids or enjoy movies and games, there will be a point where you're convinced, perhaps by a single standout piece of media, that 3D is worth it at least some of the time. https://tcrn.ch/2X7b83H

Space FPGA Mitigation Effects, Challenges and Trends

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Space provides a challenge environment for FPGAs. Some space-grade FPGAs have been hardened-by-process. They are fabricated using a CMOS silicon-o- -insulator process, or use an epitaxial layer to protect against radiation-induced latch-up. FPGAs allows partial read back and configuration .It facilitates efficient repair of configuration memory. Bit-flipping is done in the memory elements, the configuration logic itself is vulnerable to radiation not just the data is the common fault caused by radiation.

Radiation Environment

Radiation environment comprises of beam interactions, residual gas interactions and Beam losses.Single Event Effects are produced by heavy ion striking a transistor and creating charge along its path. In the Single Event Upset (SEU), State change, due to the charges collected by the circuit sensitive node, if higher than the critical charge. For each device there is a critical LET.But in the Single Event Functional Interrupt (SEFI), Special SEU, which affects one specific part of the device and causes the malfunctioning of the whole device. In Single Event Latch-up, Parasitic PNPN structure gets triggered, and creates short between power lines and in Single Event Gate Rupture (SEGR), destruction of the gate oxide in the presence of a high electric field during radiation.

Figure 1. Environment

Single Event Effect induced upsets

Single Event Effect induced upsets in the Xilinx SRAM based FPGAs can be divided into three categories such as configuration upsets, functional upsets in user logic, and architectural upset. Configuration upsets occurs in the configuration memory and can be detected by read back of the programmed configuration memory. There are normally more than a million configuration bits stored and the cross-section per bit for heavy ions and protons is low. For SEU detection, the readback function is an efficient means. Particle penetrates the susceptible portion of a configuration memory cell .It alters its state, a readback and verification of the configuration data will detect the upset. To perform verification, the configuration data is readback from the device and compared to the configuration memory bitstream. Programmable nature of the FPGA presents a new sensitivity due to the configuration memory bitstream. As the bitstream is downloaded to the device, the functionality is determined. The changing of this data which changes the design's function. The user logic which contains elements those are not directly testable for upset through the configuration memory bit stream. The elements are block memory, logic-block flip-flops and I/O flip-flops. Observability is limited unless the user design can capture an event. Architectural upsets occur in the control elements of the FPGA SEUs in these elements are often only detectable indirectly by observing an upset signature and associating it with a control element function. This type of upset is also referenced as Single Event Functional Interrupts.Half-latch which generate many of the constant "0" and "1" values used by Xilinx designs, are susceptible to SEUs. During upset, the output values of these circuits will remain inverted until the device is fully reprogrammed. They are used across the device to drive constants. Partial configuration cannot restore the original state. Latch can recover due to the leakage of the pull-up transistor, after several seconds. Mitigation requires the removal of the half-latches. Full configuration can refresh everything. SET mitigation is achieved due to increased area and power consumption of the final circuit implementation. For the latest, deep-submicron FPGAs, although CMOS scaling has helped to overcome these disadvantages, increased logic density and lower operating voltages have reduced the critical charge necessary to generate an SET. Hardening-by-process provide SET mitigation by limiting the amount of charge that can be collected at sensitive logic nodes preventing the formation of pulses. SET filter uses a chain of inverters.It is used to

delay the signal along one path and a guard-gate to pass only those transients with widths exceeding the delay. The designer has to balance electrical performance with radiation hardness: the wider the pulse, the lower the maximum frequency of operation.

Typical Work flow

We needs to make sure that we understand the requirements and the Simulation of the environment is essential. We try to select the components/technologies and pay attention to the requirements, test the components and find some information about the selected components. We needs to try to assess the risk.SEU may not be critical, or it can be catastrophic.

- Environment simulation
- Component testing
- Mitigation
- Verification

Selection of Space grade FPGA

There are sufficient logic resources to meet the mission's processing needs, unit cost, legacy of use, the suitability of the package, its size and pin pitch, ease of assembly onto a PCB and the qualification of the mounting to withstand shock and vibration, prototyping options, the number of supply rails, the design of the power-distribution architecture, the number and type of I/O and the configuration architecture. .

Challenges for FPGA in Space

Space FPGAs need to be able to deal with the aspects of harsh environment conditions. These devices must survive the high mechanical and acoustic vibration during the rocket launch, and withstand high temperature ranges due to the vacuum in space, in which industry or military temperature grade devices, using appropriate packaging technology, are able to work safely.There are multiple parameters that determine what makes one group of techniques more or less suitable in each case.

- We need to define the radiation environment that can affect your IC.
- We needs to define the reliability targets
- We needs to identify the candidate IC technologies or existing parts and collect data on their sensitivity to TID and SEE.
- We need to identify and quantify all the effects of mitigation techniques which can be introduced at the various levels.
- We need to choose the best compromise of mitigation that allows meeting the reliability targets while also respecting the rest of the requirements. In doing this, the expected levels of final fault tolerance are estimated by analysis.
- Once implemented, validate the selected approach by fault-injection and/or radiation testing.

Three rad-hard device families are NG-MEDIUM, NG-LARGE, and NG-ULTRA, with increasing fabric size and number of logic resources. A combination of radiation hardening by process, layout, architecture (EDAC), and circuit design , together with a background scrubber to preserve the integrity of the internal configuration, are used to provide a rad-hard fabric.

Challenges of Mitigation

SEU mitigation has become more challenging as increased logic densities require less overall charge to disrupt sensitive locations. Some space-grade FPGAs have been hardened-by-process, fabricated using a CMOS silicon-o- -insulator process, or use an epitaxial layer to protect against radiation-induced latch-up. There are mitigation techniques such as SM encoding, memory protection, reconfiguration, TRM etc.Flash-based FPGAs are non-volatile devices. They can be re-programmed in-orbit..

An SET is the voltage pulse resulting from the charge deposited by an ionizing particle passing through a sensitive area of a circuit. Each SET has an unique shape, polarity, amplitude and duration which is dependent on the location and energy of the impact, device biasing and output loading conditions. SETs can propagate in the asynchronous, combinatorial logic .They are found within FPGAs and subsequently be clocked by a flip-flop becoming an SEU.Logical masking occurs when an SET generated by a particle is not propagated to an output due the logic value on the input of a gate. Electrical masking occurs when an SET is attenuated because of the capacitive loading as it propagates along the signal path until it is no longer able to affect the output of a circuit .Temporal masking occurs if an SET reaches a memory element at an instant other than the triggering window's setup and hold requirements. Hardware redundancy duplicates or triplicates the combinational and/or sequential logic with the final output being a final decision.

Figure 2. From eFPGA to BRAVE & beyond
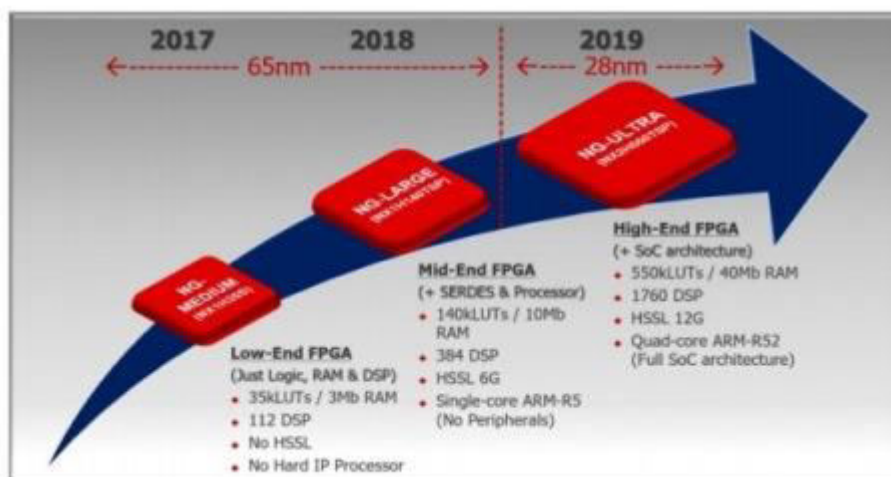

Figure 3-1. FPGA Schedule

Figure 3-2. FPGA Schedule

About the author

Mr. V. P. Sampath works as a consultant that develops hardware/software co-design tools. Among his publications are technical articles and papers on FPGA and Embedded systems and methods as well as textbooks. He is an active Senior Member of IEEE and Member of Institution of Engineers. He is a mentor for the semiconductor industries. He has a passion to build India as a super power. He is currently a patron for Semiconductor Federation of India.

Electric Vehicles for India: Overview and Challenges

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Abstract

The global pollution is on rise and every effort made, being to reduce the CO2 emissions and save the planet. One such effort is the introduction of Electric Vehicles (EV). The transport sector is one of the biggest emitter of CO2 and hence it is very important to convert the sector to a green sector. Indian government has come up with ambitious plans of introducing the EVs to Indian market and keep in pace with the development of EVs globally. The National Electric Mobility Mission Plan 2020 (NEMMP 2020) has come with a detailed report on the EVs.

1. Charging Infrastructure

At present, India needs to provide adequate charging infrastructure to boost the adoption of EVs by Indian customers. The lack of charging infrastructure will put the customers under range anxiety, as the vehicle may not run long without charging infrastructure at regular intervals on the roadways. Charging infrastructure classified into following:

1.1 Home Charging:
This is the most common type of charging. The customer needs to have a 230V/15 A single phase supply in order to charge the EVs. They can deliver a maximum of 2.5 KW. The charging process takes time and it is expect that the customers will charge the EVs at night. The metering is connect directly with home metering and hence there is no separate billing for it. However, there may be soon a policy emerge to regulate the home charging also with separate metering and guidelines for builders to mandatorily include EV charging stations in flats and apartments.

1.2 Public Charging:
Public charging maintained by the government or its any of delegated bodies. Public places such as parking lots, malls, offices may be target to offer public charging. They are meter separately.

a) AC Charging: AC charging can be a slow or fast charging. They will employ a power converter to convert the ac power into dc power to charge the batteries. The slow charging will charge at 2.5 kW to 3 kW while fast charging will charge at the rate of 7.7 kW to 22 kW. The IEC 60309 Industrial Blue connector prescribed as the Bharat EV standard to be use in AC charging.

b) DC Charging: In this method, the output of the charging port directly provides high current DC power to directly fed to the batteries. The charging rates are very high upto 50 kW. The voltage rating of them is 48V/72V. DC fast charging infrastructure is very important for buses and cabs, which usually travel long distances. The connector recommended is GB/T connector standard.

2 Research and Development in Electric Vehicles

2.1 Battery Cell:
The battery cell forms the basic unit of the battery pack that is employed in the EVs. The battery cells together constitute a module and several such modules collectively form a battery pack. The batteries form the major cost in EVs. Their cost is nearly half of the cost of EVs. Hence, if the cost of batteries brought down, then cost of EVs will come down. The prices of electrodes and electrolytes needs to bring down to affordable prices. The research on battery cell involves increased thermal protection, higher power density, increasing the lifespan and coming with lightweight materials.

There are various battery technologies available for EVs. They are summarize as follows:

a) Lead-acid Battery: These batteries employ lead oxide as positive active material; spongy lead as negative active element and sulphuric acid used as the electrolyte medium. The advantaged of lead-acid batteries are that are very commonly available and cost very less. The technology has been around fifty years and has matured now. The disadvantages are that they have a limited life cycle and low power density. They also weigh heavier.

b) Nickel-Metal Hydride Battery: These batteries carry nickel hydroxide as positive electrode and titanium or nickel as negative electrode. The electrolyte solution is alkaline solutions. These batteries are resistant to wide temperature changes and their life cycle are long. They are also recyclable. However, they suffer from lower charge-discharge cycles.

c) Lithium ion (Li-on) Battery: Currently the lithium ion (Li-on) batteries developed for running the EVs. There are three main variants of Li-on batteries. They are

i) NMC (Lithium Manganese Cobalt Oxide)
These batteries employ graphite as anode. NMC batteries very commonly used because of less cost. The other features of the battery is that they carry the highest specific energy and they are lightweight. This gives a significant edge over other variants. The disadvantage with these batteries are that they cannot be charged very fast (less than an hour) and typically requires 6 hours of charging time for normal usage of EVs. They also cannot exposed to ambient temperature of 40 degrees or above. These batteries carry 80% DoD and last up to 2500 charge-discharge cycles. The normal discharge rate of battery is 2 hours.

ii) LTO (Lithium Titanate)
The LTO batteries can address the disadvantages of NMC batteries. These batteries can be charged fast (less than 30 minutes) and they are resistant to high ambient temperatures of 45 deg. They also can last up to 10000 charge-discharge cycles and hence they seem to be a very attractive. However, the downside of the LTO batteries are that that specific energy is lesser than NMC and they weigh more. However, there cost that is the main disadvantage. They cost around 3 to 4 time higher than NMC.

iii) LFP (Lithium Phospate)
The LFP batteries occupy an intermediate position between the NMC and LTO batteries. Compared to NMC batteries, there are more temperature tolerant, but lesser than LTO. They can also charge and discharge faster.

India's approach towards battery cell should be a collaborative research with the global players and not entirely on its own. Many countries such US, Japan, China, Korea have advanced battery technologies and hence it will be wiser for India to collaborate with them. This can be done by many ways. One way is to let the global players invest their infrastructure in India. This will help the country in gaining the needed much knowledge in battery technology. Another way is to let the OEMs (Original Equipment Manufacturers) and national labs to collaborate with global players. In either way, the need for India is to scale up the battery manufacturing on quantity scale.

3. Battery Management System:

Battery Management System (BMS) is the electronics that deals with binding the cells of a battery pack together and constantly monitoring the status of each cell. The temperature of each cell, charge-discharge status, short circuit protection carried out by BMS. The BMS leads to efficient use of the battery pack. The BMS is highly dependent on local weather conditions and hence it is very important of India to develop their own BMS rather than outsourcing them. An indigenous BMS will keep in pace with the cost affordability of Indian Customers. An EV suitable for EU nations may not be suitable for Indian conditions because of the differences in the weather conditions. In this case, the BMS plays the key role to make the EV suitable for Indian weather conditions.
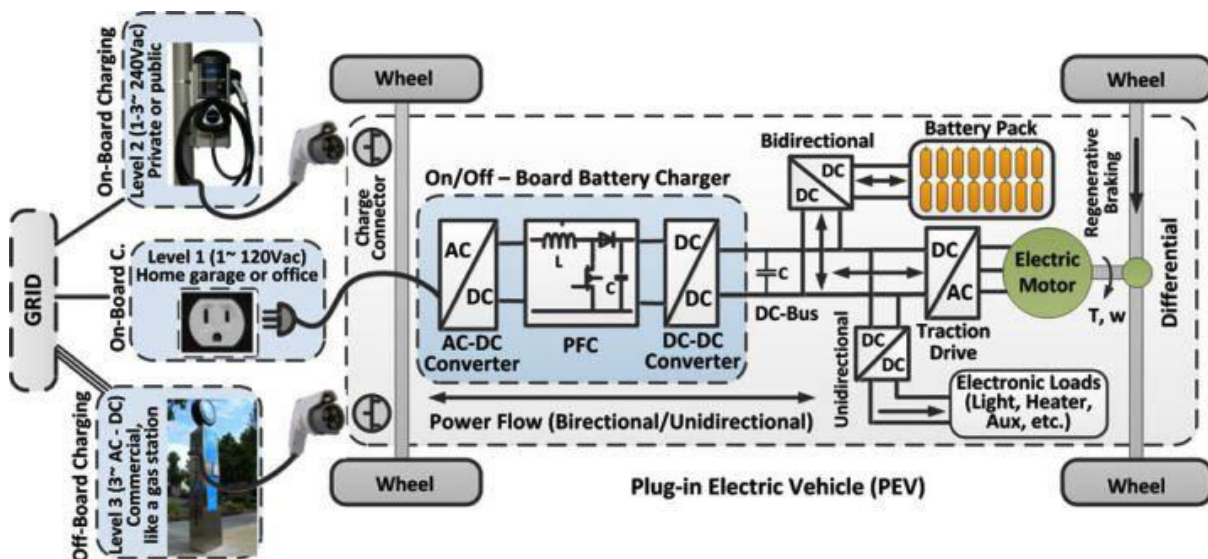
3.1 Power Electronics:

Figure 1: Power Electronics employed in a EV [2].

Power electronics takes care of the various power conversion process from the plug to wheel. The various power electronics converters employed in EVs are

a) AC-DC converter: The EVs conventionally charged from an ac outlet. However, but the batteries charge only with dc power. Hence, the AC-DC converter helps in converting the ac power to dc power, not only batteries, dc power is required by many electronics loads such as lights, heater within the EVs and hence it is a big network of power.

b) DC-DC converter: The dc power from the AC-DC converter is often variable and fluctuating. Hence, it is necessary to make the dc power constant and stable. In a DC-DC converter, it is important to provide the isolation between input and output. This makes sure that the power electronics converter are safe from any reverse flow of current.

c) DC-AC converter: The ac power is necessary to drive the electric motors in EVs. Hence, another DC-AC converter is necessary to convert the dc power from DC-DC converter to ac power. The ac power could be single-phase or three-phase depending upon the type of motor used.

d) AC-AC converter: This converter used for the purposes of changing the frequency of ac power. The electric motors when required to operate with variable speed based on frequency could employ this converter

There are wide areas of research in power electronics for use in EVs. The converters need to be compact and occupy very less space. This helps in providing more interior spacing within the vehicle; the converters also need to be lightweight. A heavier converter burdens the electric motors to carry more current to achieve high speed. The heat management in power electronics is also very important and process ventilation facility needs to provide.

4. Electric Motors

The electric motors convert the electrical power to mechanical power and drive the EVs. The electric motors also help in regenerative braking where the electric motor acts as generator and converts the mechanical energy into electrical energy. There are many types of electric motors and they classified as follows:

a) Brushed DC motor:

The stator of these motors made up of permanent magnets. The rotor consists of brushes, which provides supply to stator. At low speed, they have the ability to provide maximum torque, which is very much desirable. However, the disadvantage with these motors are that they are very bulky and operate under very low efficiency. Hence, they are usually not preferred in EVs.

b) Permanent Magnet Brushless DC Motor (BLDC):
These motors are smaller and light in weight. They have improved heat dissipation and carry higher specific power. There are no rotor copper loss associated with them. However, the cost of permanent magnet is high.

c) Permanent Magnet Synchronous Motor (PMSM):

These motors do not employ any gear system and have a wide operating speed ranges. They are efficient and very compact; the disadvantage is that they carry huge iron loss at high speeds.

d) Switched Reluctance Motor (SRM):

These motors are relatively simple and robust in construction. They are small and operate at high speeds. The disadvantages are that they are very noisy and operate at low power factor. The PM machines are also heavier and costlier.

e) Induction Motor (IM):

They have matured commutatorless motor drive system technologies and operated like a separately excited DC motor. India should encourage the indigenous manufacturing of motors. The kind of design needed for designing of motors for Indian road conditions is quite different from those of other countries. The average speed of vehicles in India is 25 Km/hr as opposed to 45 Km/hr in the western countries. Hence, it is important that the motors developed should have their peak efficiency at 25 Km/hr. This will help in power savings. Importing of motors for Indian EVs will increase the price of EVs and they are not assure of working efficiently for Indian road conditions.

5. Conclusion

India has a huge challenge in shifting the transportation sector from ICE engines to EVs. This requires a lot of planning, research and development. Government policies like FAME and few other policies needs to be updated on regular basis to

keep in pace with the development throughout the world. India should focus on improving the energy-efficiency of EVs. The power electronics, electric motors should planned for Indian conditions. A battery eco-system needs to be develop which can support many companies and start-ups developing battery pack up and cell manufacturing. Charging infrastructure needs to be adequately build to address range anxiety. The options of swapping also be explored. It is also very important to create demand generation by making all government buses electric and offering tax exemptions for private EV owners.

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Electric Vehicle Basics

Just as there are a variety of technologies available in conventional vehicles, plug-in electric vehicles (also known as electric cars or EVs) have different capabilities that can accommodate different drivers' needs. A major feature of EVs is that drivers can plug them in to charge from an off-board electric power source. This distinguishes them from hybrid electric vehicles, which supplement an internal combustion engine with battery power but cannot be plugged in. https://www.energy.gov/eere/electricvehicles/electric-vehicle-basics

Electric vehicle industry in India

Electric vehicle industry in India. India unveiled 'National Electric Mobility Mission Plan (NEMMP) 2020' in 2013 to address the issues of National energy security, vehicular pollution and growth of domestic manufacturing capabilities. Reiterating its commitment to the Paris Agreement, the Government of India has plans to make a major shift to electric vehicles by 2030. E-commerce companies, Indian car manufacturers like Reva Electric Car Company (RECC), and Indian app-based transportation network companies like Ola are working on making electric cars more common over the next two decades. https://en.wikipedia.org/wiki/Electric_vehicle_industry_in_India

Internet of Things (IoT) and E-Healthcare System – A Short Review on Challenges

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Abstract

The Internet of Things (IoT) connects smart objects and devices, which provides large amount of data to be stored than analyzed for processing. IoT devices are useful in different categories from remote monitoring of industrial environment to industrial automation. Furthermore, healthcare applications are mainly showing interest towards IoT devices because of cost reduction, user-friendly and improve the quality-of-life of patients. The existing IoT-driven healthcare applications, analyzed and still there is a need for innovative technology-based solutions to face the challenges in medical environment. In particular, wearable and implantable devices with IoT architectures, investigated for data-transmission process. The usage of IoT in e-healthcare has tremendously increased in many areas such as to maintain vital equipment, monitor patient care, monitor medical assets, track equipment usage etc. Wearable IoT interlinks body-worn sensor devices to the medical environment; the physicians can monitor the health condition of patients remotely. Implantable devices aid in replacing the biological part of the human body, which damaged. Developing wearable and implantable body area network is significantly challenging due to miniaturization of sensors, integration of Integrated Circuits (ICs), less energy consumption, body-worn antennas, non-invasive wearable structures etc. This article provides the overall ecosystem of IoT based E-healthcare systems and its relevant components.

Keywords: IoT, e-healthcare, sensor devices, wearables, implantables'.

Introduction

In the starting of 21st century, no one predicted the immense impact of IoT in our daily life. Nowadays, the things have changed drastically with the exponential growth of IoT sensor devices. IoT connects heterogeneous objects to the internet, which permit data exchange rapidly never exists before [1]. An IoT device that interconnects different kinds of objects wirelessly to a network and transmits data seamlessly and it is perceive as the "things" in IoT. Large number of entities connected with the network in IoT based infrastructure that enables easy and effective communication. The embedded technology assists internal as well as external communication in order to make further decisions [2]. The 'thing' in IoT can be an automobile with built-in-sensors or a human with a heart monitor, i.e. once the objects are assigned with IP addresses and those are capable of gathering and transferring data with little or without any human intervention. IoT devices include thermostats, light bulbs, door locks, cars, fridges, wearable such as smart clothes, smart watches, implantable like pacemakers and RFID. The trend behind IoT is all about functioning in concert of users in businesses, industry, or at home.

The recent achievements in IT industry significantly improved the intelligence and communication and the devices with which we are interacting around. E-healthcare system plays a vital role as a dedicated ecosystem for medical treatment and supervision. It is obvious that the requirement of novel technologies is essential to permit the inter-communication between heterogeneous devices via internet. Healthcare services and medical supervision provisioning is about to change the entire world of innovative technologies. Various automation devices include intelligent sensors, regulators, actuators, PLCs exchanges data in order to direct control functionalities or monitor on a large-scale system. Devices do not exhibit autonomous behavior and the intelligent sensor be fixed in building automation system, secured e-health system as well. Such device activated as an individual "thing" under the defined access control policy. IoT provides appropriate solution in various domains such as traffic congestion, industrial sector, emergency services, logistics, waste management, smart cities, and e-healthcare.

Overview of IoT in e-Healthcare system

Sharp alertness about health and fitness is the significant factor that drives healthcare users' attention towards IoT devices that removes the fear of frequent hospital visits and expensive physician. The healthcare consumers in the medical industry is growing rapidly that the total market being lead to revamped. Business models need to restructure to cope up with the growing influence of huge number of healthcare customers [3]. Recently, the recent survey states that the extraordinary growth in the usage of IoT devices such as wearable and implantable devices. With the 'Internet of Things' users can have the control of their health in a personalized way and the major strength lies in data analysis and for decision-making. The diagnosed information gathered using electronic medical annals, imaging tools, monitors, hand-held devices improves the decision-making process of physicians to play an active role in maintaining the patient's health.

IoT-based personalized review of person's health will become very common at the end of the decade. Healthcare users would be more comfortable with appropriate plans to defend against diseases and intelligent devices would assist them to maintain their health. With the data generated by IoT devices, the significant decisions made instantly to improve the patient's health. The challenge of healthcare industry is not lies in developing new devices, technologies, although the great attention is required for e-healthcare users. The number of smart connected devices aimed to improve the person's health

and the related environment with the intellectual usage of data. Such devices can track the environmental air quality and the doctors' can provide the consultation for the patients remotely [4]. In particular, there are three main qualities to certify the sensor equipped "thing" to become a part of IoT healthcare.

- ✓ First, the device should sense and collect the data about the surroundings, such as humidity, temperature, light as well in the case of pulse rate / blood oxygen monitoring, blood glucose monitoring, electro cardiogram monitoring, etc.
- ✓ Second, the device should be acting autonomous in communicating the gathered data to the central coordinator automatically or with any other device or if meets any condition [5].
- ✓ At last, it should be in an active mode until the process is completed. For instance, if patients' blood pressure or blood sugar levels are at critical, alert information should triggered out for immediate action.

Irregular heart rate of a patient stimulates an alert message to the cardiologist and the patient informed to proceed with the prescribed treatment immediately. Miniaturized implanted device or skin patch monitor's blood sugar, skin temperature and alerts the insulin pump to regulate the dosage [6]. This kind of monitoring assists not only to maintain the health status, but also enables the physician's advice before the condition becomes critical. Sensors in patients those who are suffer from heart related issues help to track the heart rhythm continuously. The blood pressure, healthcare medical devices like CTs and MRIs, oxygen saturation levels can also be tracked remotely [7]. Patient's movement tracked efficiently with Radio-Frequency Identification [RFID] technology, sensor devices and process analytics done for identifying and monitoring the optimal process flow.

Nowadays, human health predominantly influenced by behavioral as well as environmental factors like smoking, polluted city etc. IoT assist in understanding the patient's life style and it has the potential to strengthen the predictive analytics. According to Gartner's Hype Cycle of Emerging Technologies report, another 10 years are required for the full usage of IoT in e-healthcare system. Body sensors combined with Arduino and RasberryPi boards to manipulate collected data from heterogeneous networks. IoT based e-healthcare systems are design to gather biometric information and it assists in monitoring the patient for current status or medical diagnosis can be performed using android application, web services and multi-protocol unit.

Architecture of IOT in Healthcare

IoT is a network of connected physical devices and objects, which help to sense, analyze, and control remote devices. A conceptual framework introduced for connecting the edge computing devices to enable the communication among wearable sensors and smart devices seamlessly. IoT applications are highly dependent on the middleware layer in IoT architecture for information processing. Some IoT applications are smart health, smart grid, smart city, smart home, smart agriculture, intelligent transportation, etc. The fundamental IoT architecture framed with three layers comprises of perception, network and application layers. Then, extended to have more layered architectures and it includes middleware and business layer.

1. *Perception layer:* The perception layer describes about the sensor devices and physical objects. The sensor device in the perception layer identifies and senses the object and gathers information about the object. Based on the sensor type, the gathered information can be about temperature, motion, orientation, humidity, vibration, location, acceleration, chemical changes, etc. The information then transmitted to the next layer for processing. If a lady is wearing a set of smart earrings in her ears and it assists in detecting the condition of different parts of the body and locates the position of the lady. Perception layer transmits the gathered information by the earring to the network layer for processing [8].

2. *Perception layer:* Also termed as, "Transmission Layer" and its major task is to connect different servers, smart objects and network devices. It transmits the sensor data, which is collect from sensor devices. The transmission medium can be the technologies such as infrared, Bluetooth, ZigBee, Wi-Fi, UMTS, and 3G. Then the information transmitted from the network layer to the middleware layer. Network layer combines the information received from both earring and forward the same to the processing layer.

3. *Middlewave Layer:* It is the main "processing layer", which stores, analyses the large amount of information received from the network layer. It has the responsibility for the database connectivity and service management. Since it is the middle layer, provides number of services to the lower layers. It is connect with big data, cloud computing, and databases for processing the huge amount of data. Information, which is collect by earrings is analyzed and to verify the body temperature of human. If there is any dissimilarity with the normal temperature, then it is report to the corresponding entity and intimated to the patient.

4. *Application Layer:* The significant role of this layer to deliver application oriented services to the end users. This layer communicates directly with the end user by enabling application layer protocols. If the information collected from lady's earrings inform that she is having fever and the concerned lady can be communicated with the application layer. This layer communicates with the person by passing a notification about fever to the smart phone.

5. *Business Layer:* The business layer controls the entire IoT eco-system with well-constructed efficient business models. It assists the end user to make decisions for further actions. For instance, if a person suffering from fever then the nearby clinics or hospitals would suggested by displaying the details.

Wearable devices

Wearable devices can be fix to the human body in items such as bracelets, pendants, badges, wristwatches, T-shirts, smart rings, glasses, fitness trackers and other accessories for the global gain of health benefits [9]. A wearable device in close contact with the user is capable of tracking illness, wellness of a person and the collected information transmitted to the centralized hub station for analysis. Wearable devices comprise of three components such as sensors, computing architecture and displays. Wearable gadgets are able to provide biological information such as calories burned, steps walked, heart rate, blood pressure, and time spent exercising, etc. [10]. There is a huge impact on these devices and it is quite powerful which gains good attention in tracking user's physical health.

Some wearable devices as listed below:

- ✓ *Pulse Oximetry:* The device helps to measure the oxygen saturation level in a human body, tracks the difference in the blood level of skin related to cardiac cycle. Particularly, a pulse oximeter is attach to a finger or an earlobe, which consists of photodetector and Light-Emitting Diodes (LEDs). It quantifies the amount of infrared, the red light that is send to or reverted by the human body. The difference between the absorption level and the oxygenated to deoxygenated hemoglobin level assists in measuring the oxygen saturation level. The periodic signal termed as PhotoPlethysmoGraph (PPG), which is use to locate the heart rate.

- ✓ *Electrocardiography (ECG):* A waveform that tracks the heart functioning persistently and provides the information with respect to time. Hence, ECG measurements based on wireless sensor devices are prominently suitable for ambulatory applications.

- ✓ *Blood Pressure:* It helps to measure the force exerted due to the blood circulation on blood vessels. These types of sensors fitted around the wrist and systolic, diastolic readings measured by using oscillometric method.

- ✓ *Electromyography (EMG):* It is the study of muscle functioning by monitoring the electrical signals exercised by the muscle. EMG is the spatio-temporal summation of all electrical signals. Hence, the EMG signal provides an effective means of tracking the human muscle activities.

- ✓ *Electroencephalography (EEG):* Electroencephalography (EEG) is the depiction of human brain activities. Wireless Intelligent Sensor (WISE) is a micro-controller based system and introduced for EEG signal acquisition applications for data acquisition, wireless communication, analog-signal conditioning, and low-level real-time signal processing.

Implantable devices

Implant devices that are implant under the skin of the human body and it help in repairing the part or the entire biological structure [11]. Nowadays, implants normally used for various purposes such as neural prosthetics, orthopedics, cardiovascular stent, artificial pacemaker, defibrillator, dental fillings and crowns, drug delivery system, cochlear implants, etc. [12]. The outer layer of implantable devices can be made of any biomedical material such as apatite, silicone, titanium, and the material should be select based on the requirement of the human body part. The materials used for implant devices can be of ceramics, metals, and polymers. Some implantable devices listed as below:

- ✓ *Glucose Monitoring:* The process accomplished by implanting the sensor device with the multilayered membrane in the abdominal tissue. Body glucose level can tracked for every 30s and the data transmission happened for every 5 minutes. If the sensors are implanted and the glucose level can be controlled by providing the varying amount of insulin.

- ✓ *Implantable Neural Stimulators:* These types of neural stimulators direct the electrical impulses into the human's spinal cord or the brain to provide the treatment for chronic pain.

Conclusion

E-healthcare system provides a technological framework that uses wearable and implantable health sensors to facilitate monitoring various factors such as health, wellness, behavior and other chronic information for the benefit of individual's everyday quality of life. The main objective of this article is to investigate how IoT can be associated with wearable and implantable devices in healthcare system. The wearable and implantable gadgets will surely revolutionize the smart technologies that are quite familiar nowadays and in near future. The sensors needs to be design in a precise way to be easily wearable and less power consumption. The clinical information gathered from the sensor devices need to preserve in

a secured data-warehouse. Promoting IoT devices will accelerate the adoption of e-healthcare system on a wider scale. The technologies for e-healthcare system should be safe, consistent, effective, flexible, power-efficient, and patient-centric. Moreover, designing IoT devices for upcoming e-healthcare system is challenging which determines the success of IoT based e-healthcare system.

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10 examples of the Internet of Things in healthcare

The next decade may well see a revolution in the treatment and diagnosis of disease. The Internet of Things (IoT) has opened up a world of possibilities in medicine: when connected to the internet, ordinary medical devices can collect invaluable additional data, give extra insight into symptoms and trends, enable remote care, and generally give patients more control over their lives and treatment. Here are 10 examples of IoT in healthcare that demonstrate what medicine is becoming capable of thanks to technology.
https://econsultancy.com/internet-of-things-healthcare/

India's health with AI, machine learning, and smart apps

From medical tourism to telemedicine, India's healthcare sector has been expanding at a healthy double-digit rate to include newer and better services powered by new-age technologies. The problem, however, is not availability, but access to these services. For every 1,000 people, the number of physicians in India stands at 0.7 (less than 1), a metric that places the country way behind the global average of 1.5 physicians per 1,000 people. And then, there are only 0.7 beds per 1,000 people, compared to the World Health Organisation's (WHO) recommendation of 3.5. These findings from the Deloitte and CII's 'Medical Technology, Shaping Healthcare For All In India' report highlight the grim reality of healthcare in the country. But, more importantly, it stresses on the challenges that people across the length and breadth of India – including rural parts and cities other than the Tier I – face when it comes to the access to "quality and affordable" healthcare. On the flipside, India's healthcare space is expected to grow at 23 percent CAGR to a $280 billion market by 2020. And with the 'Digital India' initiative, the government has been bolstering all efforts towards bridging the gap in healthtech, an area where Indian startups already have a momentum. On the heels of World Health Day, we take a look at five such startups making healthcare efficient and affordable for us.
https://yourstory.com/2019/04/startups-monitoring-india-health-machine-learning

A guide to healthcare IoT possibilities and obstacles

This essential guide will look at some of the current applications of healthcare IoT, including how it's being used in one Boston hospital to keep track of newborns in the NICU. Next, the guide explores some of the challenges of IoT in healthcare, such as the need to manage multiple connected devices and a lack of interoperability with EHR systems. Finally, this guide will posit the future of healthcare IoT, including how physicians can turn IoT data into actions.
https://searchhealthit.techtarget.com/essentialguide/A-guide-to-healthcare-IoT-possibilities-and-obstacles

Marine Autonomous Systems – Technology, Opportunities and Use Cases

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Introduction

Despite water covering two-thirds of the earth's surface, there are very few data that we have from the water cover. It is a known fact that we have more information about outer space than underwater. Our knowledge about underwater life and environment is very thin. There is a staggering 92% of the underwater surface that is yet to be explored or mapped. Various technologies have been developed for research and mapping purposes. The highlight of them is the usage of autonomous systems. The systems can be made use of in dynamic environments of the ocean without compromising human safety. Therefore creating a wide range of research opportunities and fields to explore.

Marine Autonomy

While land vehicles and airborne vehicles have a rather clear path for traversing when compared to underwater. The land and air vehicles can be localized, connected or mapped easily with various technologies such as GPS, Wi-Fi, and other wireless technologies. In the case of underwater systems, this luxury is not available since the generally used wireless technologies are rendered ineffective. These signals do not have the capability to function underwater and they become either non-penetrable or distorted. When compared to other modes of travel, water systems, and underwater systems require automation more as the environment is completely unpredictable and dynamic. These autonomous systems can thus replace human divers to do dangerous tasks and missions. Automating an underwater vehicle is a very challenging task as none of the variables can be predicted and the actions of the vehicle cannot be pre-programmed. The vehicle has to face a number of challenges and obstacles such as random floating objects, sea creatures and unforeseeable climate changes. These have to be avoided and bypassed for the system to complete the task successfully. The processor that is used for the integration of the data collected from all the sensors is served with a 'self-thinking' algorithm framework that can decide the course and track of the vehicle with respect to the data readings.

Untethered in the physical sense, but there remains an acoustic tether. There are advantages and disadvantages to this. Without external signals from a shore controller, ROV is dependent upon positioning input from vehicle-mounted marine sensors. In case of real time applications, a mother vessel to provide this input is therefore required. However, the presence of the mother vessel allows for continuous monitoring of AUV control and payload systems. This provides assurance that the system will return with adequate data and provides for more than a minimum of quality control information allowing for provisional data interpretation and mission re-planning.

The way forward is to build flexibility into the AUV control systems, to allow autonomous operations but also to have control and real-time quality control capabilities when required. For the ROV system, this will require improvements to the AUV navigation system. For the AUV system, significantly greater mission endurance is necessary. For both, the launch and recovery weather window should be carefully curated.

Some systems can all follow pre-programmed missions and have a (largely untested) collision avoidance capability. Their payloads may contain bathymetry, side scan sonar, and profiler. However, they do not address all areas of oil industry requirements where, with further development, there is potential for the AUV technology to be applied. Other potential applications include:

- Environmental inspection
- Engineering inspection.
- Underwater engineering intervention.

Inspection is undertaken using sonar, photography and physical measurement. Intervention currently uses tethered remotely operated vehicles (ROVs) for valve manipulation, component replacement, etc.

Types of Marine Autonomous Systems (MAS)
- Remotely Operated Vehicle (ROV)
- Autonomous Underwater Vehicle (AUV)
- Unmanned Surface Vehicle (USV)
- Autonomous Ships
- Research Vehicles

Sensing and Processing
- Multibeam Echosounder (MBES)
- Side Scan Sonar

- Synthetic Aperture Sonar (SAS)
- Differential Global Positioning System (DGPS)
- Inertial Measurement Unit (IMU)
- Underwater Acoustics
- Doppler Velocity Log (DVL)

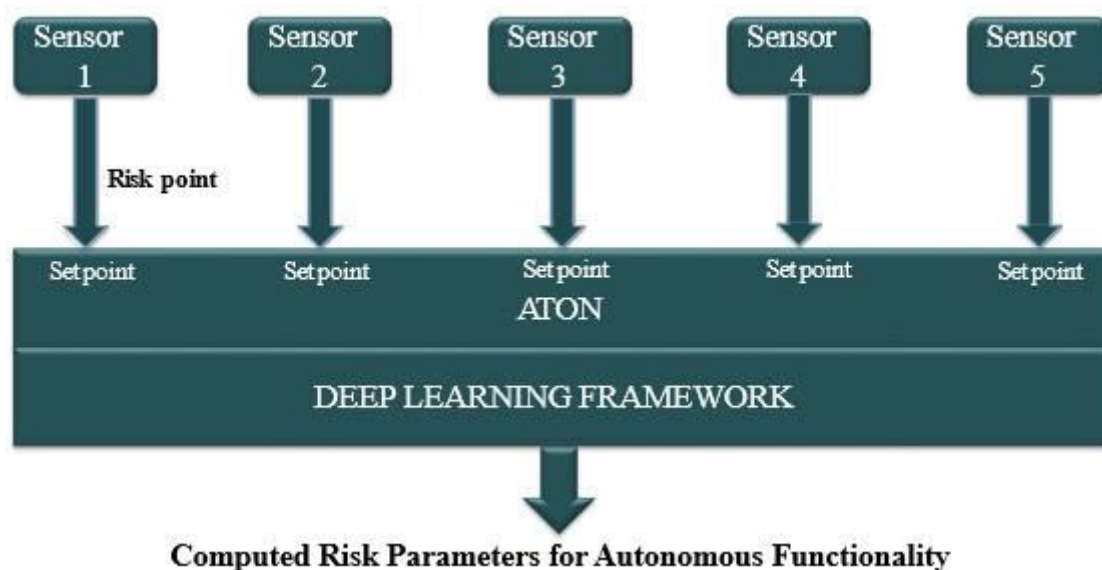**Advanced Technologies in MAS**
- Autonomous Marine Cloud Processing
- Subsea Artificial Intelligence
- Marine Big Data
- Marine Cybernetics
- Subsea Data Storages
- Collaborative Systems

Autonomously Taking ActiON (ATON)**

Every Autonomous vehicle requires a framework capable of making decisions without human support. It should be able to take the input from various sensors connected to the vehicle, process the information accordingly, and then control the vehicle motion with respect to the decisions made.

ATON is an indigenously developed framework for Underwater Robotics and Autonomous Systems. The features of ATON are:

- Identifies the best and safest model to which system can perform the Autonomous operation.
- Apart from understanding the risk, in the background, it derives alternatives to mitigate the unexpected risks.
- It works on a **Parallel Redundant Storage Algorithm**, in which numerous multi-core process run simultaneously, the risk factor is constituted from the data received and the actions will be forwarded accordingly.
- Every 18 seconds, it will formulate a reference safe model to keep updating system status.
- **Set Points** and **Risk Points** are the prime decision making factors.
- In the event of any failure, ATON will change the weightage to other sensors, which can manage the risk, and the system will remodel immediately for the maximum risk to be diverted with the current setup.
- ATON comprises of 124 internal algorithm to support any marine sensor attached with the vehicle.

Figure 1 – ATON Framework Illustration
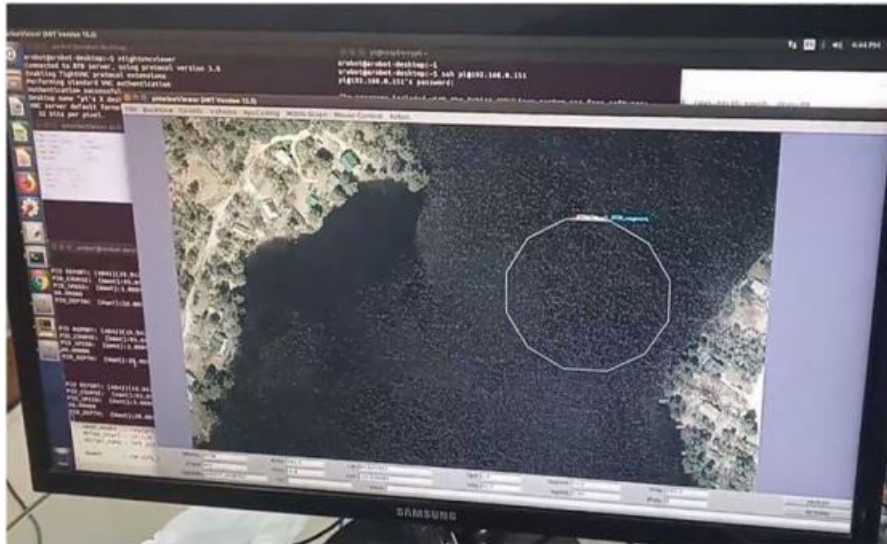Set Points - The calibrated points or data
Risk Points - Fault characterized by ATON
Example - While obtaining the DGPS data, where PDOP* > 2, the data will be incorrect that leads to risk
*Position Dilution of Precision - PDOP is a risk and will become a risk point

Experimental Setup

Figure 2 – ATON Framework Software Implementation

- The above figure shows the **Way Point** for a virtual mission.
- The mission is to complete the circular path without any support from the human controller.
- Though the path is circular, it is seen that the path resembles more like a polygon.
- Each point on the polygon denotes a Setpoint as illustrated in Figure 1.
- When the vehicle reaches each Setpoint, the path is evaluated for further maneuvering.
- This is done using the input obtained from various sensors attached to the vehicle.
- At this stage the risk evaluation and mitigation tasks (if any) are carried out.
- In case of emergency task abortion and in case of successful task completion, the vehicle returns to its **Home Set Point** that is the start point.

Figure 3 – ATON Framework Hardware/Vehicle Setup

- Figure 3 shows the hardware setup of the system.
- The trial is conducted using a self-built Remotely Operated Vehicle (ROV).
- The connections to the software and hardware with the necessary sensors are established with respect to the vehicle application.

Opportunities

Marine Autonomous Systems that includes AUV, USV, ROV and autonomous ships account for about $5 billion. As the automation in the systems increase, it calls for more sensors and computation. Each of the systems has its unique computations.

With the emergence of autonomous systems, other prominent technologies such as cloud computing and artificial intelligence have also gained traction in the marine industry. IT services for marine autonomy saves at least $1 billion by the year 2020 that leads to tremendous scope extension.

The amount of data collected from the marine surveys have to be processed to get valid information. The heavy data comprises the output of various sensors used in the mission. Fields like Machine Learning have had a huge impact on analyzing the data patterns, ocean patterns and for various other analytics. In the recent advancements along with Cloud and ML, Artificial Intelligence and IoT have been used extensively.

Use Cases
There have been numerous discoveries of shipwrecks and other debris in the recent past. This has proven to be decisive in knowing the history of various shipbuilding mechanics of the past along with other related discoveries. This has intrigued the marine archaeologists to survey potential areas for shipwreck discoveries. This, in turn, helps in widespread knowledge of the systems and the technology being used in the surveys.

Along with archaeological applications, the ROV's, AUV's along with the sensor suite have been deployed immensely for identification of debris. Numerous salvage operations related to flight crashes and oil spills have used these technologies to map the required piece of ocean area.

Since the existing mapped area of the underwater surface is very less, any new search operation requires a complete mapping from the basic levels. Therefore, for one search operation, it makes use of all available sensors for diverse data collection that in turn takes a completely new computation system for the particularly large dataset.

Along with these industries, the Oil & Gas industry, Defense, Environmental and Climatic applications usage of these latest technologies have been on the rise. The analytic methodologies have been vastly used for prediction of the data.

Note
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Architecting for Strategic Outcomes

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Technology is increasingly important. Some very successful organizations are even "born digital." However, anywhere from 70 to 84% of initiatives involving technology fail, according to Gallup, HBR, and McKinsey. I agree with this terrifying finding based on my own exposure to 500+ projects. Why do most initiatives fail? How do you advance your initiatives from tragic to strategic?

Business risks due to current tech-focused approach

Whether it is a software project or a digital transformation initiative, almost all focus is on technology. If initiatives are so tech-focused, they often involve the mere introduction of one or more technology elements into the organization – and almost nothing else. This means there is little or no business innovation, which is key to creating real transformation that can deliver outcomes compatible with corporate strategy. We normally see organizations facing 3 big business risks due to this tech-focused approach.

Wrong tech: Here are some common reasons why we select tech that is inappropriate for the organization: (a) The technology is hot (b) Competition has that technology (c) The technology rushes to solve a problem reported by a few folks (d) The technology solves standard problems.

Recurrence: Recurrence is about business problems remaining even after the organization has invested money in new initiatives. Here's a simple example. The accounting process at a restaurant chain remains the same-old, same-old after the organization had developed and deployed an accounting software; the existing accounting process was simply embedded in the new software and so old problems remain. Problems also remain due to other reasons such as: Not making changes to the broader (or umbrella) process that uses the tech. If there's recurrence, a great opportunity to improve the organization was squandered.

Degradation: At the very least, some changes to the organization may be required to make sure everything (including the newly-added technology element) could work together as one. Such changes are often not foreseen and implemented. Result: One or more existing processes connected to the tech element may actually get worse in performance. In "Enterprise Architecture as Strategy," authors Ross, Weill, and Robertson describe the problem: "Individually, the applications work fine. Together, they hinder companies' efforts to coordinate customer, supplier and employee processes." Here's one of many symptoms of degradation: Different employees give different answers to the same question.

Blend tech and business innovations
Transformation initiatives must deliver strategic outcomes, that is, outcomes compatible with corporate strategy. Strategic outcomes are measured in terms of customer value and financial performance – things that matter the most to organizations. To deliver strategic outcomes, you need a certain combination of business innovations and technologies. How do you ensure you have the right blend?

Method to architect the right blend

CIOs have tried to reduce the three business risks. For example, CIOs improved IT Governance. But, the cause of the problem is elsewhere – in the transformation practice itself. The practice needs to be redesigned to enable the translation of strategy into a strategic architecture. The practice comprises a set of discovery and design tasks. The output would be an architecture that is composed of a blend of technology and business innovations. This strategy-driven discovery-and-design process that I created is called strategy translation.

Corporate strategy drives

What traditionally drives projects is either siloed department-level strategies or no strategy at all. But CEOs want corporate strategy to drive all significant initiatives. That's because corporate strategy is purposely devised to achieve corporate goals, which matter most to organizations. So, every step in strategy translation is driven by corporate strategy.

Discovery and design

Discover the right stuff. And design them right. Take a broad view. And you'll find several opportunities to blend the right technology and business innovations. Many organizations have dozens of silo technologies that may need to be combined in a new way. Internal tech may have to work with external tech used by customers and vendors. Multichannel (digital and physical) experiences work best when they're integrated.

In a recent initiative, Allianz looked far beyond the boundaries that defined traditional tech projects. They started with their "Simple, engaging customer experience" strategic theme. They identified 140 customer journeys, each spanning several touchpoints. From this initial set, they selected about 25 of the most urgent ones. Then they worked on this set and transformed it to give it the capability to drive strategic outcomes.

The result: predictably strategic architecture

The architecture becomes the business. It is that serious. Once implemented, the architecture becomes almost infeasible to fix. Therefore it is crucial that your architecture has in it the right things designed the right way.

You may want to avoid the two extremes. (1) Avoid adding a single, siloed piece of technology. Forrester Research founder George F. Colony has warned, "... if you inject technology and don't actually change the way you do work, you will get very low returns if any, and you may likely in fact disrupt ongoing, very healthy processes." (2) Avoid attempting an elaborate, enterprise architecture. Check out Gartner's list of pitfalls associated with enterprise architecture. A good architecture typically has neither too little, nor too much. It will have the right blend of technology and business innovations.

Since the strategy translation process is driven by strategy and requires you to do discovery-and-design integrally, the resulting architecture is predictably strategic. That is, it has the capability to deliver strategic outcomes.

SaaS to help

Given the terrifying percentage of failed initiatives, organizations definitely need help with strategy translation. Goodscore™ is a cloud-based software that enables the strategy translation process as well as the collaboration needed to make the process easy. Of course, a piece of technology cannot by itself deliver on organizational goals. And this is the whole point – you need the right blend of technology and business innovations.

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Why Design Thinking Helps Identify Great Artificial Intelligence Use Cases

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Introduction

Artificial Intelligence is a class of computer systems capable to performing tasks normally requiring human intelligence, such as visual processing, speech recognition & decision-making. It is a technology very much at its peak in the hype cycle. The advancement in this technology has enabled automation in multiple domains and in increasing depth over the last few years. Today, enterprises are aiming to automate almost anything, from simple monotonous, repetitive work to highly cognitive decision making processes.

Design thinking, on the other hand, is a human centric approach to solve problems. It brings structure to a problem solving thought process. The process runs through 5 main phases - Empathize, Define, Ideate, Prototype and Test. Each phase focuses on a particular aspect of the solutioning and the process can be iterative.

This paper aims to highlight how the design thinking framework compliments and encourages a mindset that helps in the Artificial Intelligence implementation process.

Design Thinking Process - The Artificial Intelligence Perspective

Design thinking has a set of concepts that inherently brings human centricity to problem solving. It follows from this human centric nature that it is open to uncertainty. This openness is vital to solutions built on rapidly evolving technologies like Artificial Intelligence.

Each stage in the design thinking phase provides importance to some aspect of the overall solution – from empathizing with the actual user to rapid prototyping. Each of these stages can draw a parallel with building a great AI solution.

1. Empathize

Benefit For AI: Helps in identifying the unarticulated AI opportunities, promotes a bottom up approach

Almost every enterprise is trying to automate their processes and AI is an unavoidable part of these initiatives. These initiatives are usually driven in a top down approach. However, the design thinking approach flips this on its head bringing the human user to the center of the solution, thus making it a bottom up approach.

The design thinking approach requires you to interact closely with the stakeholder and empathize with them to identify the pain points. During this interaction, the AI consultant, armed with the knowledge of the vast possibilities of AI can quickly identify opportunities for improvement. This means that even if the stakeholder does not articulate some concerns, one is still able to catch these and visualize a super-efficient future for them.

AI consultants needs to be capable of identifying human actions that leads to human decisions. This is key as it is important to create and collect training data which might not even exist today. The human centric approach of design thinking aids this facet of data creation for automation scenarios as we have a better understanding of how the various stakeholders. This may, at times, even lead to a modification of existing processes to capture subtle human actions.

It is also important to understand the current technological landscape of the enterprise. This is a critical step as the key decision makers would want to understand the technological shift that may be needed as part of our solution. Moreover, adopting AI into enterprise often needs a shift in mindset about how the operations are run. This phase gives you a chance to empathize with the various stake holders and understand their concerns about this shift.
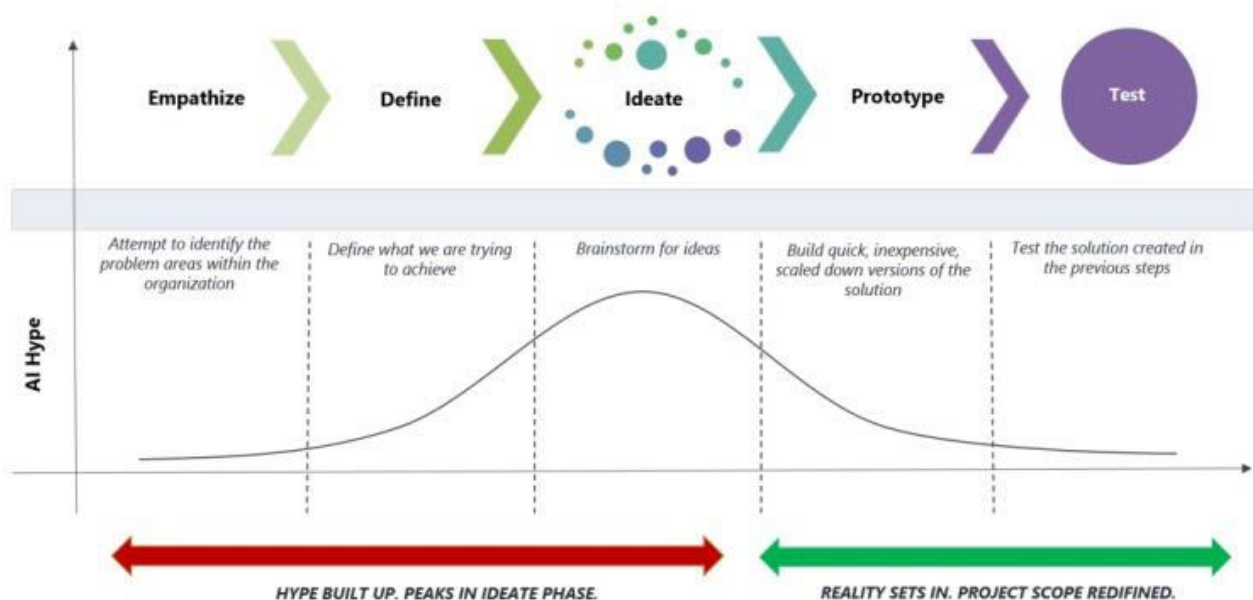
2. Define

Benefit for AI: Helps in defining the problem statement in a human centric way, thereby reducing anxiety

AI is often associated with job displacement. As such, resistance of AI solutions are often felt while interacting with stake holders. However, AI today should be viewed more as a solution that augments the capabilities of the work force, enabling them to reduce their workload on them. As such, a human centric definition of the problem statement would convey to the stake holder what they get as part of the overall solution. A statement like "Reduce effort by 50%" would do little to motivate the users to collaborate for an AI solution. On the other hand, "*Enable a more convenient execution of work*" might strike a chord with the work force.

3. Ideate

Benefit For AI: Promotes out of the box thinking, challenging status quo, thereby aiding innovation

This is a phase that allows the team to explore all the incredulous ideas. This stage allows users to challenge status quo, explore the unexplored and bravely imagine solutions akin to science fiction. Though expected to mimic human beings, automation offerings can follow a different set of rules as compared to human being for better efficiency. For example, in most automated warehouses, items are randomly placed as against an ordered fashion required by humans to do the job. The ideate stages helps us to unearth such radical and "not so obvious" possibilities for automation.

AI hype is often criticized, but in the design thinking process it is actually encouraged in the ideate stage. This actually powers innovation and helps in building out of the box solutions. As depicted in the diagram above, the AI peaks in this stage. Luckily, within the design thinking process, there is a mechanism in place to contain it in later stages.

4. Prototype

Benefit For AI: Promotes a "Fail fast, fail safe" mindset. Letting reality kick in smoothly.

This phase involves building quick proof of concepts. Design thinking encourages the philosophy of "Fail fast, Fail safe". Many benchmarking solutions out there may not be practical in production level solutions. It is often said that if you torture data hard enough, it will give you what you want. However, this will rarely be replicable in practical use cases.

Identifying the right use case candidate is a critical part of this whole process. Many practical problems in automation space have long tails. Human In The Loop (HITL) is the way forward. Spending 20% of effort to solve 80% of work makes an ideal case for HITL. Prototyping cases that meet these criteria should be the focus.

This phase reveals what is actually achievable within the AI ecosystem, bringing some sanity from all the hype built up in the previous stage. Here we quickly test hypothesis in AI and reduces the hype drastically. Furthermore, it lets the team

understand what all can be achieved via AI, staying within the limitation of the current technology maturity. Design thinking promotes a mindset that it is ok for PoC's to fail, as a failed PoC is one step closer to a successful solution.

5. Test

Benefits For AI: Uncertainty is not frowned upon

Testing AI solution needs a completely different mindset. It is often not possible to promise a given accuracy or performance for an AI solution. So it is always a moving target. That is because, the accuracy of the solution is highly dependent on the quality and quantity of data available in the enterprise. Unless one actually plays with the data, it might not be possible to confirm the accuracy of a solution at the beginning of a project. However, this mindset is often viewed cynically in the business world. However, in design thinking uncertainty is not frowned upon. In-fact it is expected facet of the overall process.

Moreover, one should note that AI solutions are expected to learn over time. The accuracy and target keep moving based on incoming data and feedback loops. Testing stage provides a feedback mechanism, allowing the team to see whether the solution is actually improving over time and more importantly whether it is able to achieve the required KPI's or not.

Summary:

Design thinking provides a framework that enables us to ask the right question at the right time while building an AI solution. Moreover, it promotes a mindset that accepts uncertainty, a major component for most complex AI projects. Design thinking tackles complex AI related problems by:

- Understanding the in-articulated AI opportunities within a process
- Reducing the apprehensions of the stake holder of the "dangers" of AI, thereby enabling better collaboration
- Allowing AI hype to grow that aids innovation while at the same time containing it at later stages
- Encouraging *'fail fast fail safe'* methodology, that empower AI engineers to test uncharted waters
- Bringing in a mindset to accept uncertainty in results, with an anticipation that the solution learns over time

Artificial Intelligence is the future and is every much intertwined with our life's. With more are more AI projects being taken up, design thinking helps promote the mindset and culture, so much required for enabling a AI-pro future.

About the authors

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The right mix of consulting experience, delivery experience, servicing experience, research experience, & futurism gives him the unbiased perspective of technology and its impact. Additional areas of interest include advances in Nano Technology, Bio Technology, Information Technology, & Cognitive Science (NBIC). Special interest in Convergence of Technologies & Technological Singularity and its impact to humanity.

**"We must design for the way people behave,
not for how we would wish them to behave."**
Donald A. Norman, Living with Complexity

Operating System Security – A Short Note

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1. Introduction

An Operating System (OS) is viewed as a Reference Monitor (RM) or a Reference Validation Mechanism (RVM) that provides basic level security. In [1], Anderson reported three design requirements for a Reference Monitor or Operating System. He suggested that an OS or RM should be tamper proof that means OS programs are not alterable, OS should always be invoked and OS must be small enough for analysis and testing purposes so that completeness of which can be assured. These OS design requirements became the deriving principle of OS development. A wide range of operating systems follow Anderson's design principles in modern time. It was also observed in [2] that most of the attacks are imposed either on OS itself or on the programs running on the OS. The attacks on OS can be mitigated through formal verification to a great extent which prove the properties of OS code on various criteria like safeness, reliability, validity and completeness etc. Also, formal verification of OS is an intricate task which is feasible only when RVM or RM is small enough for analysis and testing within a reasonable time frame. Other way of attacking an OS is to attack the programs like device drivers running on top of it and subsequently inject malware through these programs interfacing with the OS. Thus, a malware can be injected in to the sensitive kernel code to make OS malfunction. However, virtualization technology is one of the solutions to counter both kinds of attack on OS as well as the programs running on top of the OS. The virtualization technology initializes hardware resources efficiently and is related to all the design requirements of an RM or RVM proposed by Anderson [1]. Additional advantage of using virtualization is to provide basic infrastructure which are used for cloud computing these days. Section 2, 3 and 4 gives a bit detail about these technologies to give countermeasures to OS attacks. Section 5 gives what needs to be trusted to trust a kernel. Section 6 gives a short discussion on what needs to be done to ensure OS security. Finally, section 7 concludes the discussion.

2. OS Verification

An OS is nothing but a bunch of compact programs and routines that interacts with hardware and manages resources to serve applications running on top of it. It is therefore important to verify each line of OS program code to ensure nothing is executing out of specifications. There are several methods to verify an OS among which three methods are popular. First, a Theorem Prover which ensures safety and reliability of the OS kernel. It can leverage the kernel behaviour in terms of state transitions of an abstract state machine. Theorem Prover can help to prove that the OS kernel does not allow illegal memory operation, unexpected halting or infinite looping causing deadlock like situations. Advantage of using a Theorem Prover method is that it can verify any arbitrary properties that can be input to the system. However, it is limited by the huge cost of verification due to manual construction. Second, the Source Code Modelling method checks for a model to be extracted from the source code given as input and exhaustive search of states are carried out to verify and guarantee the program properties. Advantage of this method is that no manual construction is made like the Theorem Prover method and therefore, it is a comparatively easier method to perform. But this method demands huge computational resources. Nucleus part of Verve OS which is verified and guaranteed type safety is the example of kernel verification through source code modelling. Third, use of Safe Programing Language guarantees OS program against strict type checking. Advantage of this method is that OS verification becomes automatic and also requirement of computation resources is low as compared to source code modelling method. But this method has some disadvantages too like verification of the OS is limited to basic properties only and it imposes high load on OS developers. Also, verification of OS with huge code base is also infeasible.

3. Access Control Mechanisms

Objective of Access Control Mechanisms is to ensure confidentiality, integrity and availability of the OS modules and is provided at the top of a Trusted Computing Base (TCB). A TCB consists of RM or RVM component. An access control mechanism essentially provides security policy modes, security policy description languages, security policy verification techniques and list of access control mechanisms. However, it is a challenge [2] to formulate access control mechanisms in cloud environment with virtualization as well as in embedded systems.

4. Virtualization Technology

Objective of virtualization is to give OS isolation for security. There are four main aspects in which virtualization can be enforced. First is Virtual Machine Monitoring (VMM) which can be performed through hypervisors. A hypervisor sits between virtual machine (VM) and hardware to performs resource management and scheduling of virtual machines. Use of hypervisor tightens access control over general purpose OS. Benefits of VMM with hypervisor include simultaneous operation of multiple virtual machines (VMs) which allows hardware resources to be utilized dynamically according to the operational situations. Hypervisors allows construction of observations and analysis devices which are not detectable by malwares and hence security of OS is ensured through virtualization technique. Virtualization implementation can be done through virtual machine inspection (VMI) which is a process carried out through hypervisors to allow monitoring, observations, defence and isolation of VMs. VMI is a very crucial component of virtualization technique as it detects and

prevents unauthorized access by VMs to alter the code on the hypervisor side and let hypervisor be able to monitor all aspects of the VM. A VMI is invoked to externally obtain the VM status for analysis of a snapshot of memory.

Second, virtualization can be enforced by main memory devices in which physical address used by VM are the artificial address virtualized by the hypervisors. Coordinating access to true physical addresses therefore requires twice address conversions causing double paging. This double paging can be performed in either hardware or software in case of VM technologies.

Third, virtualization can be implemented in Input-Output (I/o) devices through hardware using Input Output Memory Management Unit (IOMMU) or software using device drivers to capture and interpret the requests made by I/o devices. The IOMMU implements address re-mapping in hardware during direct access memory (DMA) allowing VMs to directly manipulate addresses of physical devices. Virtualization of I/o devices provides access control and integrity verification.

Fourth aspect of virtualization is verification of the completeness of VM through integrity verification of structural elements of VM through Trusted Platform Module (TPM). TPM is used for integrity verification of physical machines while virtual TPM (vTPM) is used for structural verification of multiple VMs running on top of a physical machine.

5. What Makes a Kernel Trustable [3]

It is feasible to build small systems that can be guaranteed never to operate out of specifications. Following OS interfacing programs need to be trusted to trust the kernel as they can propagate malware into kernel code to make it malfunction:

i. VM Encapsulation

Virtualization is supposed to be a cure for all ills relevant to security and therefore, the idea also comes to build a complete OS based on a hypervisor using VMs to encapsulate individual activities. A formally verified hypervisor like seL4 [3] can provide real security using virtualization and based on that a system i.e. operating system like CubeOS can be made.

ii. Web Browser

A web browser renders engine for each page in separate process inside an OS sandbox. The rendered processes can only access the system resources and communicate with each other via browser's kernel. Encapsulating security policies in separate module called browser's kernel is a security assurance that kernel would be safe. A typical web browser architecture [3] is shown in Figure 1 below to explain how a kernel does not allow any malicious web page to bye-pass security policies invoked by the kernel.
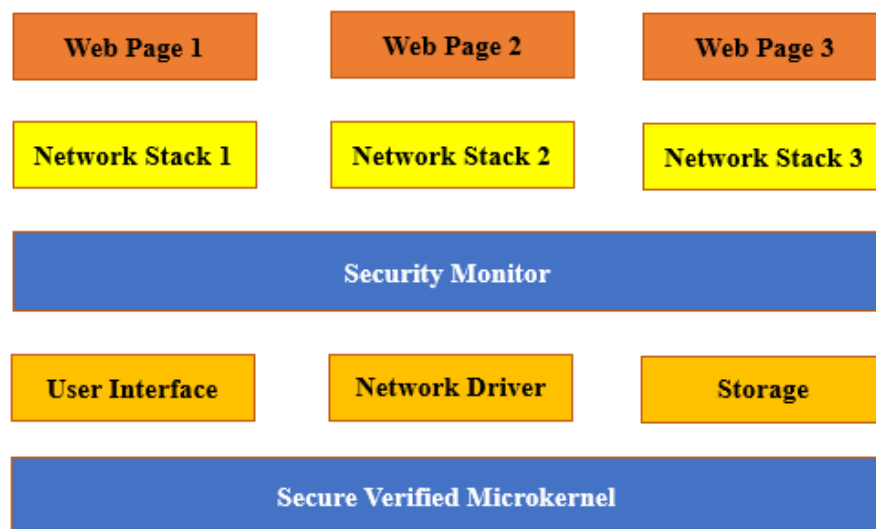

Figure 1: Secure Web Browser Architecture [3]

iii. Trusted Platform Module (TPM)

Trusted Computing Group has introduced the term TPM. A TPM enables secure boot, storage, authentication and remote attestation. Remote attestation ensures that system is running a well-defined software configuration and is achieved by accumulating hashes called measurements of software located in the system.

iv. Database

A database could pass atomicity, concurrency, integrity and durability (ACID) properties of transactions to ensure it would not harm the kernel programs.

6. How to Ensure OS Security?

The security of OS can be ensured through the following methods [4]:

i. By Proving Security

OS security can be proved through formal correctness. We need to specify the system i.e. OS as an Abstraction State Machine with completely defined input and output. Any variation in the expected output results violation in the OS integrity. A proof here identifies assumptions and ensures that the system is deployed under the right operating conditions.

ii. Safety

A Worst-Case Execution Time (WCET) Analysis is a powerful mechanism to ensure OS security through timing validations. WCET of an OS program code is the maximum time required to execute a given piece of code in a given application context (inputs, state) and on a given machine. The goal of WCET analysis is to derive upper bounds for the execution time of pieces of code [5]. WCET analysis is therefore performed to check reliability and functional correctness of the OS.

7. Conclusion

In this short note, we discussed about operating system design requirements in context of security. It was observed that an OS can be attacked either by attacking OS program code directly or through the application program interface to inject malware in to the OS. Some countermeasures like OS verification, access control mechanisms, virtualization techniques etc. were also discussed to prevent both kinds of attack on the OS. A brief note was also presented to arrive at what needs to be trusted to trust a kernel and what needs to be done to ensure OS security in general.

Acknowledgement

This note is an extract of cited research articles in the Reference section. We wish to thank the authors of [2], [3] and [4] for their commendable work which are reproduced in this article in the way to the best of our understanding.

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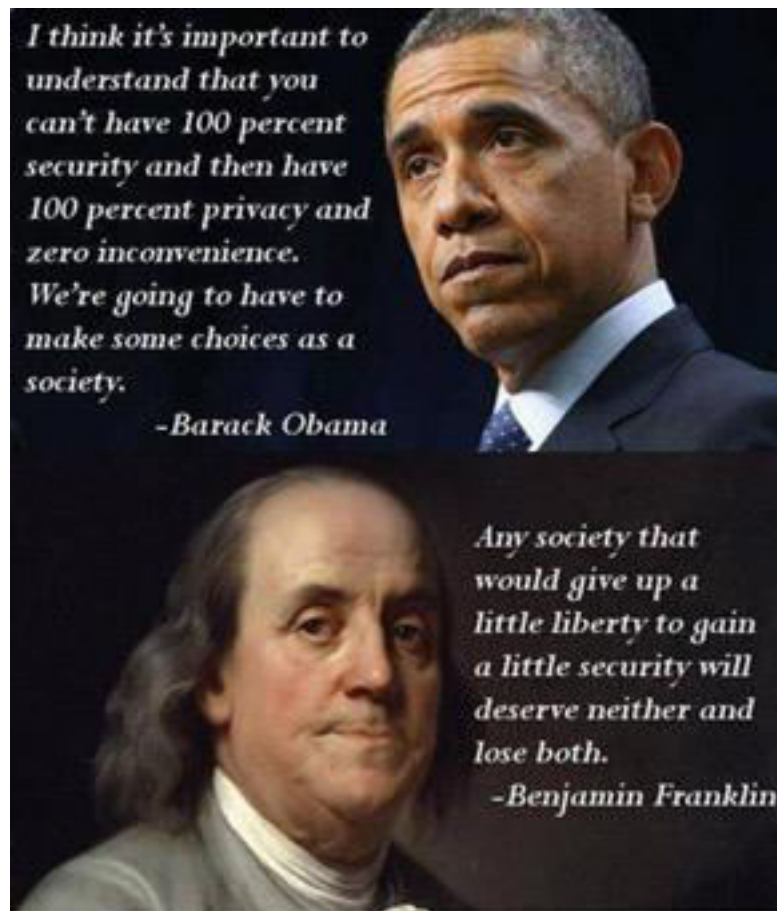

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Operating System – Security: Security refers to providing a protection system to computer system resources such as CPU, memory, disk, software programs and most importantly data/information stored in the computer system. If a computer program is run by an unauthorized user, then he/she may cause severe damage to computer or data stored in it. So a computer system must be protected against unauthorized access, malicious access to system memory, viruses, worms etc.
https://www.tutorialspoint.com/operating_system/os_security.htm

Data Privacy – Yesterday, Today & Tomorrow – An Overview

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The most of vocal Data Privacy advocates would've been shocked when they first time saw the details captured by Google in terms of their movements. The image below is slightly hashed detail of my own Google account communicating where I've been travelling in a given month.

Like any other technology giant, Google 'technically' complies to law since somewhere somehow we have ticked that box providing our acceptance to track our movements. If you never knew this, right now log into your google account under accounts.google.com and have fun.

Privacy is becoming a hot debate in the current tech world. As it is told 'Privacy in Internet' is an oxymoron. Enough has been discussed on how our mobiles track us even if the GPS is switched off. Enough has been discussed about the types of data that is shared from our mobile that results in that call from a service provider, that mail for a loan, that search for a grey colored puppy.

This article is going throw light on the evolution of data privacy globally, specifically in US, EU and India. While privacy concerns has been there been long in the western world, India is catching up with its own Data Privacy law now. The next privacy demand from California Consumer Privacy Act (CCPA) is another monster waiting to prey on privacy violators.

McAfee study on Data Explosion in 2016 has given the following forecast: -

- There is huge data generated globally
- McAfee analysis tells 8.8 ZB in 2015 to 44.02 ZB in 2020
- Governments want to stop the abuse on data privacy
- Spam emails and Cold calls are taken seriously
- Data breaches leads to heavy financial loss
- Suits by victims due to data breaches is heavy
- Protectionism, is the name of the game

So, the rush in data collection has not attained any plateau, and is only conquering more new peaks.

Where it all Started in US

In US, Privacy Act 1974 was the first initiative towards securing the privacy of individuals data. Modern tort law, as first categorized by William Prosser, includes four categories of invasion of privacy

- **Intrusion of solitude**: physical or electronic intrusion into one's private quarters
- **Public disclosure of private facts**: the dissemination of truthful private information which a reasonable person would find objectionable
- **False light**: the publication of facts which place a person in a false light, even though the facts themselves may not be defamatory
- **Appropriation**: the unauthorized use of a person's name or likeness to obtain some benefits

The essence of the law is a person to have the 'right for privacy', which is defined 'the right to be let alone'. The privacy of US residents is addressed by more than 600 state laws and 12 Federal laws to address data pertaining health, student information and limiting surveillance electronically. Recently San Francisco became the first city to ban facial recognition technology. This means individuals cannot be identified by using facial recognition technology for any service provision.

US does not have a comprehensive data privacy law like EU. The protection of data varies from public to private sector. For governmental access of people data there are there are sweeping legislations like Privacy Act, Electronics Communication Privacy Act etc. In private sector there are few sector specific norms that exist like the Federal Trade Commission Act

After the May – July 2017 Equifax breach of 145.5 million US consumers, there was an attempt to improve the consumer privacy in US, which failed in Congress.

Evolution of EU Data Privacy

EU Directive on personal data 95/46 EC 1995 was the first European adoption of privacy law. This became EU Data Protection Act 1998. EU Data Protection Directive 1995 demands: -
- Comprehensive protection of personal information
- Clear restrictions of data transfer
- Allows data transfer to third country subject to adequate level of protection

A need for change in protection laws of EU was evidenced due to following reasons: -
- Evolution of technology
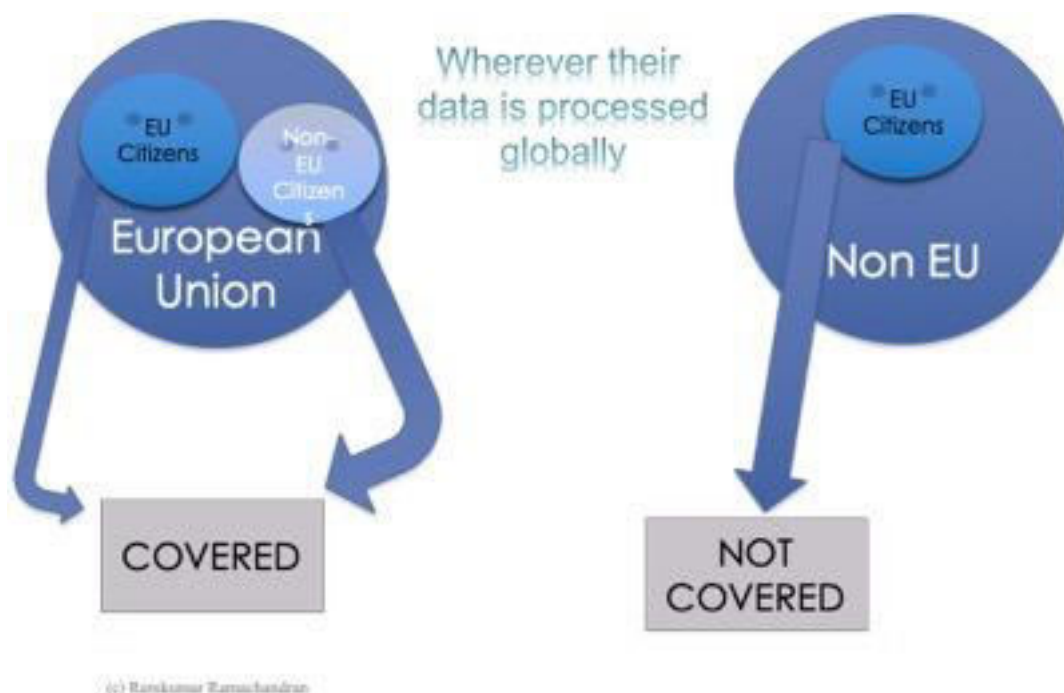- Internet
- Social Media

There was need to be more explicit in terms used, which led to the design of GDPR. GDPR chronological events happened as follows: -

The General Data Protection Regulation (GDPR) (Regulation (EU) 2016/679) is a regulation
- By which the European Parliament, the Council of the European Union and the European Commission
- Intended to strengthen and unify data protection for all individuals within the European Union (EU)
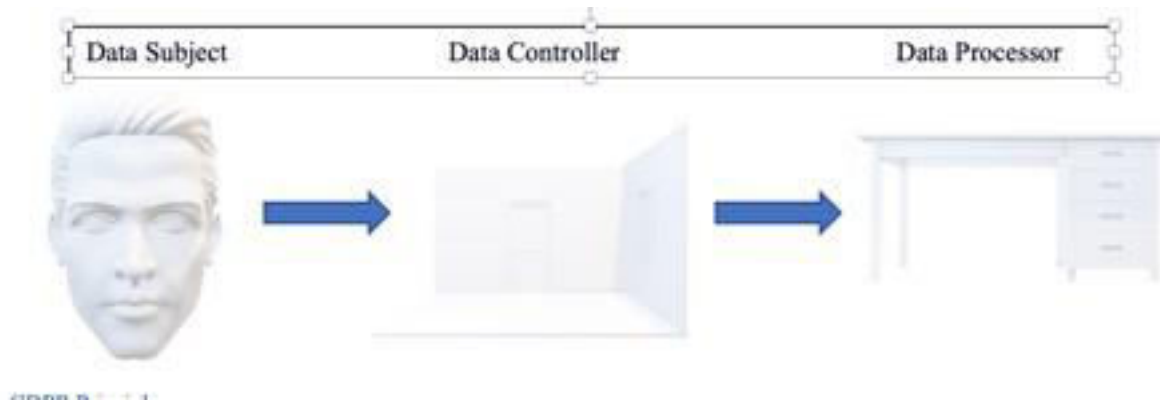
This updated Regulation applies to all member states of EU. It applies to all organization processing the data of EU data subjects – wherever the organization is geographically based. This Regulation will supersede national laws. Is meant to unify data protection and ease flow of personal data and all organizations processing PII of EU residents must comply.

GDPR talks about three distinct roles: -

1) Data Subject
2) Data Controller
3) Data Processor

Data Subject is the living person who gives their data for processing to Data Controller with formal conditions. Data Controller holds the personal data and commits to its safety. This data is processed internally by Data Processor or outsourced to another entity called Data Processor. Data Processor, based on the understanding with Data Controller processes the personal data.

| Data Subject | Data Controller | Data Processor |

GDPR Principles

GDPR operates with certain principles that are clear no-no for violation. In case of any breaches in an Organization, if it is evidenced that they've violated the GDPR principles, that may lead to maximum penalty. GDPR lists out six principles that are the core of the regulation: -

Rule # 1: Lawfulness, fairness, and transparency
Personal data must be processed in lawful manner, fairly and transparently. It shall be maintained with respect to the data subject.

Rule # 2: Limitation of purpose
Personal data must be collected for specific, explicit and legitimate purpose. Processing must be limited to the legitimate purpose only. Data collected to issue movie tickets should not be used to canvas for Star Nite celebration.

Rule # 3: Data Minimization
Personal data shall be adequate, relevant and not excessive in relation to the purpose or purposes for which they are processed. To issue ticket for cricket match only name should be taken, and additional data like age, sex, occupation should not be collected.

Rule # 4: Accuracy
Personal data shall be accurate and, where necessary, kept up to date. All stored data shall be ensured for accuracy and provision for the Data Subject to correct the same should be allowed.

Rule # 5: Storage Limitation

Personal data processed for any purpose or purposes shall not be kept for longer than is necessary for that purpose or those purposes. The data collected for issuing IPL match ticket should not be used to sell World Cup tickets

Rule # 6: Integrity and Confidentiality

Personal data shall be processed in a way that ensures security, including protection against un-authorized and un-lawful processing, damage or loss. Safety of personal data should be ensured and the controls should be implemented after analyzing all possible risks to the same.
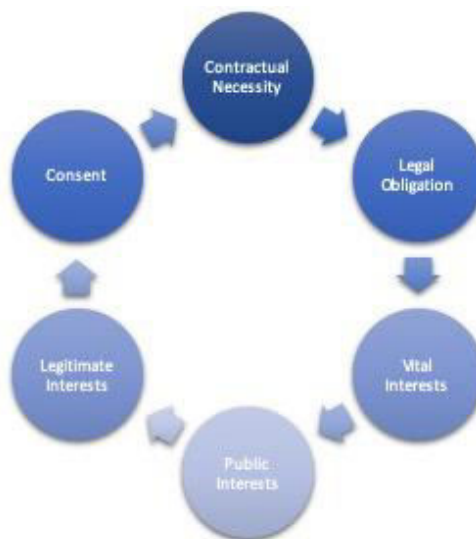
Data Subject Rights

GDPR lays very high importance to the rights given to the Data Subjects whom's personal data is stored. The empowerment of Data Subject is very high and if he/she properly uses the same they can ensure the highest safety for their personal data. The Data Subject Rights are as following: -

1. **<u>Right to information</u>** - Right to ask what personal data of theirs is processed and with whom it is shared. Data Subject can ask which of their personal data is processed, which should sync with the consent taken from them
2. **<u>Right to access</u>** - Right to access their own data as well as request copies of the same. Data subject can demand access to their personal data any point in time.
3. **<u>Right to rectification</u>** - Right to request for change to their data if it not accurate. Data Subject may want to modify the data any point in time for any valid reasons.
4. **<u>Right to withdraw consent</u>** - Right to withdraw the previously given consent, so that company does not process their data anymore. Data Subject may want the consent given for processing to be stopped. The mechanism to withdraw consent should be clearly communicated to the Data Subject prior and cannot be turned down
5. **<u>Right to object</u>** - Right to object when his/her data is processed in variance to committed purposes. This is similar to 'Withdraw Consent'. The data collected for a given purpose being used for a different purpose can be objected by the Data Subject.
6. **<u>Right to object to automated processing</u>** - Right to demand only manual processing to understand the uniqueness of the data subject. Data Subject can request for their personal data from being included in automated processing which profiles individuals and decides on what to communicate to them
7. **<u>Right to be forgotten</u>** - Right to request for deletion of their data. To be in conjunction with retention period and retention schedule in-line with applicable laws. Data Subject can inform that their data need not be included for processing any more.
8. **<u>Right for data portability</u>** - Right to return the data or transfer it to another controller. Data Subject may want their data to be removed and given to another Data Controller.

Lawful Processing

GDPR provides six lawful way of processing the personal data of the Data Subjects. While many GDPR Practitioners talk about Consent as the only way, GDPR is clear and gives six possible channels to lawfully process personal data of Data Subject.

The six lawful ways of processing personal data are: -

1) Performance of Contractual Agreement
   - You can rely on this lawful basis if you need to process someone's personal data:
     - To fulfil your contractual obligations to them; or
     - Because they have asked you to do something before entering into a contract (eg provide a quote)
2) Legal Obligation
   - You can rely on this lawful basis if you need to process the personal data to comply with a common law or statutory obligation
   - Ex. An employer needs to process personal data to comply with its legal obligation to disclose employee salary details to Income Tax Department. The employer can point to the IT website where the requirements are set out to demonstrate this obligation. In this situation it is not necessary to cite each specific piece of legislation
3) Vital Interests
   - You are likely to be able to rely on vital interests as your lawful basis if you need to process the personal data to protect someone's life.
   - Ex: An individual is admitted to the Emergency department of a hospital with life-threatening injuries following a serious road accident. The disclosure to the hospital of the individual's medical history is necessary in order to protect his/her vital interests
4) Public Interest
   - You can rely on this lawful basis if you need to process personal data:
   - 'In the exercise of official authority'. This covers public functions and powers that are set out in law; OR
   - To perform a specific task in the public interest that is set out in law
5) Legitimate Interest
   - Legitimate interests is the most flexible lawful basis for processing
   - It is likely to be most appropriate where you use people's data in ways they would reasonably expect and which have a minimal privacy impact, or where there is a compelling justification for the processing.
6) Consent
   - The GDPR sets a high standard for consent. But you often won't need consent. If consent is difficult, look for a different lawful basis.
   - Consent means offering individuals real choice and control. Genuine consent should put individuals in charge, build trust and engagement, and enhance your reputation

Penalties for Violation

GDPR treats data breaches in two categories viz.1) Minor and 2) Major breach The penalty for less important (minor) breaches will be 10 million Euros or 2% of global turnover, whichever is higher. In case of major breach the penalty will be 20 million Euros or 4% of global turnover, whichever is higher.

The penalty is decided after considering various factors. GDPR checks the intent of the organization that has failed in safeguarding the personal data and then decides the penalty. Following are the considerations done before a penalty is decided: -
- The *nature, gravity and duration of the infringement* taking into account the nature scope or purpose of the processing concerned as well as the number of data subjects affected and the level of damage suffered by them;
- The *intentional or negligent* character of the infringement;
- Any *action taken by the controller* or processor to mitigate the damage suffered by data subjects;
- The degree of responsibility of the controller or processor taking into account technical and *organizational measures implemented* by them pursuant to Articles 25 and 32;
- Any relevant *previous infringements* by the controller or processor;
- The *degree of cooperation with the supervisory authority*, in order to remedy the infringement and mitigate the possible adverse effects of the infringement
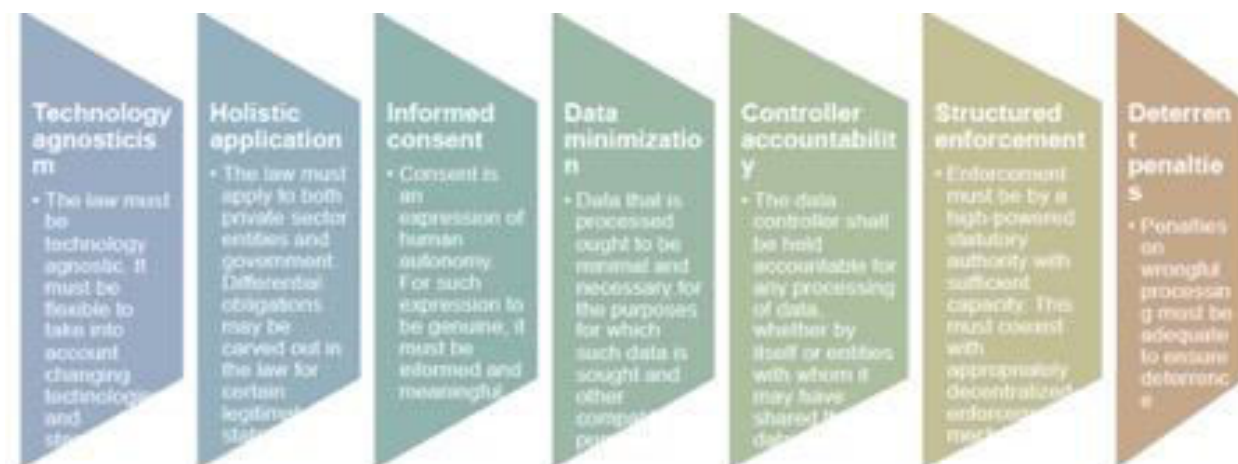
Security By Design

GDPR expects organizations to foresee risks and implement appropriate controls. Based on the type of data that is handled and other related parameters, the risks to the data should be identified and effectively mitigated. This ensures that the security is implemented by default than reacting as and when the breach happens.

This effectively means that 'data protection' should be built-into the business processes and should not operate in silos. Data Protection by design effectively means considering data protection and privacy anything you do. Ex. We create a new product campaign, then discuss about whom you are going to approach and their consent for the same. New privacy measures should not be invented for each data that comes in, but data privacy principles should be automatically applied during the same

The Indian Context

Currently protection of personal data in India is governed by SPD Rules (Sensitive Personal Data information, 2011). This is becoming very inadequate, due to which the latest personal data protection bill is getting tabled. Data Protection in India is based on the following principles: -

Justice Srikrishna Committee submitted the report on Data Protection and Draft Personal Data Protection Bill 2018 to MeITY on 27th July 2018. This bill predominantly reflects the GDPR requirements.

Features of Indian Privacy Law

Certain salient points of the Indian Personal Data Protection Bill 2018 are: -

1) All the organizations who need to protect personal data needs to appoint Data Protection Officer
2) Exemptions have been provided for processing data for journalistic purpose, or for purely personal / domestic purposes
3) Penalties range from 2% to 4% of company's global turnover or INR 5 Crores to INR 15 Crores, whichever is higher
4) Data Protection Authority of India will be the equivalent of Supervisory Authority in EU
5) Organizations should store atleast one copy of the personal data in India
6) Critical personal data shall be processed only in a server or data centre in India
7) Part of the penalties would go the Data Protection Fund and Data Protection Awareness Fund

Demands of California Consumer Privacy Act

The California legislature passed AB 375, the California Consumer Privacy Act of 2018, on Thursday, June 28, 2018, effective January 1, 2020 (the "CCPA").

It is important to look into the last 40+ years history of California to understand the privacy legislation of California. Way back in 1972, California voted to include privacy amongst the 'inalienable' rights to all people. This gave the individuals the ability to control the use and sale of their personal data.

The state followed with adopting privacy measures that include:
1) Online Privacy Protection Act
2) Privacy Rights for California Minors in the Digital World Act
3) Shine the Light, a California law intended to give Californians the "who, what, where, and when" of how businesses handle consumers' personal information

It's quite logical that California has now come up with the upgraded privacy law that considers the latest technological developments.

Under the new law, residents of California will be able to:
• Know what personal information is being collected about them
• Access that information
• Know if their personal information is disclosed, and with whom
• Know if their personal information is sold and the right to opt out of the sale
• Receive equal service and price whether or not they exercise their privacy rights

CCPA would apply to organizations that would fall in one or more of the following categories: -

- Has annual gross revenues in excess of $25 million;
- Possesses the personal information of 50,000 or more consumers, households, or devices; or
- Earns more than half of its annual revenue from selling consumers' personal information

Sanctions that is possible under CCPA are: -

- Companies that become victims of data theft or other data security breaches can be ordered in civil class action lawsuits to pay
  - statutory damages between $100 to $750 per California resident and incident, or
  - actual damages, whichever is greater, and
  - any other relief a court deems proper, subject to an option of the California Attorney General's Office to prosecute the company instead of allowing civil suits to be brought against it
- A fine up to $7,500 for each intentional violation and $2,500 for each unintentional violation

Where will we be in 2025 on Data Privacy

In the years to come Data Privacy will mature and could transform into controls that are reasonable to comply. The data privacy laws could also change based on regional demands, where 'exhibitionism' could lead to lesser control of privacy and 'conservatism' could lead to stronger controls.

The judicial activists crowd may exploit organizations through class suits and make more money, while organizations could build a strong compliance framework to prove they are right. With increase of data by the second, it could become more costlier to safeguard data.

Data Privacy is here to stay, it could evolve into a new animal, but it will remain an animal that should be tamed…!

About the author

Ramkumar 'Ram' Ramachandran is a veteran in the IT industry with global service delivery experience across 10+ countries, which includes US, UK, France, China, Singapore, Malaysia, Indonesia, Thailand, Taiwan, Philippines, Kuwait, Bahrain, Qatar, Saudi etc. He is a IIM-Calcutta Alumni and a qualified PMP, CISA and CSQA. He is also a Lead Auditor for QMS, ISMS, BCMS and ITSM. He is a certified Systems Thinker from MIT Sloan Institute of Management. He provides services in the areas of Information Security, Data Privacy, Agile, DevOps, CMMI and ISO standards. He also happens to be the past President of SPIN Chennai and currently on its Board. He runs his Consulting Firm 'Ascentant Corporation' which is primarily into IT consulting. Prior to starting his own Firm, he has worked with organizations like HCL, Polaris, KPMG and Renault-Nissan. He started his career as a Programmer and has been in various responsibilities in software delivery. He later moved into Software Quality and Security. He has taken many organizations into successful ISO and CMMI journeys. He is an avid reader of books and boasts a great collection of fiction and non-fiction in physical and e-forms. He loves travelling and would like to visit places of heritage importance. He loves music and his Alexa helps him get the best.

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7 principles of the GDPR and what they mean

1. Lawfulness, fairness and transparency: Obtain the data on a lawful basis, leave the individual fully informed and keep your word.
2. Purpose limitation: Be specific
3. Data minimization: Collect the minimum data you need
4. Accuracy: Store accurate up-to-date data
5. Storage limitations: Retain the data for a necessary limited period and then erase
6. Integrity and confidentiality: Keep it secure
7. Accountability: Record and prove compliance. Ensure policies

https://www.amara-marketing.com/travel-blog/7-principles-of-the-gdpr-and-what-they-mean

EU GDPR.ORG

The EU General Data Protection Regulation (GDPR) is the most important change in data privacy regulation in 20 years. The regulation will fundamentally reshape the way in which data is handled across every sector, from healthcare to banking and beyond. https://eugdpr.org/

Universal Acceptance is the concept that all domain names should be treated equally. Domain names and e-mail addresses should be Accepted, Stored, Processed and Displayed in a consistent and effective manner.

Universal Acceptance is a foundational requirement for a truly multilingual Internet, one in which users around the world can navigate entirely in local languages. It is also the key to unlocking the potential of new generic top-level domains (gTLDs) to foster competition, consumer choice and innovation in the domain name industry. To achieve Universal Acceptance, Internet applications and systems must treat all TLDs in a consistent manner, including new gTLDs and internationalized TLDs. Specifically, they must accept, validate, store, process and display all domain names.

USAG -- Universal Acceptance Steering Group (https://uasg.tech/) was founded in February 2015 and tasked with undertaking activities that will effectively promote the Universal Acceptance of all valid domain names and email addresses. The group is made up of representatives from more than 120 companies (including Afilias, Apple, CNNIC, Eco, i2 Coalition, ICANN, Google, Microsoft, NIXI, THNIC and Yandex), governments and community groups.

The Universal Acceptance Steering Group is a community-based team working to share this vision for the Internet of the future with those who construct this space: coders. The group's primary objective is to help software developers and website owners understand how to update their systems to keep pace with an evolving domain name system (DNS).

To create awareness on Universal Acceptance, the USAG has published the following posts.

UASG101 - Introduction to Universal Acceptance: http://get.uasg.asia/docs/UA101-Intro-2019-03-20.pdf
UASG102 - Email Address Internationalization (EAI): http://get.uasg.asia/docs/UA102-EAI-2017-05-17.pdf
UASG103 - Programming Language Hacks: http://get.uasg.asia/docs/UA103-Hacks-2019-03-20.pdf

Recently, IEEE Spectrum, the flagship magazine of IEEE has also published the following article related to Universal Acceptance
,
Creating a Better Online Experience for Billions is Just a Fix Away
https://spectrum.ieee.org/at-work/innovation/creating-a-better-online-experience-for-billions-is-just-a-fix-away

Though bit dated, the post at https://uasg.tech/2017/02/universal-acceptance-india/ deals with Universal Acceptance in India.

Some interesting related documents include:

Action Plan for Universal Acceptance of Domain Names and Email Addresses (FY20: July 2019 - June 2020)
https://uasg.tech/wp-content/uploads/2019/05/UASG-Plan-20190522.pdf

Looking Ahead to a Bright Future for the Universal Acceptance of All Domain Names: . A month into my new role as Chair of the Universal Acceptance Steering Group (UASG), I am more energized than ever about the work we are doing to help build the inclusive Internet of tomorrow. As the next billion Internet users come online, it is critical that all domain names and email addresses – regardless of language, character or length – work with all applications. Read the full message by Dr. Ajay Data, chair of the UASG; founder and CEO of XgenPlus at http://bit.ly/2wIAKVU

UA: Information for IT Leaders: Learn how a routine "Bug Fix" can increase revenue potential and bring millions online. https://uasg.tech/information/it-leaders/

UA: Information for Developers. Learn how updating your systems to keep pace with the evolving domain name system results in business and social benefits. https://uasg.tech/information/developers/

UA: Information for UASG Members. https://uasg.tech/information/members/

IEEE *Xplore*® Digital Library Continues to be Your Career Partner

Dr. Dhanukumar Pattanashetti
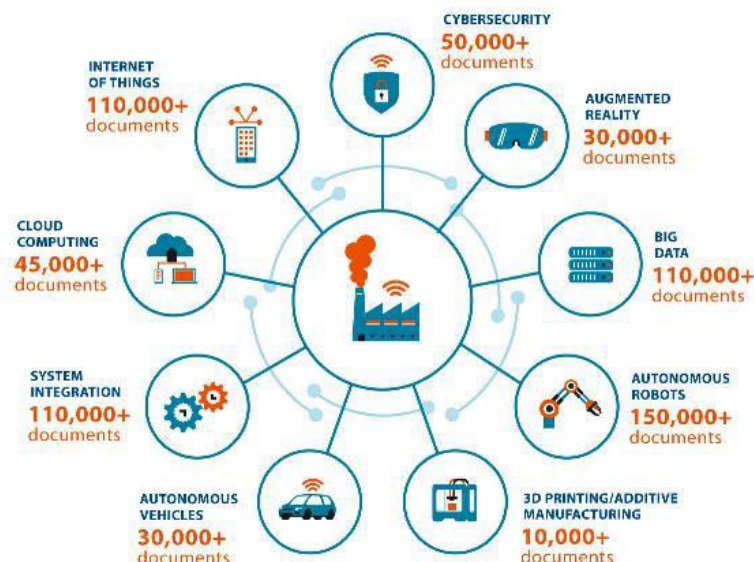IEEE Client Services, IEEE India Operations Center, Bengaluru
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The world is now undergoing a digital transformation where the use of technology in every field is gaining momentum. The technologies itself are evolving for solving many of today's complex problems. In the era of emerging technologies, the need for highly curated scientific literature and information on patent disclosures are a necessity to address today's challenges and to stay relevant.

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The Fourth Industrial Revolution (4IR) is coming, and IEEE is at the heart of all of these. Described as a range of new technologies that are fusing the physical, digital, and biological worlds, this revolution is certain to alter the way the human race lives, works, and relates to one another. A number of technological fields will see major advances over the next few years that will affect all disciplines, economies, and industries. These fields include robotics, artificial intelligence, nanotechnology, quantum computing, biotechnology, the Internet of Things, 3D printing, autonomous vehicles, 5G, and more. The World Economic Forum states that due to the Fourth Industrial Revolution, 65% of children starting primary school will eventually work in jobs that do not exist. The 4IR is upon us, and IEEE is leading the way.

Education is key for adapting to the changes 4IR technologies will bring. The employment landscape will undergo a massive shift, making advanced skills increasingly important. IEEE is helping to educate future leaders on their role in fostering innovation and shaping technological breakthroughs.

Technologies Fueling 4IR in IEEE Xplore

Technical information for education, research or otherwise is available easily at our fingertips on demand. But the problem is the information is enormous, and one may ponder if the available information is reliable or not. So there is a big question mark on the credibility of the available information. This is where the IEEE *Xplore*® Digital Library plays an important role.

IEEE *Xplore*® Digital Library is a powerful repository of authoritative content for discovery and access to scientific and technical content published by the IEEE and its publishing partners. In terms of credibility, IEEE peer-reviewed content continues to be the most cited publisher in US and European new technology patents. The authors publish with IEEE because the journals are highly valued in the chosen disciplines, for the heightened visibility, research activity, and industry credibility. Also, the authors find that publishing with IEEE enhances professional development and provides a scholarly platform to showcase their work.

As technologies are evolving, IEEE is continuing to add many new journals and also initiate conferences in new technological areas. Around 20,000 new documents are added to IEEE *Xplore*® each month. IEEE *Xplore*® continues to add new publications and published content from its publishing partners. It provides web access to close to five-million full-text documents from some of the world's most highly-cited publications in electrical engineering, computer science,

electronics, and allied fields. The sheer size of the resources makes it even more challenging to provide the user with a way to conveniently access the resources. Hence, the platform plays a crucial role in delivering the content.

IEEE Xplore® has evolved over a period of time. The articles used to be delivered to the institutions, readers in print format. In 2005, IEEE launched IEEE *Xplore®* and started moving all documents to pdf format. With the advent of technology, HTML articles were introduced. Designed for quick navigation and discovery, the new features in the IEEE *Xplore®* help users find the content they need. Easier-to-use discovery and search tools, remote access functionality, and other valuable features have been incorporated into this powerful interface.
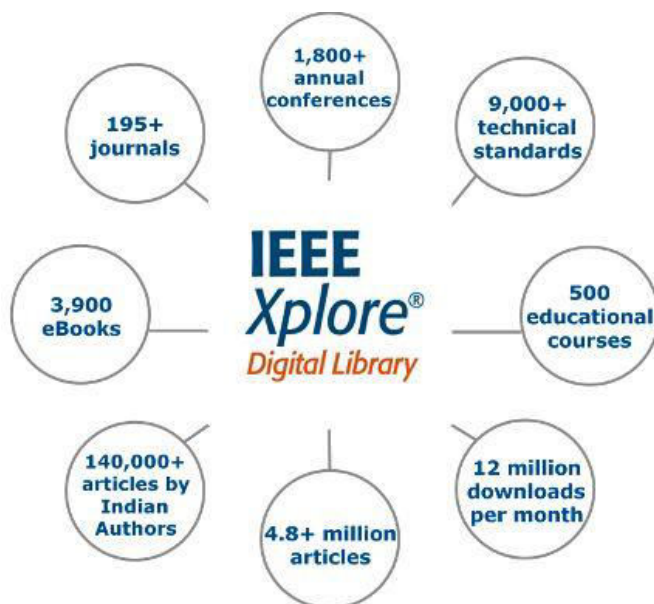
Many options such as multiple pdf downloads, saving a search query, setting an alert in an area of interest, setting alerts to receive new journal issue notifications, an enhanced experience with advanced and command search were also introduced. Interestingly, the users can now download the algorithms associated with an article, with the help of Code Ocean. IEEE and Code Ocean have partnered to enable IEEE authors to upload, share, and run their code on the Code Ocean platform, accessible through IEEE *Xplore®* to provide a seamless experience.

Another important milestone was the launch of a mobile application for the IEEE *Xplore®* and stepping into API space. This enables the users to access the content on the move. One can also get notified on the latest research topics in their fields of interest with the help of *MyXplore* app. Recent enhancements to the mobile app include more search filter options and the ability to perform a custom search, and also view results before saving searches or setting notifications. IEEE *Xplore®* API provides access to metadata for over 4 million documents from IEEE journals, conference proceedings, and technical standards. One can register for access to the new IEEE *Xplore®* Metadata API on the new IEEE *Xplore®* API Portal.

The search engine forms the backbone of the digital library by assisting the user in fetching the data that is needed. The latest IEEE *Xplore®* search engine upgrade offers users a more integrated search experience. It comes with the ability to include wildcards with phrased searches and search operators via the basic search, optimized search functionality for a variety of file types, and an improved process for saved searches. IEEE Xplore digital library now has enhanced security measures being implemented along with the transition to HTTPS.

IEEE recognizes that the authors are an integral part of the journals and hence it provides users access to more information about the authors in IEEE *Xplore®* and easily navigates to other documents they have published in the library. Authors can also submit pictures, details of their biography, the number of articles they have published, and more.
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Dhanukumar Pattanashetti – South and West India – d.pattanashetti@ieee.org
Ranbir Singh – North and East India – r.sedhey@ieee.org

The team holds open learning sessions on how IEEE *Xplore*® can benefit the scientific research community. One can sign up for the upcoming webinars here - https://ieeexplore.ieee.org/Xplorehelp/#/ieee-xplore-training/live-online-training

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- **International Business Machines, Inc. (IBM)**—select periodicals
- **Society of Motion Picture & Television Engineers (SMPTE)**—standards, select periodicals, and conference publications
- **Oxford University Press (OUP)**—journal publications
- **American Society of Mechanical Engineers (ASME)**—some jointly-sponsored periodicals and/or conference publications
- **Association for Computing Machinery (ACM)**—some jointly-sponsored periodicals and/or conference publications
- **Beijing Institute of Aerospace Information (BIAI)** —Journal of Systems Engineering and Electronics
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- **Optical Society of America (OSA)**—some jointly-sponsored periodicals and/or conference publications
- **Tsinghua University Press (TUP)**—Tsinghua Science and Technology
- **VDE VERLAG**—conference publications
- **American Geophysical Union (AGU)**—journal publications
- **Chinese Society for Electrical Engineering (CSEE)**—CSEE Journal of Power and Energy Systems (JPES)
- **Morgan and Claypool**—Books collection
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About the author

Dhanukumar Pattanashetti is the Client Services Manager at IEEE and works at the IEEE India Operations Center in Bangalore. Dhanu works with IEEE Xplore Digital Library subscribing institutions in Sri Lanka, South and Western regions in India. He handles IEEE Xplore learning sessions (both onsite and via webinar) on how IEEE Xplore can benefit the technical community. He works with students/faculty/researchers in academic, government and corporate sectors and advises effective data use for their endeavors. He closely works with libraries in the institutions for internal IEEE promotions to include IEEE content within library web pages, intranets and other work-flow applications. He has published two papers in journals and presented a paper at an international conference in Indonesia. He has a PhD in Library and Information Science from University of Mysore; Master's degree in Library and Information Science and a Bachelor's degree in Engineering.

How to Effectively Discover and Use IEEE Information to Further Your Research

In this instructional video, Professor Gaurav Sharma guides an engineering student in India through the research process using the IEEE Xplore Digital Library. Professor Sharma provides essential tips to help users quickly find the relevant information they need, how to evaluate the source and quality of the information they find and save valuable time in the research process. https://www.youtube.com/watch?v=UQoOtBXsppk

Why Standards Matter?
IEEE Standards Development Initiative in India

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In today's world every citizen, every human being comes across standards developed by the IEEE one way or the other. In the connected world that we are living today, the usage of WiFi™ (IEEE 802.11™) is ubiquitous. There are millions or WiFi connected devices that are shipped each and every day. The growth of Internet of Things and the convergence of several emerging technologies (Artificial Intelligence, Machine Learning, Software Defined Networks, 5G, Electric Mobility, …) and the automation it brings to each individual's personal and professional lives means that systems are becoming more complex. In today's world driven through millions of sensors constantly collecting data and software algorithms processing the data to make decisions its very important that each individual component or a system are able to interconnect and interoperate with each other within a bigger system to deliver the full value and potential to the users. The importance of non-functional requirements are also becoming critical in today's systems where there needs to be serious considerations cybersecurity, data privacy, data integrity, to name a few.

IEEE Standards Association (IEEE-SA), the standards development body of the IEEE, is a global SDO with over 900 standards in active publication and more than 400 standards in active development across various technical societies. These standards are developed by over 20000 volunteers globally, and 300 corporate members. The IEEE-SA is an independent organization where participants (volunteers) come together to develop standards independent of any government organization and is governed by volunteers.

Before discussing IEEE-SA's engagement in India, it will be important to understand about standards and its importance. What are Standards? Standards are published documents that establish specifications and procedures designed to ensure the reliability of the materials, products, methods, and/or services people use every day and they form the fundamental building blocks for product development by establishing consistent protocols that can be universally understood and adopted. In today's market where systems are made of sub-systems and the complexities of the systems are increasing, Standards establish compatibility, interconnectivity, interoperability, simplify product development, and enables faster time-to-market. Apart from product developers, there is also a significant benefit that standards bring to the consumers and end users. Standards makes it easier to understand the features of a product and also thus enables customers to compare competing products in the market. Standards developments also bring economic benefits to countries as when these standards are globally adopted and applied in many markets, they also help with international trade. It helps government and regulatory agencies to set appropriate procurement process and also there are number of standards that establish safety norms for the public which are critical as technologies are being adopted and used ubiquitously. IEEE understands the critical role that standards play and through the IEEE-SA bring the expert community together and provides a consensus based platform for world-class standards to be developed and used by the community.

From a regional context within India, IEEE-SA recognizes India and its growing R&D engineers as a key community to work with as part of its global standards development program and started a focused engagement in 2012 in line with the increasing commitment of IEEE-SA to the Indian market. The growth of new standards working groups with leadership in India has been steadily growing and the technical expert community recognises the importance of standards development, driving standards development in core emerging areas. IEEE-SA is also actively forging partnerships in the region with government institutions, corporates and industries, R&D labs, academia and other relevant stakeholders important to the standards development activity in India. This focused engagement will not only enable a 2-way dialog between IEEE and the Indian entities with regards to standards requirements including regulation and policy, but also disseminate IEEE's vast experience in standards development with key stakeholders and most importantly encourage development of future global standards from India. A good standard provides a balanced blend of technical alternatives, economic needs and ensures that the standards are able to be adopted across regions and countries globally. I would like to highlight that the only way that standards can become global and global standards be relevant for India is for the Indian engineering community to participate actively in standards working groups and contribute to the development of these standards providing their expertise, guidance that addresses the requirements of the global as well as local markets. This will enable engineers to understand the evolution and growth of various technologies and also ensure that the standards capture the Indian requirements adequately.

There are several use cases and example where IEEE Standards are playing a critical role both from a global perspective as well regional and Indian perspective. For example, in the area of Smart Grid, IEEE-SA with over 100 standards and standards-in-development spanning the entire Smart Grid spectrum is playing the role of an ecosystem facilitator in India investing in awareness and education initiatives as well. IEEE-SA also collaborates with other key standards and research organisations around the world in developing harmonised standards and frameworks. Also, IEEE-SA, as a lead standards

developing organization participated in the development of the "US NIST framework of standards and protocols for the Smart Grid". More standards are in the pipeline in these areas with advent of new DC technologies, wireless charging, security standards, utility automation, new technologies on battery and advent of renewables, providing among the most comprehensive, globally accepted and validated set of standards that enable better interoperability, connection, communication and management of the various elements that go into a Smart Grid system. Smart grid ecosystems mean different viewpoints for different communities. For example in some regions the primarily focus of smart grid implementation is focused around Advanced Metering Infrastructure – AMI which is integrated system of smart meters, 2-way communication networks and data management systems including the software applications. The focus of AMI can be around demand response (DR), enabling appropriate management of the loads amongst other things. In some regions the primary focus is around distribution automation (SCADA). Renewables play a critical role in smart grid systems and the integration of renewable energy such as wind or power is becoming an integral part of the overall power distribution network. Managing these complex systems and its individual components, including the interface of different technology perspectives such as fundamental power T&D networks, with 2-way communication protocols along with software is driven through key standards development activities such as IEEE 2030 (Smart Grid Interoperability Standards) and IEEE 1547 (Interconnection standards that define the interconnection of distributed resources to the electric power supply) series of standards to name a few.

The impact of the IEEE standards is already being experienced through WiFi™ (IEEE 802.11™). Today every citizen connected to ICT experiences WiFi™ and the impact it has had on ICT, connectivity and human behaviour has been tremendous. In this context, I would like to mention another important standard IEEE 802.3™ and its impact and how new applications, industry verticals see the importance of these standards and have contributed significantly to the roadmap and development of standards development activities. Every new revision of the IEEE 802.3™ standard which is also known as the ethernet standards addresses new requirements driven by specific industry needs. The first 6 "speed revisions" of the standard took 27 years and the next 6 speed revisions have taken just 5 years. Ethernet standards were originally established to drive high speed data through twisted pair and the primary focus on the earlier revisions was focused on driving higher data rates driven by the requirements of data centers, Enterprise and carrier ethernet. However more recently other industries have started using ethernet technologies such as Automotive as well as Industrial systems focused on factory automation. With new industry verticals, there has been multiple focus areas within IEEE 802.3™ which has resulted in several physical (PHY) options to address different speeds. For example, for automotive industry one of the primary focus is on the weight of the overall vehicle rather than very high speed that is required for date centres. Hence a single twisted pair PHY with appropriate speed requirements are being established for the automotive sector under the IEEE 802.3™ standards development activity. One of the other more recent focus areas for ethernet is what is termed as "Power Over Ethernet" (PoE) where power can also be driven along with data. The IEEE Std 802.3bt-2018™ 4 pair PoE can drive upto 90W of power at the power sourcing equipment (PSE). This highlights the evolution of standards and the impact of different industry verticals and their inputs in shaping the future of these standards.

I would like to thank the IEEE India Council for providing me an opportunity to write about IEEE-SA's standards programs and include couple of use cases which highlight the importance of standards and why they matter and to provide me an opportunity to engage into a discussion with the IEEE members and technical experts in India. Please feel free to reach out to me at sri.chandra@ieee.org if you have any queries, or comments.

About the author

Sri has been associated with the IEEE Standards Association and the IEEE India office for the past 6 plus years as a Sr Director, with focus on the emerging technology programs within the IEEE-SA and driving strategic standards engagements in India and the region. Currently Sri is leading the IoT & Infrastructure Practice as part of the Global Business and Strategic Intelligence department within IEEE-SA. In this strategic role, Sri drives the industry & standards related initiatives focused on IoT, Sensors, & Blockchain and also engages with the Indian engineering communities to drive regional standards initiatives. Sri also manages IEEE Blended Learning Program (BLP), an IEEE training platform, focused on training and skills development for students as well as professionals.

Prior to joining IEEE, Sri was associated with Freescale Semiconductor Inc. (formerly Motorola Inc.) for 18 years, managing a global Electronic Design Automation R&D team focused on modelling of mixed signal designs and Electromagnetic compliance for Freescale products. Sri received the Accellera Technical Excellence Award in 2009 for his leadership and contributions to design automation standardisation activities. Sri holds a Bachelor of Science degree in Physics from Madras University, India and a Post Graduation degree in Electrical Communication from Indian Institute of Science, Bangalore, India.

e-commerce -- Past, Present and the Future

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First they ignore you, then they laugh at you, then they fight you. Then you win.”

Mahatma Gandhi's famous quote has striking similarities to how e-commerce has panned out in the world.

Most of us wrongly assume that pure-play online technology firms are the key drivers of ecommerce. This was true in the early days but is no longer so; going forward offline retailers (who were the competitors of online retailers) will be the most important driver of global ecommerce in the coming decade.

Globally (and in India on similarly parallel lines with a slight lag) e-commerce can be broadly divided into three distinct phases - Surprise, Realisation, Pushback. The first phase from the mid nineties till (say) around 2005; the second phase till around 2015 and we are in the midst of the third phase now.

The first phase (worldwide 1994 - 2005, India 1999 - 2008) - Surprise

The five year period from 1994-1999 triggered the e-commerce revolution globally when Jeff Bezos and Pierre Omidyar founded Amazon.com and Ebay.com in the USA followed quickly by Hiroshi Mikitani and Jack Ma who launched Rakuten and Alibaba in Japan and China respectively. During this phase, the visionary founders focused on: (1) building an ecosystem of infrastructure, merchants, online payment systems, logistics systems and processes from scratch since nothing existed (2) evangelising the benefits of e-commerce and attracting customer trials and (3) create an impression that e-commerce will sound the death knell for offline retail in the coming years.

While the first two were critical steps that set the phase for explosive growth of e-commerce, the third was really the most strategic. In reality, e-commerce is just another channel to retail products and services. Digitally integrating an e-commerce site or app with offline assets like stores and warehouses will significantly enhance customer experience. Pure-play e-commerce companies were the first to realise this and quickly understood that they were at a grave disadvantage. To counter this, they smartly crafted a competitive “Us vs Them” narrative. I daresay if Walmart had realised the significance of e-commerce in the previous century, Amazon may never have become the powerful force they are today.

Unfortunately, offline retailers initially ignored online retail as a passing fad and when it suddenly took off, they were all taken by surprise. Worse, many of the large retail chains swallowed the story put out by online retailers and assumed that all their offline assets including stores and warehouses were no longer assets but liabilities. It took them over a decade to realise how wrong they were.

In India, this first phase lasted till around 2008 and was quite similar. Apart from India's first e-commerce site Fabmart (which I co-founded along with five friends), the only other e-commerce startups of note were auction site Baazee and air-ticketing website MakemyTrip (which shifted focus to the overseas market), in addition to the Shopping Channels in portals like Rediff, Sify and Indiatimes. We faced a unique set of infrastructural challenges - lack of payment gateways, no content providers, no third party logistics firms, limited availability of merchants and merchandise and everything had to be built from scratch. Even the market was virtually non-existent - less than 3 million Indians were online and hardly 20,000 people shopped online, primarily for books shipped into India from Amazon USA. Essentially we were trying to squeeze water from stone using our bare hands and all that came out was blood.

The Second Phase (worldwide 2005-2015, India 2008 - 2018) – Realisation

It took a decade from 2005 onwards for offline retailers worldwide to realise that their offline assets like stores, warehouses, depots, offices which seemed to have transformed overnight into “ expensive liabilities“ were still strong assets and if anything critical for online commerce and they started their own digital journeys in great earnest, thus starting off the second phase of global e-commerce which lasted till around 2015. The big story of this period was offline retailer brands led by the likes of Walmart and Tesco playing digital catch up rapidly with online retailers.

In complete contrast to the first phase in India, the second phase from 2008 till 2018 has been overwhelming. Driven by a set of young entrepreneurs who founded new e-commerce ventures like Flipkart, Myntra, Snapdeal, Bigbasket etc.; supported by aggressive overseas risk capital and venture funds and coinciding with the smartphone boom, over 50 million new shoppers went online with a vengeance. Global giants like Amazon and Alibaba started investing billions in their quest for market leadership. Offline retail chains and brands like the Future Group, Reliance and Tata, after initial hesitation, started devising their own digital strategies.

The seminal moment was Walmart's acquisition of Flipkart which in a sense brought the curtains down on the second phase and signalled the beginning of the third.

The Third Phase (worldwide 2015 onwards, India 2018 onwards) - Pushback

This third phase will be the most crucial for the future growth and development of e-commerce both globally and in India. The underlying theme will be the integration of offline and online assets to deliver a high quality hyper-local, omni-channel customer experience while leveraging new technologies like DML, AI, Big (or small and medium) Data, Chatbots etc.

Here's a telling statistic. In the first decade and phase of e-commerce, any top 10 listing globally was dominated by pure-play e-commerce firms whereas in the second phase, a few big offline retailers started making their appearances in such listings. The next phase will see more of this and I won't be surprised if there are more offline than online retailers in future top 10 lists of e-commerce firms. Look at Amazon's moves - an offline bookstore, a hi-tech offline grocery store, the Whole Foods acquisition. These small steps are part of a large strategic play globally and are representative of the critical role offline assets are likely to play in future ecommerce success.

Even in India, while Amazon is investing big money to win online against Flipkart and Alibaba, there are crisp offline moves like investment in Shoppers Stop, a significant stake purchase in More chain of stores and talks of some stake in Future Retail as well. Amazon realises that continued leadership in global e-commerce will require strong offline integration and companies like Walmart with immense offline assets could take a lead here. Hence the urgency. In fact, all big players in India including Walmart / Flipkart, Alibaba are likely to make such moves while offline retail giants will keep investing into or acquiring digital assets.

Twenty Five Years of Ecommerce - Turning Full Circle

In a sense, ecommerce has turned a full circle. In the mid nineties, e-commerce was first ignored by offline retail giants while burgeoning online stores treated offline assets as "old economy" businesses with a dismal future. Today, the name of the game is a partnership and both offline and online players are getting locked into tight embraces.

"First they ignore you, then they laugh at you, then they fight you. Then we all win together."

If the Mahatma was around today, maybe he would have said this about e-commerce!

The bugbear though continues to be sustainability. E-commerce is now 25 years old and despite so much hype and investments, profits are inconsistent. Amazon makes most of their money from other lines while Alibaba benefited from a protected market. Amazon, Alibaba, Walmart, Reliance, Tata and other big daddies have to figure out how to continue to deliver great customer experience while making money. The "it is still early days and we are not thinking of profits" excuse is starting to wear thin now.

About the author

K Vaitheeswaran is referred to as the "father of ecommerce in India" and the best-selling author of "Failing to Succeed - the story of India's first ecommerce company" He is a serial entrepreneur who co-founded India's first ecommerce company. He also co-founded the Fabmall chain of supermarkets which subsequently got acquired by the Aditya Birla group and re-branded as "More" which has been recently acquired by Amazon. Vaitheeswaran's latest startup is an FMCG venture in beverages called AGAIN drinks. He lives in Bangalore and his twitter handle is @vaitheek

Jeff Bezos, Founder of Amazon on e-commerce

"We see our customers as invited guests to a party, and we are the hosts. It's our job every day to make every important aspect of the customer experience a little bit better."

We want eCommerce especially when people are shopping from our store and buying our product to have a seamless and enjoyable experience. The more people feel at ease the more they shop, that is why shopping malls are planned in such a pleasant way. Also, as the 'host' as Mr. Bezos calls retailers we need to ensure that:

- Customers get what they paid for in a timely fashion
- Are satisfied and know how to operate our products
- Are updated at every point of the purchase and shipping process

Starvation Deaths, Migrant Labour, Gypsies and Blockchain

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(Views expressed here are personal)

The heart rending news of death of three young children of a migrant family in Delhi has shaken the whole country. The reports suggest that Mangal's family fell on hard times after he was evicted from his tea shop. Yet, somehow the family managed to enrol their eldest daughter in school. Mangal had turned alcoholic after losing his tea shop, and had an untreated chronic injury in his leg. Three innocent lives - Sukho, Paro and Manasi – were extinguished even before they could get a fair chance in the world.

It is grim reminder of the hardships migrant families face. Driven by poverty and dim prospects of earning in their native place, millions migrate to cities each year in search of employment. For some this is their only chance to bring their over-strained lives back from the brink. A terminally sick family member back home or a mounting debt burden from a loan taken earlier for daughter or sister's marriage, make the migrants suffer the sub-human conditions of the slums in cities. While some migrate alone, some bring the whole family. Bihar, Uttar Pradesh, West Bengal, Chhattisgarh, Odisha and Rajsthan are the states sending the most blue collar migrants. The destination states are Gujrat, Maharashtra, Karnataka, Kerala and Tamil Nadu.

The estimates on number of migrants vary. While Census 2001 estimates some 40 Million people as inter-state migrants (Census, 2001), the 2017 World Economic Forum report "Migration and its impact on cities" estimates the number close to 9 million. The report identifies access to government run health, education and housing programs as key challenges for the migrants and suggests DBT (direct benefit transfer) as a way out. The report surprisingly, doesn't mention food security as a challenge, whereas this should have been listed as the topmost challenge.

It appears that the untimely deaths of three children in Delhi could have been avoided had the family had access to Public Distribution System and Public Health Services. This was a family of migrants from West Bengal - father unemployed, alcoholic and with an untreated injury in leg, mother – illiterate, mentally disturbed, the eldest daughter - 8 year old Manasi studying in third standard in a government school and used to be absent for long periods at a stretch, two other daughters- aged 2 and 4. The post-mortem report, according to newspapers, confirms death due to starvation.

Why migrants are Invisible:

Migrants are the reason for much of the glitter around us. The new shiny malls, stores, apartment complexes, factories, IT parks, offices are the result of back breaking hard work of migrants. Many industries which require hard labour or long hours of work such as mining, metal industry, textile, hotel and food industry, and many medium and small enterprises depend upon migrant labour. In many states farming, food processing and horticulture activities would come to a standstill sans the migrant labour. By one estimate migrants contribute to about 10% GDP nationally. Then why are they invisible?

They are invisible and inaudible because in a democracy the citizen's vote is his/her voice. Most migrants are not registered as voters in their destination state. The reasons could be many – circular migration, language barrier, illiteracy, lack of identity proof, high transaction cost (not having the time, energy or money to pursue registration in the voter list). Migrants as a result, are largely invisible to the people living around them. Challenges of daily survival and uncertainty stares them in the face every morning. Registration as a voter would never ever occur in their daily priority list.

PDS and Food Security of Migrants:

After National Food Security Act 2013, GoI (Government of India) has introduced TPDS (targeted Public Distribution System) which limits the subsidy support from center only to the BPL (Below Poverty Line) families. Moreover there is a prescribed ceiling for every state's BPL population. States, unable to suddenly terminate subsidised ration eligibility for its excess BPL card holders beyond the prescribed ceiling, have taken on the extra subsidy burden onto their books. In some states this extra burden is as large as few thousand crore rupees. This is the key to understanding the issue of Food Security for migrants. Migrants having moved from another state, do not get access to the PDS system of their new state even if they hold BPL ration card of their home state. There are three reasons for this-

First, the destination State finds it difficult to include the migrants into their system because it would need to spend its own, already stretched, resources in supporting such population. Since each state's BPL foodgrain quota is capped at a certain level (in all cases below 50% of urban population) and almost all states have claimants already over this level, any additional BPL numbers would directly impact the State's subsidy burden. The GoI subsidy is capped at the foodgrain

quota fixed for the state and for any extra allotment from the center, state has to pay the economic price (typically a much higher price).

Second, the BPL list is prepared by each state independently and there is no centralized list of BPL families. Moreover, the socio economic variations across the states are just too many to even attempt formulating a central list. A particular group or community could be in the lowest socio economic strata in one state whereas they may not even find a mention in the disadvantaged list of another state.

Third, even if the destination state wanted to support BPL migrants from other states, it doesn't have a reliable way of verifying their BPL status. Allowing other state's BPL families to draw subsidised food could lead to misuse and leakages in the PDS system of the destination state. The records from home state would, in all probability, be in a different language and a different format. Even in today's on-line world it would be highly unreasonable to expect that every tiny PDS outlet in a city would be technically equipped to reliably verify other State's BPL ration card, issued in a different language and different format. This function could possibly be done at some central office in a State but then it serves no purpose as it just puts the whole design out of the reach from those for whom it is designed.

Blockchain to help:

If every migrant labourer's data such as his/her 'aadhar number', BPL status, existing ration card (PDS card), along with his/her monthly PDS transaction data is built onto a blockchain, it could potentially open all the closed doors for the hapless migrant in the destination state. This would need be backed by a multiparty agreement between GoI and all state governments, allowing PDS access to each other's BPL migrants.

This would work beautifully because it would be a trusted undisputed PDS transaction record for all the parties. The Govt of India can aggregate the migrant's foodgrain allocation by the destination state and they can debit the respective home state's allocation to that extent resulting in no extra financial burden on the destination state. The home state can pause the foodgrain allocation on the migrant's ration card till the migrant is back; the destination state can allocate foodgrains without having to worry about eligibility, misuse and extra financial burden; and the migrant gets his/her much needed subsidised foodgrain from the nearest ration-shop wherever he goes without having to fill any forms or visiting any government offices. A blockchain supported smart card in the hands of a migrant family would be their insurance against all adversities. Come what may they would certainly not starve!

This kind of a blockchain based system would be completely transparent and fool proof. No state would have to use any extra resources, neither would there be any extra subsidy burden on the GoI. Migrant would just need to show up to the nearest PDS outlet, wherever he/she is, and present his/her smartcard. Today most states have connected their PDS shops to a centralised state server and all transactions get captured there. This migrant's smart card data would go to the destination state's central server, which would verify the details using blockchain technology, and would authorize the transaction for the PDS shop.

Blockchain for Education & Health of Migrants:

The blockchain can incorporate the migrant children's school record allowing them to seamlessly transfer and get admission in Govt run schools wherever their parents' job takes them, even mid-session. Instruction language could still be an issue but children pick up the language like a sponge soaks up the water, and in any case it would always be a superior solution than having them out of school. This system would create other safety nets for the family as well. The school going children would automatically enrol in the Mid-day-Meal program of the new school. Their scholarships can continue without break. A pregnant mother could access the Janani Suraksha Yojana's monetary and health incentives across the country. The family's medical history can also be stored onto it. All social welfare schemes such as old age pension, or infirmity pension etc can also be brought onto this platform.

Why Blockchain:

First, Data Protection and Privacy: Most blue collar migrants are semi-literate at best, and possibly unaware of data theft. Their data protection and privacy can only be ensured if it is encrypted on blockchain. They could easily give out all their details to an unscrupulous agent who could misuse this information.

Second, migrants and gypsies wouldn't be capable of carrying multiple documents like their children's birth certificates, school enrolment details, aadhar cards, ration cards, driver's license, medical records. Let alone carrying these records they would have lost many of these due to frequent shifting across cities and states. This solution safely keeps it all together for them.

Third, transparency, reliability and verifiability of transactions which all governments can trust and accept. This system would protect against any misuse or leakages in the PDS system.

Detecting fake news and information

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Fake news has always been around. Under the guise of mis information, fake news has earlier operated in small circles, among known people and connected circles as incorrect information. What has now changed the gamut and influence of such news is technology. Technology like Facebook, Twitter, WhatsApp and other info sharing apps like Instagram have become the conduits through which such misinformation spreads and since there are more than millions of users on each of these social sites, the sphere within which misinformation may be circulated has also increased manifold. In India today, fake news is more than just misinformation.

As the BBC (2019) reported, "WhatsApp, India's most popular messaging platform, has become a vehicle for misinformation and propaganda ahead of the upcoming election. The Facebook-owned app has announced new measures to fight this, but experts say the scale of the problem is overwhelming." Fake news in India has caused people to be lynched and influenced voting behavior. As The Atlantic reported, recently, "Misinformation is endangering India's election (2019)." India has various fact checking organizations like BOOM, which partners with Facebook to check videos and posts, and Alt News. Just as technology today has enabled the flow of such news, it also has certain tools that can be used to combat the menace. But before we consider the technology, it is important to understand the different ways fake news disseminates online. CNN disinformation reporter Donie O'Sullivan (https://www.youtube.com/watch?v=1vS5dXfBLmg) says, "There is normally two main motivations. One is financial and two is political and ideological." Writing for Medium (https://medium.com/1st-draft/fake-news-its-complicated-d0f773766c79), Dr. Wardle, says, to combat misinformation, we must understand the motives of those of who create it. Elliot Higgins, Founder of Bellingcat, says, "Poor Journalism, Parody, to Provoke or 'Punk', Passion, Partisanship, Profit, Political Influence or Power, and Propaganda" are the main motives of those who crate misinformation. Mis information is shared every time we share information without checking it. So deliberately created misinformation, gets shared when we retweet stuff without checking, between closely connected groups or close-knit sets of people where the information posted is trusted since its coming from a known source, the person who shares it.

As the Verification Handbook (https://journalismcourses.org/courses/VRFY0419/verification.handbook.pdf) says, "…journalists and humanitarian and emergency workers must become adept at using social media and other sources to gather, triangulate and verify the often conflicting information.." Dr. Claire Wardle agrees. A leading expert on social media, user generated content, and verification and co-founder and leader of First Draft (https://firstdraftnews.org/) the world's foremost nonprofit focused on research and practice to address mis- and disinformation, she says when news is breaking journalists "different accounts, pages and groups on social networks." In recently taught course (MOOC) in association with the Knight Center for journalism in the Americas, she outlined some strategies for detecting fake information. Key among them were using internet tools to verify facts and information.

Using the internet and social media to verify facts

Often the only search engine most use is Google. But social media, especially Twitter can lead to a wealth of information. Dr. Wardle says that Boolean search queries on Twitter (just like search queries on Google) and the advanced Twitter search are helpful tools. What do you search for when you are fact checking? Twitter can handle complex search queries and hashtags can lead to sources and information that be used to verify. As Dr. Wardle advices, "Twitter lists which are really powerful." Steph Nissen (https://www.stephnissen.com/what-twitter-list/) describes them as, "A list is a curated group of Twitter accounts. You can create your own lists or subscribe to lists created by others. Viewing a list timeline will show you a stream of Tweets from only the accounts on that list. The simplified version is that Twitter lists organize your Twitter followers." On Google, tying in the words, site:twitter.com/*/lists, and then putting in keywords will throw up Tweetdecks that be followed. Michael A. Caulfield, author of the Web Literacy for Student Fact-checkers (https://webliteracy.pressbooks.com/) says, most web content is usually not original and thus look for previous versions of the content. He has a list of sites (https://webliteracy.pressbooks.com/chapter/fact-checking-sites/) where content can be checked for veracity. Another tool to monitor social media and the internet is CrowdTangle (https://www.crowdtangle.com/features). This is a licensed tool available to newsrooms to track "individual pieces of content, you can also see what's trending on Google Search." With CrowdTangle you can also search comments and shared news on Facebook. Journalists create a dashboard to monitor social media and the internet, focused on different news they are covering, and check information as the stories come in.

Dealing with scrapes: Scrapes are images and videos that are downloaded, modified and re-uploaded online. Being skeptical of the information you have found is always a very useful place to begin with. Such products can be verified by reverse image searches enabled by websites like TinEye (https://www.tineye.com/).TinEye helps find "duplicate and modified copies of an image in your image collection. Perfect for identifying duplicate images, image verification, and

deploying reverse image search solutions." The Google Reverse Image Search works on similar principles. As the https://www.labnol.org/internet/mobile-reverse-image-search/29014/ says, "Google Reverse Image Search helps you quickly discover visually similar images from around the web. Upload a photograph from your desktop to Google Images and it will show you related images used on other websites and also different sizes of the same photo almost instantly. Journalists can use the reverse search option to find the original source of an image or to know the approximate date when a picture was first published on the Internet. Photographers can use 'search by image' feature to know about other websites that are using their photographs."

How date and time stamps work on social posts: Finding the date and stamp on social media posts helps identify where the post originated from. For example, as Raymond Wong says, on Mashable, "Instagram app now shows the exact date (month, date and year) a post was published on both our own and other peoples' posts." By checking the date and time on the post, images can be checked for the original time they were posted and whether they have been scrapped and reposted. Geo locating photos often shows the time and location of where the original photo was taken. For example, the site http://osxdaily.com/2015/05/08/view-exact-location-photo-taken-preview-mac/ shows how the Preview function leads to the info tab and GPS section where the location and date of the original file can be checked. Geo location can be very important. In an incident, ISIS supporters across Europe were encouraged to take photographs with the ISIS social media campaign's hashtag on a piece of paper but as the FirstDraft reported, users inadvertently gave away their positions (https://firstdraftnews.org/how-twitter-users-tracked-down-4-isis-fanboys-from-a-pr-campaign-gone-wrong/), allowing Twitter users to track down the exact location where each photograph was taken and inform the local police. Verifying tweets can also be done through websites like Who Tweeted It First (http://ctrlq.org/first/) and http://verificationjunkie.com/.

Identifying photos and videos: Other tools that can help determine when the photo or video was taken include the Wolfram Alpha (https://www.wolframalpha.com/about/) which is a knowledge engine that brings in available information from across the web. As a tool, one of its main strengths is that it allows fact checkers to look for the weather at the time and day the time stamp on photos or videos show. This can then be used to check if the background of the photo or video matches the weather as shown on the day and date by Wolfram Alpha. As the BellingCat says, "The first thing to look for is landmarks that might help narrow down the search." FindExif (http://www.verexif.com/en/) helps extract exif data from any jpg online photo. Simple and easy to use, all it needs is a simple url to work with. There is no need to upload the photo. The GeoSearch tool (http://youtube.github.io/geo-search-tool/search.html) needs an address or location with a time frame to find videos uploaded from different areas. It is a tool designed for fact-checking locations and crowdsourcing.

Advanced google maps can also help. For example, photos can be checked against the street view imagery available. Another useful tool, another which allows you to look up who might own a domain name, how long the name has been registered and the location of the owner is https://viewdns.info/. Besides Google maps, Tencent Maps (formerly SOSO Maps), a desktop and web mapping service application and technology provided by Chinese company Tencent, offers satellite imagery, street maps, street view (coverage) and historical view perspectives, as well as functions such as a route planner for traveling by foot, car, or with public transportation. Android and iOS versions are available.

Algorithms too are now being refined for use to help journalists' fact check reports. Naeemul Hassan of UT Arlington and Bill Adair of Duke University in their paper, present a tool called ,ClaimBuster (https://idir.uta.edu/claimbuster/) have automated fat checking. In a recent white paper (https://www.blog.google/around-the-globe/google-europe/fighting-disinformation-across-our-products/) Google said that it was working very hard to ensure that audiences had access to safe and correct information. The company was doing this by adding more "context" for searches to help audiences check for themselves the background of the results, including links to related information, as well as different ways of notifying users that certain results have been fact-checked by reliable organizations (https://support.google.com/websearch/answer/7315336?hl=en).

The Journalists ToolBox (https://www.journaliststoolbox.org/2019/04/12/urban_legendsfact-checking/) has different ways journalists can use Google Search, YouTube, Google Chrome, Google Earth and Google Translate to check for facts. The Google chrome can become "a verification dashboard that helps you investigate, debunk or confirm the authenticity of a photograph or video" with added extensions that and help check the veracity of information. Other Verification plugins like invid-project.eu are designed to help journalists verify images and videos. The http://reveal-mklab.iti.gr/reveal/index.html can help to detect still images alterations. Videos can be verified by Amnesty International: YouTube DataViewer https://citizenevidence.amnestyusa.org/ and all it needs is a video's thumbnails to do a reverse image search in one click. The Media Cloud is an open-source platform for media analysis (https://mediacloud.org/) that can create an instant analysis of how digital news media covers different topics. Newsworthy (https://www.newsworthy.se/en/) is a system developed in Sweden, that monitors open government data and data analyses them to find leads by identifying outliers and trends.

Information especially during a crisis, can be easily manipulated. Here the Google Crisis Response Map (https://newsinitiative.withgoogle.com/training/lesson/5402052981161984?tool=Google%20Crisis%20Map) can be useful. The google team works directly with authoritative emergency organizations such as the Red Cross, NOAA and many others

to create and update the Google Crisis Map, which features helpful information regarding disasters all over the world. **A Field Guide to "Fake News" and Other Information Disorders** (http://fakenews.publicdatalab.org/index.html) has other digital resources to help reporters check information for facts.

Resources that are useful include:
https://www.bellingcat.com/resources/how-tos/2014/07/09/a-beginners-guide-to-geolocation/
https://firstdraftnews.org/stunt-geolocation%E2%80%8A-%E2%80%8Averifying-the-unverifiable/
http://verificationhandbook.com/
https://firstdraftnews.org/en/education/curriculum-resources/

About the author

Dr. Paromita Pain is an assistant professor of Global Media at the University of Nevada, Reno. USA. Her research focuses on alternate media and global journalism practices from feminist perspectives. A former journalist with The Hindu Newspaper, India's most respected broadsheet, she has also written for The Guardian and Al Jazeera. Interested in epistemological concerns raised by emerging forms of media that are hybrids between old and new forms, between citizen and professional news practices, she has published various book chapters on the intersection of gender and social media besides looking into areas of online commenting and uncivil behavior and its impact on journalistic practices. She uses use qualitative and quantitative methods and has recently started focusing on computational methods of data collection and analysis. Her research has been published in refereed journals like the Journalism and Mass Communication Educator, Journalism Studies, Journalism Practice, Media Asia and Feminist Media Theory. As an Assistant Professor of global media studies, at The Reynolds School of Journalism, University of Nevada, Reno, her particular focus at the moment is digital feminist activism in the global south.

Explained: What is Fake News?

Lots of things you read online especially in your social media feeds may appear to be true, often is not. Fake news is news, stories or hoaxes created to deliberately misinform or deceive readers. Usually, these stories are created to either influence people's views, push a political agenda or cause confusion and can often be a profitable business for online publishers. Fake news stories can deceive people by looking like trusted websites or using similar names and web addresses to reputable news organisations.
https://www.webwise.ie/teachers/what-is-fake-news/

How to Spot Real and Fake News

Alice rushes to work with her cell phone in one hand and a coffee in the other. Scrolling through her social media feed, she's stopped in her tracks by the news that her company is about to be bought out by its biggest rival.

She quickly posts a response, shares the story with her contacts, and emails it to her team so that they can discuss it later.

But then Alice has a troubling thought. What if the story wasn't true? What if she just shared a "fake news" story? After all, she didn't check the source, and it was from a website she'd never heard of before.

If she has been a victim of fake news, and then added to the rumor mill herself, how will people ever trust her again?

Fortunately, there's lots you can do to avoid making the same mistake as Alice. In this article, we explore how you can separate fake news from the truth.
https://www.mindtools.com/pages/article/fake-news.htm

Fake news website

Fake news websites (also referred to as hoax news websites) are Internet websites that deliberately publish fake news—hoaxes, propaganda, and disinformation purporting to be real news—often using social media to drive web traffic and amplify their effect. Unlike news satire, fake news websites deliberately seek to be perceived as legitimate and taken at face value, often for financial or political gain. Such sites have promoted political falsehoods in Germany, Indonesia and the Philippines,Sweden,Myanmar, and the United States. Many sites originate in, or are promoted by, Russia, North Macedonia, Romania, and some individuals in the United States.
https://en.wikipedia.org/wiki/Fake_news_website

Neuromarketing: An Overview

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Abstract

Advances in neurosciences are re-defining and enhancing our understanding of how we make decisions in general and how consumers make decisions from a marketing perspective. Laboratory and field based applications are contributing new insights on consumer behavior that have a direct impact on marketing plans. Courses in consumer neuroscience and Neuromarketing are now offered by many IIM's. How the brain processes and generates responses when viewing an ad is now the subject matter of research. A preliminary study in the eighties showed that subjects preferred Pepsi if they didn't know what they were drinking, but preferred Coke if they did. Brain scans however showed different activity in different parts of the brain in each case. Today using (Functional MRI) fMRI, (Electro Encephalo Graphy) EEG, (Magneto Encephalo Graphy) MEG, eye tracking, face scanning and other objective methods of measurement some neuroscientists claim that they will soon be on the way to identifying the location of the **" Buy Button"** in the brain and eventually perhaps this area of the brain could even be stimulated and manipulated. The complex neuronal network which is active during a "simple" decisional process connected to the purchase of a product is now being studied in detail that is what actually happens in the brain when we see an advertisement. What finally presses the " Buy button" . Can this be predicted and even manipulated. Would this be ethical ? In one study of neural responses to sips of wine, medial Orbito Frontal Cortex response were higher when subjects were told that the wine was expensive ($90 per bottle) versus inexpensive ($5 per bottle). If an ad does not produce functional changes in the brains of the intended audience, then it has not worked! New vistas on marketing and glimpses into the future of neuro marketing are on the horizon

Introduction

Neuro marketing is the branch of neuroscience research that aims to better understand the consumer through his cognitive processes and has applications in marketing, explaining consumer's preferences, motivations and expectations, predicting his/her behavior and explaining successes or failures of advertising messages. Neuro science can help Marketers by Providing confirmatory evidence about cerebral changes. Generating more fundamental (i.e., a neural level) conceptualization and understanding of underlying processes, refining existing concepts of various phenomena, and providing methodologies for testing new as well as existing theories are in the offing.

The term neuromarketing was first used in a June 2002 press release by an Atlanta advertising firm, BrightHouse, announcing the creation of a business division using fMRI for marketing research. The annual advertising market in the USA alone in 2014 was 475 Billion US $. Traditionally marketers have watched what we do in stores or tracked how purchases rise or fall in response to promotional campaigns, changes in pricing, endless surveys and focus groups, asking us what we buy and why. In Neuromarketing one understands patterns of brain signals (electrical, blood flow, O2 and blood utilisation in specific regions) as a function of time (milliseconds) during observation of commercial advertisements , leading to information about cognitive and emotional processing of information in the brain . The neurophysiological changes in the complex neuronal network , during a simple decisional process, involved in purchase of a specific product is studied. The response to advertising (how the message is encoded) matters more than the stimulus (the ad itself) because the response is what the ad leaves behind.

Advertising productivity will increase if managers knew how advertisement stimuli (the Unique Selling Proposition) were received and stored by the brain, and how they affect brand choices. Individuals with a high BMI prefer a thin-shaped bottle, even if this drink is higher in price. Brains in obese people respond differently to nutrition labels. When given an identical milkshake , there is an increased brain activity in reward areas if the label reads 'regular' compared to 'low-fat'!!. Neuroimaging has been used to identify structural and functional brain markers associated with racial biases, trustworthiness, moral reasoning, economic cooperation, social rejection, sexual preferences and even consumer brand attachment. While one school of thought says " Don't just advertise. Neurotise ", others believe that Brain Scans are only Brain scams !!

Basis of Traditional Marketing:

The main objective of marketing is to match products with people. - guiding design and product presentation to suit consumer preferences – *is it possible to examine what the brain does while making a purchasing decision*
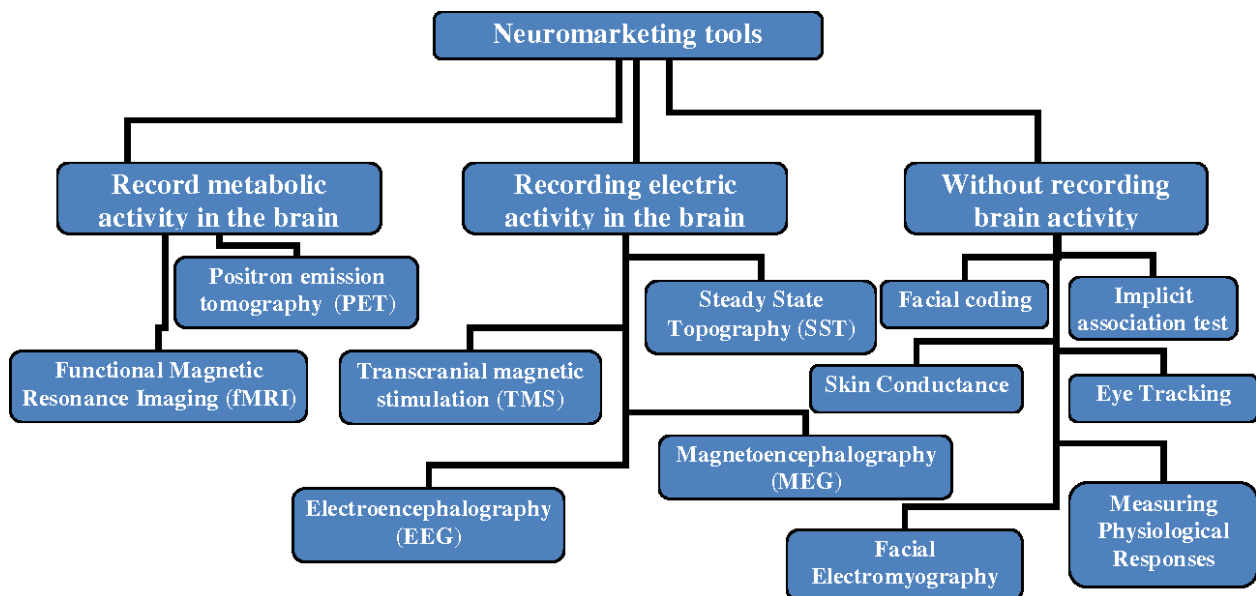
Basis of Neuromarketing

Cognition describes the way our brain thinks, reasons and solves problems. Changes that occur in the brain while we focus, concentrate, maintain or divide attention can now be qualitatively and quantitatively measured. Learning, remembering

new things, planning, executing and regulating activities, understanding and using language, assembling and grouping things together all form the basis of neuromarketing studies.

Neuromarketing Tools

This is represented pictorially below. However these studies can only be done in well equipped neuro labs with considerable infrastructure and technical expertise.

Source: Sharad Agarwal IIM Ranchi

Techniques of Neuromarketing

Eye movement tracking is a standard tool deployed for understanding interaction with both online and bricks-and-mortar environments. Eye movement (fixed and interrupted) reveals focus and attentional bias, distribution and gaze time (of the look) and pupil dilation. These are surrogate markers of the subject's attention and cognitive processing. A longer blinking interval would correspond to better processing of information. ERP ANALYSIS: An Event-Related Potentials (ERPs) analysis, revealed that visuo cortical processing shows an increase in the early positive component (P1 of an ERP), at central and parietal sites, along with increase of the later negative component (N2 of the ERP), at parietal and occipital sites, related to the observation of disliked logos. Brain fingerprinting includes identification of the p300 wave in EEG and MEG and correlating this with observed responses when exposed to a marketing stimulus. Transcranial magnetic stimulation (TMS) a neuroenhancer could even have potential for altering " Neuro responsiveness" to Branding. The brain is the ultimate business frontier and technology is now letting marketing managers peek inside our heads. An EEG allows neuroscientists to track the electrical changes occurring in the brain when watching a commercial. Miniaturization and portability of the equipment has made evaluation of potential customers easier.

Illustrations of Neuromarketing

Subjects preferred Pepsi if they did not know what they were drinking, but preferred Coke if they did. Brain scans showed different activity in different areas .When tasting blind, **the ventromedial prefrontal cortex** responded more actively to Pepsi. When told they were drinking Coke, there was more activity in the **medial prefrontal cortex** — a part of the brain dealing with higher cognitive processing and memory. *Positive brand associations could almost literally be seen overriding the basic pleasure response (taste)*

Specific Documented Brain changes when seeing an Advertisement

Strong activation of the Right Inferior Frontal Cortex (Vocalisation), at 500 ms, latency and in the Left Orbitofrontal Cortex (Judgement) between 600 and 1200 ms after stimulus presentation has been recorded. Active involvement of **Anterior Cingulate Cortex (ACC)** and **Cingulate Motor Area (CMA)** have been correlated to liking or disliking particular advertising logos. **Ventromedial Prefrontal Cortex (VMPC**) is critically involved in emotion and emotional regulation, playing a pivotal role in brand preference. The Prefrontal cortex discriminates cognitive processes, encoding new complex stimuli (e.g., logos, products, testimonials, payoff, etc). Amount individuals were willing to pay (a measure of decision utility) correlated with activity levels in the Medial Orbitofrontal Cortex (OFC) and Prefrontal cortex (PFC). Similar activation in the OFC was observed when subjects anticipate a pleasant taste, look at pretty faces, hear pleasant music, receive money and experience a social reward. In a study of neural responses to sips of wine, medial OFC response

were higher when subjects were told that wine was $90 per bottle vs. $5 per bottle!!! If an ad does not modify the brains of the intended audience, then it has not worked . This would be the way a marketing campaign is assessed

Neuromarketing: a Peep into the Future

MRI scans for neuromarketing studies are at present not regulated by FDA or IRB. *Neuro-caution* must be used in deploying the new *neuro culture* of neuro marketing, while appreciating the exciting discoveries about human behavior using neuro technologies. Commercial effectiveness indicators could be measured including emotional engagement, memory retention, purchase intention, novelty, awareness and attention. We make decisions based on our emotions. Emotional engagement is secondary to the emotional excitement. What happens in the brain when consumers respond differently to an ad, brand or campaign will be understood. Cerebral changes during the Emotional Reaction and Cognitive Processing component of seeing an advertisement can be studied. This is correlated with remembering /forgetting the Ad, attention sustenance, like/dislike . Marketers could exploit these tools in an ad pretest. The exact location/s of the "Buy Button" could be identified. Using. principles of reverse engineering the BB could be stimulated and consumer behaviour modified !!! Improbable Yes. Impossible No

About the Author

K. Ganapathy MCh (Neurosurgery)FACS, FICS, FAMS, Ph.D

Director, Apollo Telemedicine Networking Foundation & Apollo Tele Health Services, is a Former Secretary & Past President Neurological Society of India, Telemedicine Society of India & the Indian Society for Stereotactic & Functional Neurosurgery.

Emeritus Professor Tamilnadu Dr MGR Medical University. He was formerly Adjunct Professor IIT Madras &Anna University Homepage:: www.kganapathy.com

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Few Neuromarketing Books

Hooked
Author: Nir Eyal (@nireyal)

This book explains the Hooked Model: a four-step process embedded into the products of many successful companies to subtly encourage customer behavior and form habits. Hooked is not abstract theory, but a how-to guide for building better products. Nir Eyal masterfully weaves his insights of technology, business, and psychology into his four-step model that reveals the formula for creating habit-forming products.
https://www.amazon.com/Hooked-How-Build-Habit-Forming-Products/dp/1591847788/

Neuromarketing for Dummies
Author: Stephen Genco (@sjgenco)

Don't be put off by the title of this book, it's one of the better neuromarketing books on the market. Although the content is presented in the format used by all books in Wiley's Dummies series, there's a ton of well-researched information in the book. Neuromarketing for Dummies (my review) is a readable intro to both non-conscious effects on decision-making and the more technical side of neuromarketing.
https://www.amazon.com/Neuromarketing-Dummies-Stephen-Genco-ebook/dp/B00EO3ZIIS/

Buyology
Author: Martin Lindstrom (@MartinLindstrom)

The lessons in Buyology (my review) are pulled from a three-years, $7 million research project which Lindstrom started in 2004. This might still be the largest neuromarketing study ever conducted' Lindstrom worked with organizations around the world to test what people actually feel about certain advertising techniques and products using fMRI. Some of the findings about tobacco warning labels and red Formula One cars will surprise you. One of the first neuromarketing books to be a true bestseller.
https://www.amazon.com/Buyology-Truth-Lies-About-Why/dp/0385523882/

Neuromarketing Books: The Ultimate Reading List:
https://www.neurosciencemarketing.com/blog/articles/neuromarketing-books-reading-list.htm

Management Lessons from a Rural Indian Water Project

Mr. Sathish Vaidyanathan
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Motivation

The motivation behind this article is three-fold:

- *to share the story of a ponds restoration project with the engineering enthusiasts across the globe.*
- *to present the project's detailed blueprint so that it can be adopted by socially conscious corporates as part of their Corporate Social Responsibility (CSR) initiatives across India.*
- *to encourage environmentally conscious citizens to come forward in resolving the water crisis faced by India.*

Background

Thappalampuliyur village, situated in Thiruvarur district of Tamil Nadu in India, is home to over 1500 families and has over 1000 years of rich heritage. The villagers primarily depend on agriculture and livestock rearing for their living. For centuries, three water tanks (ponds) of this village have served as vital sources of water for the villagers. These ponds have historically served as drought mitigation structures to meet drinking water needs during distress periods. However, by the year 2016 continuous reduction in ground water levels, absence of sufficient spells of rain and the prevailing drought situation left the ponds to dry up

Restoration of the Village Ponds

Over the past 2 years a core team comprising of Mr.T.P.Venkataraman, Mr.Seetharaman Kalyanaraman, Ms. Vaidehi Krishnamurthy, Mr.T.S.Balasubramanian and myself worked towards the desilting and restoration of these ponds – an activity that was carried out after eight decades. The effort that spanned over 18 months, has offered phenomenal environmental, and economic benefits. It has increased the water level and extended the water retention capacity of the ponds. It has elevated the ground water levels of the surrounding areas as well.

By replicating this model across villages in Tamil Nadu and similar water-sparse states of India, there is a good chance of increasing ground water levels across the country, thereby efficiently and sustainably addressing lack of water supply from rivers. The before and after pictures of these two ponds are given below.

Mela Kulam (Western Pond)

BEFORE DESILTING (MAY 2017)

AFTER DESILTING (DEC 2017)

Kezha Kulam (Eastern Pond)

BEFORE DESILTING (13th June 2018)

AFTER DESILTING (17th August 2018)

Project Details and Lessons in Management

The ponds restoration initiative saw immense levels of passion, process optimization, cost optimization, meticulous planning and innovation - a combination that many professionals in the management field aspire for. I have outlined some of my key takeaways in management from this project, along with illustrations.
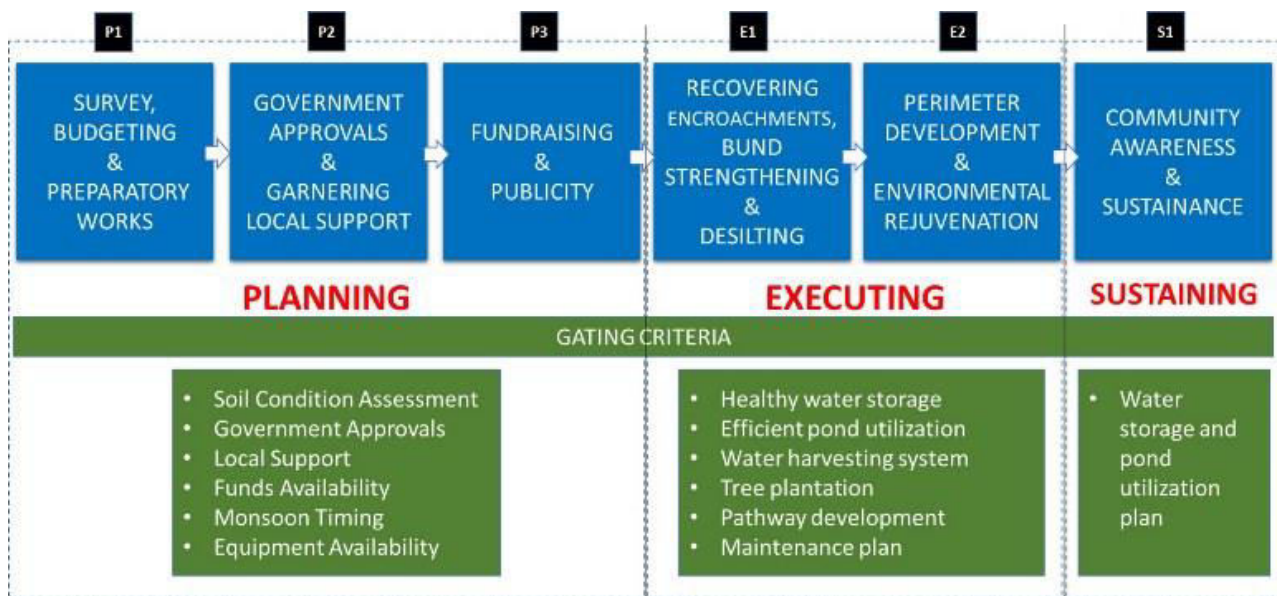
1. Attain clarity of purpose before embarking on the initiative

The foremost factor that resulted in the success of this initiative was the clarity of purpose. The anticipated benefits of desilting the ponds spanned across four areas – **Environmental**, **Societal**, **Economic and Wellness**. Some of the benefits aspired for were, to improve the water table, provide natural replenishment of ground water, strengthen the community in and around the village, improve agricultural productivity and most importantly provide clean water for current and future generations. With this powerful vision, the intent to carry out the initiative was quite compelling and provided the impetus to the subsequent planning and implementation stages.

2. Draft a blueprint, by involving relevant stakeholders

Once the purpose was established, a blueprint or a draft plan was put in place. For this, various stakeholders were engaged, and this helped in building consensus around the initiative. The stakeholder set included the villagers, village well-wishers, desilting and civil works experts, ecologists, geoscience experts, corporate donors, individual donors, NGO partner and local government authorities.

This also served as a good pulse check to evaluate what head-winds and tail-winds the project would face during execution. The draft plan also allows for identification of key tracks for the initiative and owners to drive those tracks.

3. Study feasibility and visualize action plan to get it right
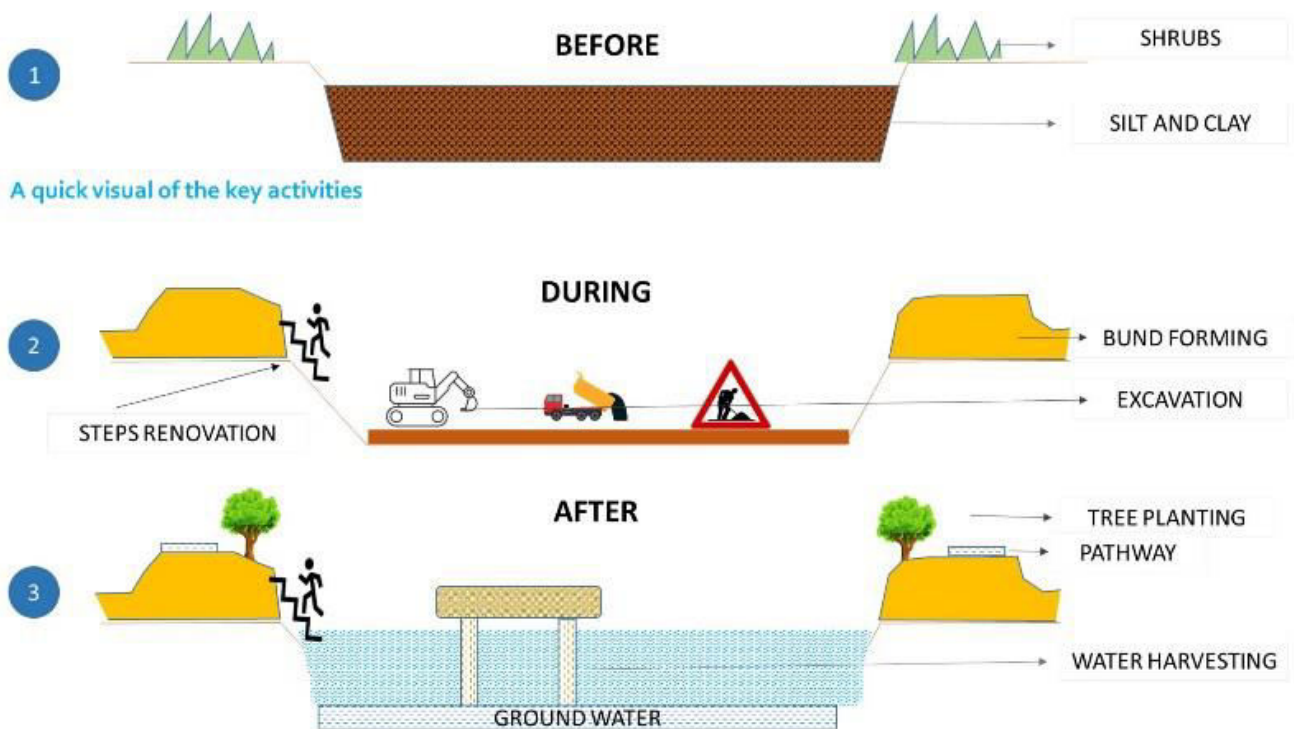
A scientific approach was adopted to assess the feasibility of the initiative. Established professionals from the geological discipline conducted a Total Station Survey of the ponds to study the soil quality and water management experts were consulted to propose measures to be taken for long term sustainability. The study also helped visualize the end-end process, assess the cost of restoration of each pond, and the administrative support needed.

The following interventions were recommended as a result of the survey.

1. Conduct a topographic survey covering the total extent, water spread, bund length and height, inlet and outlet channels, intake well and its dimensions etc.
2. Establish a baseline on the presence of groundwater extraction structures such as open wells and bore wells, their depth, usage, yield and water quality. Document the ponds' history by interacting with village seniors.
3. Clear the weedy and thorny vegetation around the water bodies, so that new vegetation cover with trees of good canopy can be developed on the bund of the pond.
4. Clean, desilt and deepen the water spread area to increase the water holding capacity. Utilize the desilted material to be used for shaping and strengthening the bund.

5. Investigate the sub-surface to assess the nature of aquifer and its groundwater potential so that groundwater extraction structure can be provided to maintain the vegetation.
6. Introduce a groundwater recharge system based on the nature of sub surface, that will harvest the excess water in the pond and recharge the groundwater system.
7. For future sustainability, protect the pond with proper fencing to avoid encroachment in future.
8. Provide walk ways around the bund for easy access for the local community.
9. Explore fishery as a pilot in the ponds and use the groundwater extraction structures to maintain water level during water distress periods.
10. Engage the local villagers and students in rejuvenating the water bodies.
11. Provide a notice board covering all the structural aspects of the water body.
12. For the long term, create the ability to increase the water bed and water quality, thereby improving the quality of life amongst the village community.

4. Build consensus and secure necessary approvals to understand boundaries and achieve autonomy

Since these tanks were public property, it was important to secure approvals from the authorities. Based on consensus among the village, a requisition letter was submitted by the village locals seeking approvals. The approvals given by the authorities were time-bound and extendable based on progress achieved. This helped reveal the boundaries within which the project can be carried out such as dates approved, desilting criteria based on permitted depth/area etc. The approvals not only give better confidence and full autonomy to the team, but also helped with more detailed planning.
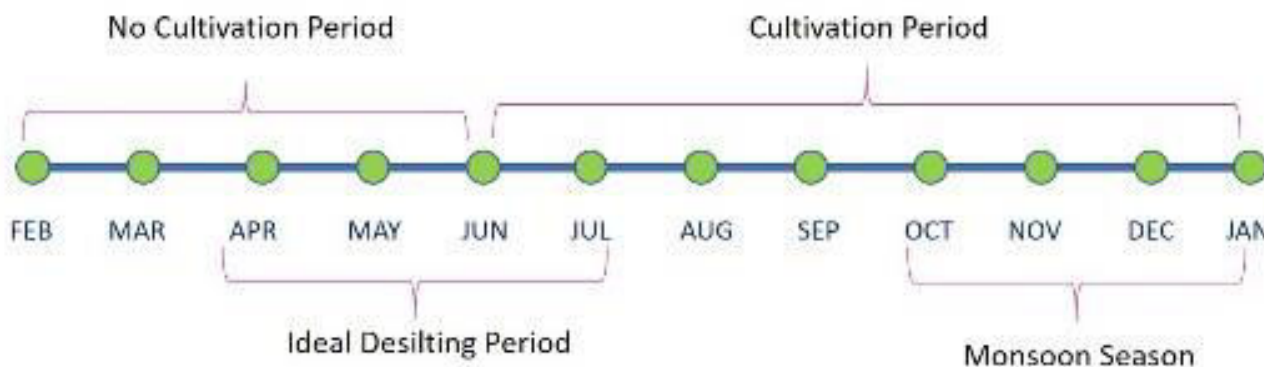
5. Prepare a comprehensive, conservative and collaborative plan with budgeting, resourcing and timelines.

It was determined that the vital part of successfully executing this initiative lied in the detailed planning. Since this was the first time it was being done in 8 decades, unearthing the unknowns were more crucial at the earlier stage. In addition to surveying the ponds and reassuring the support of authorities, budgeting and fundraising were key factors that were seriously considered.

Budgeting - With help from experts in the field, budget needs were determined and distilled in a detailed manner.

Fundraising – A non-profit partner, Rotary Club, was identified as a partner to serve as the channel to raise funds. Funds were raised from individuals, corporates, organized/family trusts and village community. It was largely due to the CSR funds raised from environmentally conscious corporates, that a project of this magnitude was possible. Piecemeal donation options comprising of daily donations, activity specific donations, lump sum donations and machinery time contributions were instituted. Fundraising avenues included outreach to people with connects to the village, social media channels like Facebook and WhatsApp, and outreach to foreign nationals.

Timing: Given this initiative can only be carried out during summer months and months where agricultural activities were minimal, timing of the project was quite important.

Resourcing: We involved the village community from the initiation stage, and as a result locals actively participated in the supervision and execution of this initiative with adequate guidance. A daily report of on-ground activity was shared with the core team and the key stakeholders.

6. Explore avenues to constantly innovate on cost and effort

While determining the plan to dispose off the desilted soil, the villagers came up with an optimal, yet innovative plan. Instead of letting the soil accumulate in mud-piles, they reached out to the local farmers, who in turn brought their own tractors for removing the decades old fertile soil that was rich in nutrients and minerals. Hundreds of loads of soil were spread on the fields for cultivation, resulting in a much richer yield in the following cultivation season. Surplus soil was also used to lay roads and construct houses. In addition to saving the cost of soil removal, this also boosted agricultural productivity.

Reuse of the sand for agriculture purposes | Sand used for construction | Fixing Potholes on the street

7. Focus on sustainability beyond the initiative, to create true impact

The impact created did not end with completion of work. The ponds got a fresh flight of steps, elevated embankments were laid out to around the pond to prevent water overflow, a water harvesting plant was set up to ensure the surplus water is harvested as ground water, palm tree seeds were planted around the embankments to prevent soil erosion, and awareness was created within the village about the importance of maintaining and sustaining the initiative.

8. Monitor, Report and Communicate often

In order to provide visibility and transparency, the daily status update on the project was shared over simple channels like WhatsApp. Frequent visits by the core team members from the city boosted the confidence of the local team. Field experts also visited the site periodically to guide, enrich and course correct the activities as needed. Cost, effort and key milestones were tracked and recorded for documentation purposes. Donors were kept constantly updated on the ongoing progress and impact.

9. Establish a sense of community to nurture engagement and strengthen purpose

More than the successful execution of the project, the community that it nurtured and sense of purpose it established were the true indicators of meeting its vision. The project infused tremendous confidence among the village locals and has

resulted in a positive change in their mindset. Thanks to the constant engagement with the local community they now firmly believe that with support from individuals and corporates, and by adopting a structured professional approach they can create a much better life for themselves and their children. They have now started the next impactful initiative of desilting water canals which form the vital irrigation framework of the village, covering approximately 5 sq.km of the village's cultivable land, in addition to additional ponds in an around the village.

The greatest of management lessons are not always taught in B-School classrooms or corporate workshops. They are often experiential in nature and are taught on the field, while undertaking projects with a strong sense of purpose and long-standing impact.

PS: A more detailed presentation is available at: http://bit.ly/tplponds

About the author

Sathish Vaidyanathan is a core team member of Thappamalpuliyur Ponds Restoration Project. He has been associated with this initiative in planning, publicity, marketing and fundraising for this project.

An engineer by profession, Sathish Vaidyanathan works for PayPal India and heads the engineering team that launched PayPal's payments platform for the India domestic market. Before joining PayPal, he had stints in engineering at eBay, Sun Microsystems, Mentor Graphics, Ramco Systems, and two early-stage startups in the US. He is deeply passionate about empowering non-profits and social enterprises through technology, innovation, entrepreneurship, intrapreneurship, mentoring and leadership development and authored articles on these topics on LinkedIn. Sathish has a Masters' degree in Software Systems from BITS Pilani and an engineering degree in Computer Science from SRM Engineering College, Chennai

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Status of Drinking Water and Sanitation in rural India

In Budget Session 2018, Rajya Sabha has planned to examine the working of four ministries. The Ministry of Drinking Water and Sanitation is one of the ministries listed for discussion. In this post, we look at the key schemes being implemented by the Ministry and their status.
https://www.prsindia.org/theprsblog/status-drinking-water-and-sanitation-rural-india

76 Million Don't Have Safe Drinking Water: India's Looming Water Crisis

Nearly 76 million people in India do not have access to safe drinking water, as polluted rivers and poor storage infrastructure over the years has created a water deficit which may become unmanageable in the future
https://swachhindia.ndtv.com/76-million-dont-have-safe-drinking-water-indias-looming-water-crisis-5606/

India's water and sanitation crisis

India is the second most populous country in the world, with more than 1 billion citizens. Roughly half of India's population, a staggering 522 million, practice open defecation.

The World Bank estimates that 21 percent of communicable diseases in India are linked to unsafe water and the lack of hygiene practices. Further, more than 500 children under the age of five die each day from diarrhea in India alone.

With its strong microfinance sector and extensive need for improved water and sanitation solutions, India provides a great opportunity for Water.org to scale our WaterCredit solution. Monitor Deloitte estimates that the rural sanitation market in India is worth US $25 billion. https://water.org/our-impact/india/

Water In Crisis – India

With a diverse population that is three times the size of the United States but one-third the physical size, India has the second largest population in the world. According to the World Bank, India has taken significant steps to reduce poverty but the number of people who live in poverty is still highly disproportionate to the number of people who are middle-income, with a combined rate of over 52% of both rural and urban poor. Although India has made improvements over the past decades to both the availability and quality of municipal drinking water systems, its large population has stressed planned water resources and rural areas are left out. In addition, rapid growth in India's urban areas has stretched government solutions, which have been compromised by over-privatization.
https://thewaterproject.org/water-crisis/water-in-crisis-india

Building tech startup culture through colleges for generating National and International Opportunities

Mr. B. Parameshwar Babu
Founder, FirstWorldAccelerator.in
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Why India needs more startups

Nearly 10 million youths reach employable age every year in India. They may be graduates, diploma holders, vocational graduates and so on. However, are there enough jobs for these young adults? No!! Frankly speaking, a problem of this scale does not exist in any other country. We cannot arrive at a solution for this easily since we do not have any similar models in other countries to compare, learn and apply. Since 1990s, after liberalization happened in India, foreign investments have led to creation of jobs in a phenomenal way. However, job creation has not been consistent and stable in recent times. Obviously, a better solution for this would be to create numerous startups nationwide. Therefore, the best exercise would be to arrive at new mechanisms to accelerate the creation of quality startups.

While there are plenty of schemes/funds coming up for startups and entrepreneurship training, one should remember these schemes will not be effective if there aren't any mechanisms to nurture pre-startup activities in colleges/schools especially engineering colleges. The article provides a broad outline of **why** we need startup culture, **what** pre-startup activities can be brought in and **how** such pre-startup activities can be run through college infrastructure/resources.

Foreign investments, exports and employment opportunities

No doubt, foreign investments and export of IT services have provided enormous job opportunities for software engineers, automobile, electrical / electronic engineers, diploma graduates, etc. for nearly three decades since 1990. Of course, it led to the growth of various industries like real estate, hospitality, travel services, etc. because average salary levels of working population were increasing steadily. Media has been consistently going gung-ho over impressive growth rates in India since 1990s. In fact, India's branding in the international market has improved over the years because it is seen as a large country with better growth rate than most countries.

However, excitement over growth rates and large consumption market powered by huge working age population has actually eclipsed so many issues that are beginning to show up in detrimental ways in India. In recent times, the most visible consequence of this negligence is the disturbance in IT sector and its impact on engineering education.

Engineering education and IT industry

During 1990s, engineering education was seen as a privilege because of limited number of engineering colleges across the country. Either a person would have to spend substantial amount of money for paid category admission or should have some academic excellence to gain admission to engineering colleges. So, not everyone was aspiring for admission into engineering colleges. However, IT outsourcing to India picked up steam after 1995. Though the employability of engineering graduates was not that great, the sheer demand of IT manpower simply skyrocketed and large companies thought it would be okay to spend money to train and nurture fresh engineering graduates for one year or so. **The cost of training engineering graduates was miniscule compared to the amount of revenues these IT companies were generating. In fact, this trend continued till 2015.** Though this practice was becoming unaffordable for companies since then, college management started feeling the negative effect of this change only recently. Large tech. companies are drastically cutting down campus placements and overall hiring.

Before we delve deeper into the intricacies of engineering education in India, it's worthwhile for us to understand how engineering/technical education runs in most countries. For extremely complex problems, it's also better to zoom out and view them like an outsider.

Engineering education in other countries

It may not be possible to compare Indian engineering education system with all countries of the world. However, we can just do a quick analysis of systems prevailing in in rich, middle-income and poor countries.

Rich countries of the west have a mix of private and government aided educational institutions. Most of these countries established a strong financial foundation during Industrial revolution. They have a fairly good employment opportunities in a variety of sectors and hence multiple opportunities for a stable life. Perhaps, this is one reason why there has never been a mad craze for an engineering degree there. They have never witnessed mushrooming of engineering colleges for this

reason. Also, only those students who had analytical/mathematical mindsets during high school days opted for engineering education. Whereas in India, a student who may not have had any involvement in scientific or engineering projects may simply opt for engineering college just for the sake of peer pressure or status symbol. I am not talking about students who do this because of parental pressure, rather I am talking about students who simply want to get an engineering degree because they have seen some friends/relatives or neighbors go abroad and lead a great lifestyle. In other words, they have seen friends who had very little technical inclination during high school, obtain engineering degree and work for popular IT or tech companies. **Notwithstanding this trend, it's worthwhile to note that non tech. businesses in rich countries have always been quick to spend good amount of money and resources far higher than non tech. businesses in India**. Managers in such non-tech businesses of western countries may be Arts/Humanities graduates but they maybe in-charge of handling complex business processes involving implementation of top-notch software tools like ERP, etc.

Figure below shows the conversation between a school kid and a professional with overseas job.

In middle-income countries, number of engineering colleges is likely to be lower and the standard of education may not be that great. **However, those students opting for engineering education in certain Asian countries may have a strong attitude towards problem solving**. Even if quality of the faculty or curriculum is not top class, when students who have the determination to grasp societal/industry problems are likely to acquire better skills and become entrepreneurs or be quickly absorbed by the industry as employees. Also, these countries depend on various sources of income like natural resources, tourism or some specific niche industry. Because of diverse nature of their incomes, they may not have the pressure to depend on IT sourcing income like India. However, **non tech. businesses in upper middle-income countries may still spend some amount of money and resources somewhat higher than non tech. businesses in India**.

Finally poor countries in Africa or in Latin America/Central Asia may have very little resources to offer high quality education. Students from these countries will definitely be willing to come to India for higher education. Though majority of the businesses may not have the budget for buying IT and engineering resources from India, there are considerable number of large enterprises in these poor countries that can provide decent revenues for tech. companies in India.

Peculiar Fabric of Engineering Education In India

As of today, majority of engineering colleges are worried about maintaining revenue streams whereas tech. companies cannot afford to hire large pool of manpower from engineering colleges. On the other hand, Governments face enormous challenges to provide livelihoods to graduates through employment or entrepreneurship route. To understand the causes of this dilemma, one has review the history of engineering education for the past three decades. Engineering colleges in India have been built based on spurts in demand during the boom period. **While it's always a good idea to build any business based on demand and supply, education does not always work that way**. Education sector simply did not worry about the yardsticks for measuring the quality of technical education but was simply carried away by demand and supply logic. Education sector is not a simple commodity to be governed by simple demand and supply logic alone but we also need to understand what format of engineering education would make sense from time to time. **If this validation of format of education is not reviewed on an ongoing basis, we need to face dire consequences like how a person suffering from diabetes would face slow and steady killer symptoms.** We had several warning signals during the last three decades but

we did not see that as a wake-up call and use that as an opportunity to fix a proper foundation for engineering education. In the next section, we will see how the format of engineering education can be tweaked based on industry trends, international practices and experiences.

Engineering and software projects for Startup Culture

As mentioned in the beginning of the article, doing pre-startup activities/exercises would be more essential for nurturing startup culture rather than simply creating startup funds, hackathons, grand challenges, etc. **Many investor groups often claim that there is no shortage of funds for Indian startups; it's only the shortage of investible ventures that's preventing investment growth in India. In this context, what the author implies by the phrase "Nurturing Startup Culture in colleges" is a series of activities/exercises in colleges to create a proper mindset amongst students leading to faster creation of quality startups.**

Let's see what format of engineering education would make sense for nurturing Startup Culture. We can classify various engineering and software projects into two broad categories:

1. **Patent winning or high intellectual property value types**
2. **Process driven projects based on preset standards and practices**

For a very long time, employers in India were focused on type #2 projects. Hiring of engineers for this type of work has been dominant. In recent times, employers for type #1 are beginning to increase but for a country of India's size, they are not enough. **In many countries, students are exposed to type #2 projects during college or sometimes during school days. In fact, these project activities are treated as learning exercise in these countries** whereas in India, candidates are involved in both types of projects only after employment. Even more alarming is the fact, candidates typically consume one or two years after employment for attaining basic tech. skills and maturity of mind to face the world. **This is a huge cost burden for companies/startups for imparting basic skill training**. Current skill training schemes are not sufficient as they are still based on rote learning rather project-based activities.

Any project with decent intellectual property value(type #1) involving scientific, engineering or software development typically may require a team of varied skill levels. This is also true for many **research and development projects** involving multi-disciplinary approach. In developed countries, engineering students experience type #1 projects during college days and Arts/Humanities students involve themselves in type #2 projects. This is one reason why it's easier to allocate substantial funds for research and development funds in these countries while India is still struggling to increase R & D spending beyond IITs. Of course, considerable amount of IP creation happens in IITs but a country of India's size would need different flavors and varieties of startups that cannot be exclusively engineered from IIT's ecosystem. Of course, IIT's ecosystem generates startups that attracted the best of big investors probably because investors found them safe to invest. However, there are considerable number of non-IIT innovators and entrepreneurs who have left India but they found support from places like Harvard (USA), etc. To quote another example, billionaire tech. entrepreneur, Peter Thiel often says things like **Education is optional for successful entrepreneurs** and he does not give much importance to the education of founders while identifying ventures to invest. In fact, Peter Thiel funds students to drop out of college and join the coveted and controversial fellowship program funded by his foundation. Young entrepreneur from India, Ritesh Agarwal dropped out of college and opted for this Peter Thiel fellowship to earn $100,000 from USA. Ritesh Agarwal later became India's youngest billionaire. Eco-system in India does not lend great support for such thinking and hence we do not have sufficient flavours of startups that would be expected from a large country like India.

Even when Ritesh Agarwal's company, OYOROOMS had made it big, Agarwal was the only dropout heading a team of 10-20 people from IIMs, more than 200 people from IITs, Harvard Business School and Ivy leagues. What I am trying to say is that fast growing Unicorns like OyoRooms do need teams from IITs, IIMs and Ivy Leagues; India has the mechanism to produce such team members, however, mechanism to nurture people like Ritesh Agarwal came from Silicon Valley people like Peter Thiel. If we build similar mechanisms in India, we can nurture / accelerate more startups in India to generate huge employment and fuel economic growth in an unimaginable way.

The author has been pushing for certain activities in colleges that will help not only in the identification of right people like Ritesh Agarwal but also create nurturing eco-system (nicknamed "**Startup Nectar**") around such people to grow and scale up.

Obstacles for Startup Nectar

In India, despite massive propaganda for startups, there has been some resistance against the implementation of any form of **Startup Nectars.**

- Skewed attitude and aptitude of aspiring engineers
- Enforcement of new learning techniques by the faculty and college administration
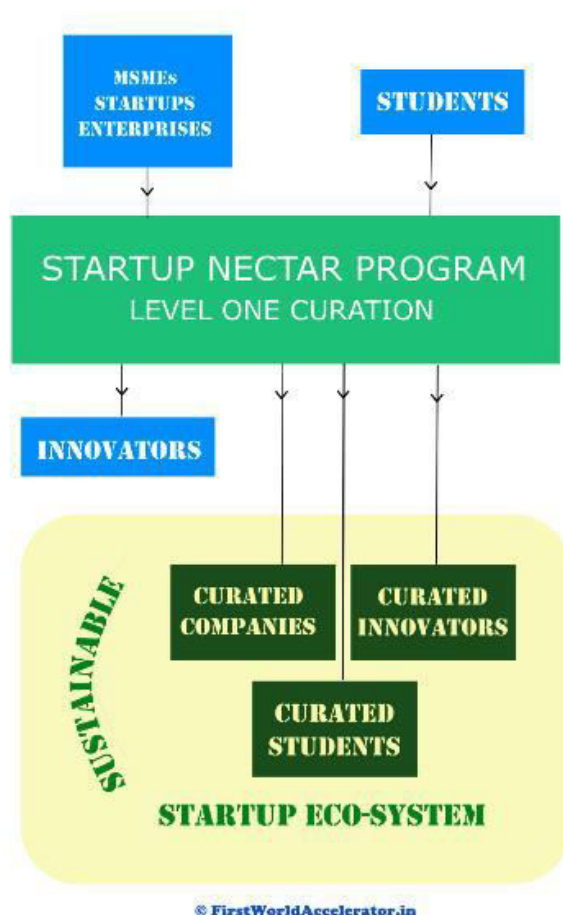
- Resources needed by companies to engage students/interns
- Orientation for Parents to allow kids for work based learning methods
- College Management's addiction to affiliation as opposed to producing real results

The resistance level was very high when the author tried to inculcate any form of startup culture in colleges several decades ago. However, in recent times, co-operation from college management has been steadily building up though very slowly in baby steps. Since colleges have been mostly accustomed to perform purely for affiliation purpose, they take just baby steps rather than giant leaps. Despite this general trend, there have been some colleges in India who have tried small but significant ways to nurture startup culture without waiting for schemes and affiliation points.

Framework of Startup Nectar

As mentioned in the beginning of the article, series of pre-startup activities are needed in college campuses to create a pre-startup eco-system code-named Startup Nectar. This eco-system will gradually overcome resistance from various fronts and will create new believers and contributors for the startup eco-system. Also, it will make governments and industry associations to bring out new policies and schemes. Based on the interactions of the author with college owners and industry associations during the last couple of years, there are signals of growing positivity and some real action.

Based on various experiments conducted by the author, the framework that works for Startup Nectar is outlined below:

The above diagram is the output of several decades of research and pilot projects. Also, the most effective output can be seen if innovators, scientists, startups, enterprises and students are brought in from different parts of the globe. This is usually time-consuming and expensive but from the author's experience, it is worth the effort to reap substantial dividends.

Conclusion

We need more educational institutions to spend more time and resources to accommodate new frameworks like **Startup Nectar** as part of their overall activities in the college. They need to understand it will also help in getting worldwide recognition and branding in the long run far better than short time programs. Many of the educational institutions in developed countries have been doing this for several decades and they can easily derive inspiration from them while remembering to make local orientation to suit Indian students.

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About the Author

Parameshwar Babu is a serial entrepreneur and mentor who has more than 20 years of experience in running various tech. ventures. He created award-winning Java software that became a popular product across the globe bagging orders from NASA, US department of defense and also resulting in mushrooming of Internet Cafes/Browsing centers across India. After 2006, he was instrumental in creating various e-commerce frameworks for a variety of industries like retail, fashion/garments, entertainment/music, education, manufacturing and hospitality. Since 2010, he has mentoring and nurturing entrepreneurs from diverse backgrounds across India and also helping overseas companies to establish collaborative projects India. Some of the startups mentored by him have been winning awards in India and abroad every year. He plays a very active role as committee member in various industry associations and chambers of commerce in India and abroad. He has been pushing for international support for Indian Startup eco-system through such committee activities and has been delivering talks as a key speaker for events organized by CII, AICTE and various business associations/chambers of commerce.

Top 25 Marketing & Entrepreneurship Books For 2019

There are countless lessons to learn as a business owner, entrepreneur, marketer, or manager. It's always helpful to gain new perspectives and learn from the business mistakes of others instead of learning the hard way. Business books from the best experts in their industries can be an effective and low-cost way to gain additional insight that will benefit your company. They can also help to keep you motivated during the many challenges that you'll face in business in 2019 and beyond. Here are 25 of the top business books for entrepreneurs and marketers from some of the top business minds in the world (in no particular order) in 2019.
https://www.myfrugalbusiness.com/2018/08/top-books-entrepreneurs-marketers-managers.html

The Science Of Entrepreneurship: Assessment, KPIs And Measured Tactics

Businesses nowadays are very competitive and fast phasing. The drastic changes in business world needs better strategic planning and actions in order to reach its potentials along its organizational goals and ambitions. Every day is an opportunity for every venture to make itself on the top, and this has been part of every business' aspirations. To attain this, better strategies must be developed. There are planning tools that are always available to help managers and their team create, monitor and assess their goals and the actions taken to achieve it.

Along with other strategic planning that is appropriate for your business, the Key Performance Indicators (KPI) and other business metrics is a big help for any venture to identify, recognize and understand the goals that are striving to reach, and how every actions taken can contribute to its fulfillment. Anyone does not want to become blind and clueless on everything that is happening on their organization, that is why they need to have business measurements specially to aid them in decision- making process.

Generally, metrics are used to measure particular points for a particular period of time, However, KPIs exist to symbolize an organization's certain objectives, at the same time measure an action or performance against a specific target. Every target has its own definition whether in strategies, planning or budget categories and with it comes its range of performances that needs to be done. These are comprehensive measurements that are used as guidance in any business objectives. Moreover, KPIs can also be used when dealing with people or clients outside the workplace. With this, it can be analyzed that any KPIs are metrics, but not all metrics can be considered as KPIs.

Every KPI stipulates emphasis on improvements in operational and strategic perspectives of the business, essentiality of creating analytical foundations in decision-making, and the need to just focus on every detail that matters most.

https://www.myfrugalbusiness.com/2019/05/science-entrepreneurship-assessment-kpi-metrics.html

Startups as an investment asset class

Mr. Sanjay Mehta
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Funding startups is glamorous, but the big question is how much returns it can generate as an investment asset class.

Start-ups are young emerging companies working on breakthrough innovations that would fill the need gap or eradicate existing complexities in the ecosystem. These companies are in constant endeavor for new development & research new markets. They have agility embedded in their inventive thinking. Angel investor funds a startup for several reasons but the first & foremost reason is that they believe in that idea, project or passion. They want to the make the entrepreneur start-up successful with help of disposable capital available at their end. Investing in startups is more an art less of science - it isn't meant for everyone, is subjective. There is no method to this madness nor a defined college degree to help you learn venture investing. Every deal, experience and strategy shared in public domain is anecdotal. **Angel investor provides capital for small entrepreneurs but are not in money lending or financing business.** The finance they provide is for that first round of seed capital to make the idea vision in a reality. Entrepreneurs can also find angel investors in its family and friends who will support them with capital on terms favoring entrepreneur. Angels risk their money in people, team & idea which are fragile in nature. Hence it is called as risk capital investment.
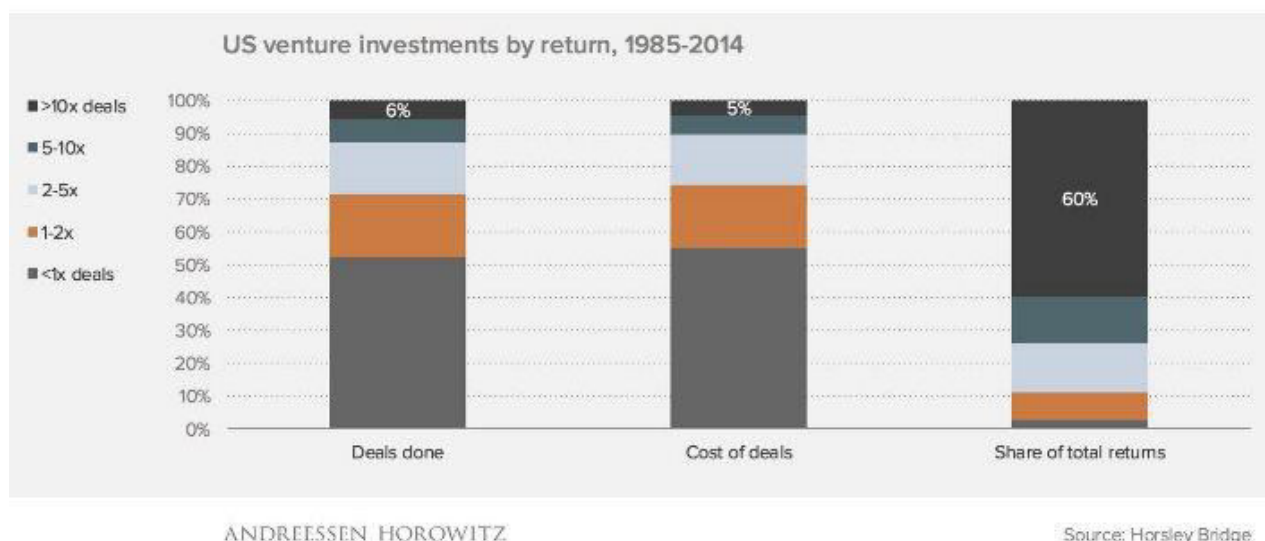
Angels are individuals who are with good successful background, their names evoke trust in minds of customer or future investors. They back the Start-up by associating their name which provided entrepreneurs required creditworthiness in market.

Why I love startups as an asset class for investment is because I can offer my time besides capital. In other investments like public equities or real estate I can't influence an outcome. **Venture investing is a people business** so if you like meeting, working & helping people then your chance of success are very high. With early stage startups as their lead investor I work closely with founders to create a positive outcome. So before beginning a discourse on the merits and demerits of investing in startups, let's first understand investing in startups from the bottom up.

What is investing? It is the process of putting money into various physical or abstracted assets with the expectation of making a profit. One can expect to make a profit on the money invested by seeing an increase in the value of the asset - whether real or perceived - and selling off the asset at the increased value. When you invest in a company - public or private - you invest in the asset that is the company itself; you get a part of the ownership of the company. As the value of the company increases, so does the profit you can make by selling off your stake. A key difference between investing in public companies and private ones like startups is that in public companies, selling off your stake is much easier and near instantaneous. The same cannot be said about private investments - hence it is one of the most illiquid asset classes. It can give you huge profits, but those profits will be only on paper for the most part as realizing an exit takes a lot of time. **It is an illiquid investment**

The VC power law curve
6% of deals produce 60% of returns, and half lose money

US venture investments by return, 1985-2014

ANDREESSEN HOROWITZ   Source: Horsley Bridge

One basic fundament that every early stage investor should know is that startups follow the law of power - a small percent of the startups you invest in will give you the majority of your profits. Take for example Andreseen Horowitz's portfolio. They're one of the top VC firms - and about 60% of their returns comes from about 6% of their deals. What does this tell us? It means to truly make a profit from startup investments, one should be able to access that 6% of deals. The rest of your investments may or may not materialise significant returns for you - but that 6% of your portfolio is where the return is. If you invest in few startups it's like buying lottery; it's the portfolio approach which helps the early stage investor create mega returns.

Having given this background, let us come to the question at hand - "Are startups a good investment?" Startups are high risk high return investments which follow the power law. It is not about the number of hits you have, but the magnitude of those hits. That's where we find the answer to our question. The wealth creation opportunity that startup investments provide is nearly unparalleled. But it is also extremely risky, and conditional. So when are startups good investments?

It is a good idea to invest in startups when one has the appetite and the capacity for the high risk involved. Investor with mission to give first, help founders and build business will win this game. One must be capable of creating a significantly sized portfolio of investments in the hope that some of the investments are part of the 6% and give one huge return. One can create a startup portfolio by investing about 5 - 10% of their total investment capacity in such an illiquid asset class. It is worth noting that the money invested here must be thought of as a sunk cost - until and unless an exit is realised. The investors must be able to stay patient with their capital - the best companies can give returns after 10 years.

The toughest part of investing in startups is gaining access to the top tier of deals that can give you the huge hits. When one has access to those 6% of deals, it is a great idea to invest in startups. One cannot ascertain at the get go if a particular investment will provide the returns you hope - but one can invest in startups that can give unparalleled returns you hope for if they work out. To gain access to the top startups, one has to put in time and effort to become a part of the startup ecosystem, become a part of various investor networks, and collaborating with other lead investors and VC firms.

Startup Investments can provide disproportionate wealth creation opportunities. Before investing in startups, every investor should ask themselves - Am I ready to take on the capital risk? Do I have the required time & effort to build a portfolio? And last but not the least - Do I have the patience to wait for the disproportionate return?

Investing in early stage companies is about capturing the value between the startup phase and the public company phase.

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Private Investor, Mehta Ventures-Family Office Investments, Director Rainmaker360, Startup, Estate, Crypto, CORE-Media. Awarded Angel Investor Of The Year 2017 by Let'sVenture. Investor in Block.one EOS decentralized platform & societal infrastructure for deploying smart contracts. More at https://www.linkedin.com/in/mehta-sanjay/

HOW VENTURE CAPITALISTS SPEND THEIR TIME

Activity	Percentage of time
Soliciting business	10%
Selecting opportunities	5%
Analyzing business plans	5%
Negotiating investments	5%
Serving as directors and monitors	25%
Acting as consultants	15%
Recruiting management	20%
Assisting in outside relationships	10%
Exiting	5%

Source & Courtesy: https://hbr.org/1998/11/how-venture-capital-works

The Progress and Value of Patents in India

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Over the last decade, intellectual property (IP) has emerged as an important business tool for companies in India. Many companies have during the period managed to overcome the challenges posed by the Indian IP regime and devise strategies to derive business and competitive value from their IP assets. The progress of intellectual property law, policy and systems has instilled confidence in IP holders and noticeably furthered their commercial interests. Intellectual property awareness, knowledge and culture improved significantly during the period, and IP has now become an important assessment parameter for research and educational institutions, academics and corporate employees. Among researchers, engineers and technologists, intellectual property registration is today recognized as a valid criterion to measure ability, achievement and progress.

Intellectual Property

At a general level, intellectual property is understood to protect products of the mind or intellect. There are however some variations to the general rule, and protection of knowledge, information, association, representation and others have over the years been incorporated within the scope of IP protection. As it stands today, there are more than 10 forms of IP that protect different manifestations of the mind and other subjects as well. Inventions are protected as Patents, aesthetic product designs as Industrial Designs, business representations as Trade Marks, expressions as Copyrights, secret information as Trade Secrets or Confidential Information, and so on.

With some exceptions, Intellectual Property grants exclusive rights for a limited period of time. Once the term of IP expires, the subject of protection enters the public domain. The term of IP protection varies from one form of IP to another. For example, the term of patents and industrial designs are twenty and fifteen years, and the term of trademarks and trade secrets, if maintained, can be perpetual. Registration is compulsory for forms such as patents and industrial designs, and is not mandatory for forms such as copyrights and trade secrets. Also, protection afforded by most forms of IP is territorial, which means it is limited to the country in which it is registered. Some exceptions to this general rule are copyrights, famous trademarks and trade secrets, whose protection extends beyond boundaries if certain conditions are satisfied.

Patents

Patents are considered to be the most important forms of intellectual property for scientists, technologists and engineers as they protect inventions. Unlike in the United States, the scope and extent of patent protection is not very broad in India. It is limited by exclusions to patentable subject matter in the form of a long list of non-patentable inventions. Irrespective of their novelty, inventiveness and usefulness, inventions that fall within the scope of excluded subjects are not patentable. 'Computer programs Per Se,' 'Business Methods,' and 'New Pharma Forms' are examples of some contentious subjects that are excluded and not patentable. Though the meaning of a few exclusions such as 'Computer Programs Per Se' have been interpreted narrowly to allow patentability of many types of computer program inventions, the scope of patentable subject matter continues to be relatively narrow in India when compared to other countries such as United States, United Kingdom, and Australia.

If it is not an excluded subject, an invention is granted patent protection if it satisfies the requirements of novelty, usefulness and inventive step. The Indian Patent Office (IPO), which has offices at Delhi, Mumbai, Kolkata and Chennai, examines patent applications and grants patents only to inventions that satisfy all the patentability requirements. The term of a patent is twenty years from its filing date, and has to be renewed every year to keep it alive. It takes about three to five years to acquire a patent in India through the normal route. However, by filing for expedited examination, which route is available only for start-ups and certain PCT applicants, a patent grant may be acquired much faster. During the last two years, IPO has granted patents in as short a period as 7 months through the expedited route.

Patent Process

The process of acquiring a patent involves four basic steps before the patent office; filing, examination, publication and grant. A patent application may be filed by the inventor or the company where the inventor is employed. The application may be a provisional application or a complete application. A provisional application is normally filed when the invention has been conceived, but has not been perfected yet. If a provisional application is filed, the applicant gets twelve months to file the complete application. Provisional specifications cover the invention broadly and may be filed quickly and inexpensively. Many applicants file provisional applications to get an early priority date, and take time to file the complete application once the date is secured.

After filing, the patent application will be examined by the IPO. Unlike in the United States, the process of examination is not automatic in India. It will be initiated only if the applicant requests for examination within forty-eight months of filing. Most applicants file the request for examination at the time of filing the patent application to kick start the examination process immediately. After examination, a patent will be granted only if the invention satisfies all patentability requirements and other statutory requirements. If the applicant does not satisfy any of the requirements, the application will be rejected.

A patent application will normally be published within eighteen months of filing. Once a patent application is published by the IPO, the application will be open for opposition by third parties. A granted patent will also be open for opposition by persons in the field of the invention for a period of twelve months from the date of grant. Once a patent is granted, it must be renewed every year in order to keep it alive for twenty years. Many patents lapse and expire due to non-payment of renewal fee. For example, in the financial year 2016/17 alone, more than 19 thousand patents lapsed, expired or ceased.

Patent Statistics

As per the Annual Reports of the IPO, 4,39,590 patent applications were filed between the financial years 2006/07 and 2016/17. The number of patent applications increased by 57% from 2006/07 to 2016/17. Electronic/electrical patent applications increased during the said period from 8193 in 2006/07 to 10584 in 2016/17, which is an increase of about 29%. In 2006/07, the share of filings originating from India was 18%. This increased to 29% in 2016/17.

The table below shows year wise patent filings between 2006/07 and 2016/17. The data has been extracted from the annual reports of the IPO, which are available until 2016/17.

Table 1 – Year Wise Patent Filing Statistics

Sl. No.	Year	Total Patent Applications filed	No. of patent applications relating to electrical technology	No. of patent applications relating to electronics
1	2006-07	28940	2371	5822
2	2007-08	35218	2210	4842
3	2008-09	36812	2319	7063
4	2009-10	34287	2376	7646
5	2010-11	39400	2719	9594
6	2011-12	43197	4160	4225
7	2012-13	43674	3568	4424
8	2013-14	42951	4371	4410
9	2014-15	42763	4031	4285
10	2015-16	46904	4102	5988
11	2016-17	45444	4141	6443

Overall, the number of patent applications filed in India increased steadily until 2012-13, but has been stagnant thereafter. Compared to 2006, the IPO is today more transparent, organized and technologically advanced, but its traditional lethargy, apathy and inaction continue to subsist in some quarters.

Patent Fee

The fee for acquiring a patent is divided into two types, statutory fee, payable to the IPO and professional fee, charged by the patent attorney. The basic statutory filing fee for individuals and startups is 1600 INR and it is 8000 INR for large entities. This fee is for patent specifications that do not exceed thirty pages and ten claims. The fee charged by an attorney varies based on the experience, expertise and stature of the attorney and ranges between 1 to 5 lakh rupees. For startups, attorneys empanelled by the IPO offer services without charging any professional fee, which may be claimed by the attorney from the Government.

The Table hereunder provides the basic statutory fee applicable to different entities.

Table 2 – Basic Statutory Fee

Sl. No.	Entity	Action	Statutory Fee
1	Start-up / Individuals	Basic filing fee	1600 INR
2	Start-up / Individuals	Fees for each page in excess of 30 pages	160 INR
3	Start-up / Individuals	Fees for each claim in excess of 10 claims	320 INR
4	Start-up / Individuals	Filing a request for examination	4000 INR
5	Small Entity	Basic filing fee	4000 INR
6	Small Entity	Fees for each page in excess of 30 pages	400 INR
7	Small Entity	Fees for each claim in excess of 10 claims	800 INR
8	Small Entity	Filing a request for examination	10000 INR
9	Large Entity	Basic filing fee	8000 INR
10	Large Entity	Fees for each page in excess of 30 pages	800 INR
11	Large Entity	Fees for each claim in excess of 10 claims	1600 INR
12	Large Entity	Filing a request for examination	20000 INR

The specific statutory fee applicable may be accurately calculated based on the type of applicant and number of pages/claims in the specification.

Commercialization and Enforcement

Though the patent protection system has improved appreciably in India over the last decade, the extent of commercialization and licensing of patents has not progressed significantly. With a few exceptions, the patent licensing/commercialization market has not matured enough to facilitate and enable licensing transactions. Experts attribute quality of patents, weaknesses in the enforcement system, dearth of professionals and other reasons for the same. Though licensing transactions are few and far between, some companies have started using patents effectively as a part of their marketing, financial, and corporate transactions.

Like other countries, India also witnessed patent actions around Standard Essential Patents relating to mobile technologies during the last 5 years. Ericsson sued Micromax, Intex and others for infringing its patents that form part of standards relating to 2G and 3G technologies. Following initial orders in its favour, Ericsson was able to convince some companies to acquire licenses over its patents.

Recent judgments indicate that the understanding and perspective of Indian Courts with respect to patent disputes has changed over the last decade, and they are no longer perceived to be biased against enforcing patents. Several patent holders were able to get favourable judgments against infringers, and many companies have developed patent strategies specific to the Indian IP system. Though it is not as easy as it is in the United States or United Kingdom, patent holders have shown that patents can be enforced effectively for business benefit in India as well.

Value and Performance

Patents have today emerged as indicators of value and performance among corporates and academic institutions in India. Number of patent filings and grants are recognized by corporates and research institutions as indicators of innovation, technological excellence and product quality. Patents are today important parameters in valuation and evaluation of organisations. They are used to measure progress in several aspects ranging from Research and Development output to standards of education.

At the individual level, patents are recognized as important parameters for making hiring decisions, measuring employee performance, and deciding on promotions/increments. They have also been recognized as valid alternatives to publications, and form part of parameters for performance review of academics and researchers at educational institutions. The awareness of patents among the general public has significantly increased during the last decade, and many people have started relating patent holdings to the quality and credibility of products, companies and individuals.

Acknowledgements

My sincere thanks to Gaurav Mishra and Ashwini Arun for their research assistance.

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About the author

Dr. Kalyan Kankanala is an accomplished and respected IP attorney in India. He is the Managing Partner of BananaIP Counsels, a top ranked Intellectual Property (IP) firm headquartered at Bangalore. His book on Indian Patent Law and Practice published by Oxford University Press is among the highly referenced and cited books in patent law. Dr. Kalyan holds honorary positions with centres of IP excellence, ethics committees and non-profit organisations working for persons with disabilities. He also teaches at renowned institutions such as IIMB and NLSIU, and writes legal fiction.

With the vision of offering high quality, technology, and business driven IP law services following international standards, Dr. Kalyan Kankanala co-founded BananaIP Counsels (formerly Brain League) in 2004. The firm incubated from IIMB's entrepreneurship cell (NSRCEL) and has today emerged as a top ranked and premier IP firm in India. BananaIP differentiates itself from other firms through its achievements and accomplishments in IP services, contributions to the law and policy framework, and business-driven IP research. The firm and its partners are recognized and ranked as leaders in the IP industry. They hold honorary positions with national and international IP committees and research centres, and their views are regularly cited by leading news organizations, journals and research publications. BananaIP's Technology Team & Patent/Trademark and IP Attorneys would be happy to support the members of IEEE network on IP Strategy & Protection at special discounted pricing.

Intellectual property is an important legal and cultural issue. Society as a whole has complex issues to face here: private ownership vs. open source, and so on.
Tim Berners-Lee

Stealing things is everybody's problem. We [Apple Inc.] own a lot of intellectual property, and we don't like when people steal it. So people are stealing stuff and we're optimists.
We believe that 80 percent of the people stealing stuff don't want to be; there's just no legal alternative.
Steve Jobs

Making an Impactful Presentation

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It is a challenging task to create, design and make an impactful presentation. Further, it is even more challenging to create a positive influence on the audience if the presentation has a tight timeline. Presentations are made for multiple purposes such as project proposals, business plans, scientific discoveries, budget plans, product releases and lectures. Regardless of the type of the presentation, it is a Herculean task to grab the attention of audience to convey your points across. In this article, we have illustrated few P's that are required in making an impactful presentation:

P1- Purpose: It is highly important to understand the purpose of the presentation? To understand the importance, ask yourselves the following questions: What is the purpose of this presentation? Is it to inform? Is it to stand for an evaluation? Is to train the audience? Is it to propose a business? Is it for an approval? Because, understanding the purpose of the presentation enhances the clarity in the thought process. This further will enrich the things to be mentioned and points to be articulated during the presentation.

P2- People: Secondly, it is important to know the targeted audience of the presentation. To understand your audience, ask yourselves the following question: The presentation is addressed to whom? This will help us to prepare the presentation as per the expectation of those people. Further, this analysis will also bring clarity on points to emphasize, questions that may arise, etc. This understanding on the audience of the presentation such as number of audiences, their interest, background, their level of knowledge on the topic and their preferences will facilitate the articulation of thoughts. It is equally important to observe the interest and focus of the audience during the presentation. This may help of dynamic personalization of the presentation.

P3-Plan: Planning the presentation can bring visualizations about the presentation to your mind which will answer the following questions: What is to be communicated at which slide? What are the points that need to be highlighted? How much data that need to be provided on each slide? This analysis will be identify the points that meets the purpose and that do not. The substantial points that meets the purpose contributes for the better score of the presentation. This planning helps us to identify the points to narrate with and connect with. One important outcome of planning is the identification of appropriate number of slides and the content for the presentation.

P4- Prepare: Planning of the presentation is followed by its preparing. This P is very essential and has no shortcuts. Preparation is essential for any proper presentation. It should be noted that expertise in the domain can only bring down the time required for presentation. However, preparation cannot be skipped. The complexity and the significance of the presentation matter also decide the time required to prepare the presentation. The importance of the preparation can be understood from the following phrase: "If you fail to prepare, then prepare to fail"

P5-Picturize: Picturization yourself, your thought process together with the content of your presentation in the people's mind is an essential logical process required for presentation. One may picturize on how people would read, understand and infer on the content presented. This is because, the presentation is not about you but about them, the audience. It is important that they should be able to understand what you intend to convey. The core ideas of the presentation should resonate with your audience. Picturization of the presentation will certainly help in this aspect.

P6-Preference: Your preference on the presentation need to be identified. What are the points that you wish to highlight? What is your focus and stress upon? What is the main point that you wish to convey? To satisfy the purpose of the presentation with the plan you have made, what are your preferences? This will facilitates for identification and understanding the points that need to be highlighted in your presentation.

P7-Priortize: Contents of the presentation need to be prioritized considering the purpose, people and preferences. People should follow the flow of ideas in your presentation with ease. Similar to contents, time also need to be prioritized. Deciding on what is to be presented, what points need to be stressed, what need to be skipped, what need to be kept in appendix, what need to be jumped, etc., is the process of prioritizing. Creation of appendix is another important aspect of prioritization. Supporting items such as data, facts, etc. can be kept in appendix. The different between the preference and priorities need to be understood. Preference allows understanding the contents of the presentation from your perspective while priority allows understanding the contents of the presentation from audience's perspective.

P8- Plot: Identify a plot for your presentation. It is a relevant storyline that establishes the context of your presentation. A good plot would help you to connect to the people quickly in the first few minutes of the presentation. This will help the audience to relate themselves to your presentation. However while choosing a plot you should be careful in selecting a plot that is relevant to the context of the presentation and also the audience.

P9-Practice: From P1-P7 discusses about the preparation of content while this P discuss on organizing yourself towards the presentation. It should be noted that slides do not speak but the individual does. One should make a rigorous practice for the effective delivery of the material prepared. Practice can be rehearsing the presentation to oneself multiple times. This can help the individual to know about the voice, enunciation, body language, etc. However, experienced personals would have already understood this aspect that contributes of best presentation.

P10-Pre-Presentation: Once everything is ready, it is important to make Pre-presentation. Presenting your contents to your peers or new audience will gives us feedback. This feedback will help to be prepared for any random questions. This kind of interaction would keep the individual mentally ready for handling unexpected questions or situations.

P11-Persuade: While making a presentation, do not just read the contents of the slides. Provide your logical reasoning or argument to the contents in the slides. Further, your logical reasoning should convince the audience that you are in full belief of what you are presenting and your confidence. They may either agree or disagree with your arguments. But your presentation effort should involve them in your presentation and make them to think.

P12: Performance: The performance is the biggest moment. With the identified purpose and audience, after a thorough planning, preparation and practice, one can make an impactful presentation with confidence. Set the context and start the narration. Some thumb rules on the performance day such as arriving to the venue in well in advance, understanding the surroundings and interacting with people. During the performance, stand confidently, present firmly & invite the people to participate in the discussion. Encourage your audience to ask the questions. During your performance again focus on few P's. They are Pitch of your voice, Pace of your presentation and Posture of your body. All these are important.

P13: Peroration: Conclusion aspect of the presentation is another important aspect which should not be neglected. Conclude your presentation with an inspiring note that kindles interest and enthusiasm among the audience to explore more on the topic of your presentation. By igniting their curiosity, it is a good opportunity even to you to connect and collaborate with your audience later.

These are the P's you can consider while designing, creating and making a presentation. These Ps help in not just delivering the presentation but in connecting with people. Finally, it is important to remember that slides are not the presentation. They are the aids for your presentation. One should remember your presentation than the slides that are displayed.

Thank you for reading it. If you find it useful, please share it across.

About the author

Dr. Ch. Aswani Kumar is currently a Professor at School of Information Technology and Engineering, Vellore Institute of Technology, Vellore, India. He holds a PhD degree in Computer Science from VIT, India. He also possesses Bachelor's and Master's Degrees in Computer Science from Nagarjuna University, India. Aswani Kumar's research interests are Information Security and Machine Learning. He has published over 100 refereed research papers so far in various reputed journals and conferences. He has received Young Scientist Fellowship from Tamilnadu State Council for Science and Technology for his research at Tata Institute of Fundamental Research (TIFR), Mumbai.

Dr. Aswani Kumar was the principal investigator to a major research project sponsored by the Department of Science and Technology, Govt. of India, during 2006 - 2008. He was also the principal investigator to a major research project funded by National Board of Higher Mathematics, Dept of Atomic Energy, Govt. of India during 2011-13. Currently, he is the principal investigator to a major research project funded by Dept of Science and technology, Govt of India under Cognitive Science Research Initiative Program.

Dr. Aswani Kumar is a senior member of ACM and is also associated with ISC, CSI, ISTE. He is an editorial board member for several international journals.

"If you have an important point to make, don't try to be subtle or clever. Use a pile driver. Hit the point once. Then come back and hit it again. Then hit it a third time - a tremendous whack."
Winston S. Churchill

"If you're not comfortable with public speaking - and nobody starts out comfortable; you have to learn how to be comfortable - practice. I cannot overstate the importance of practicing. Get some close friends or family members to help evaluate you, or somebody at work that you trust."
Hillary Clinton
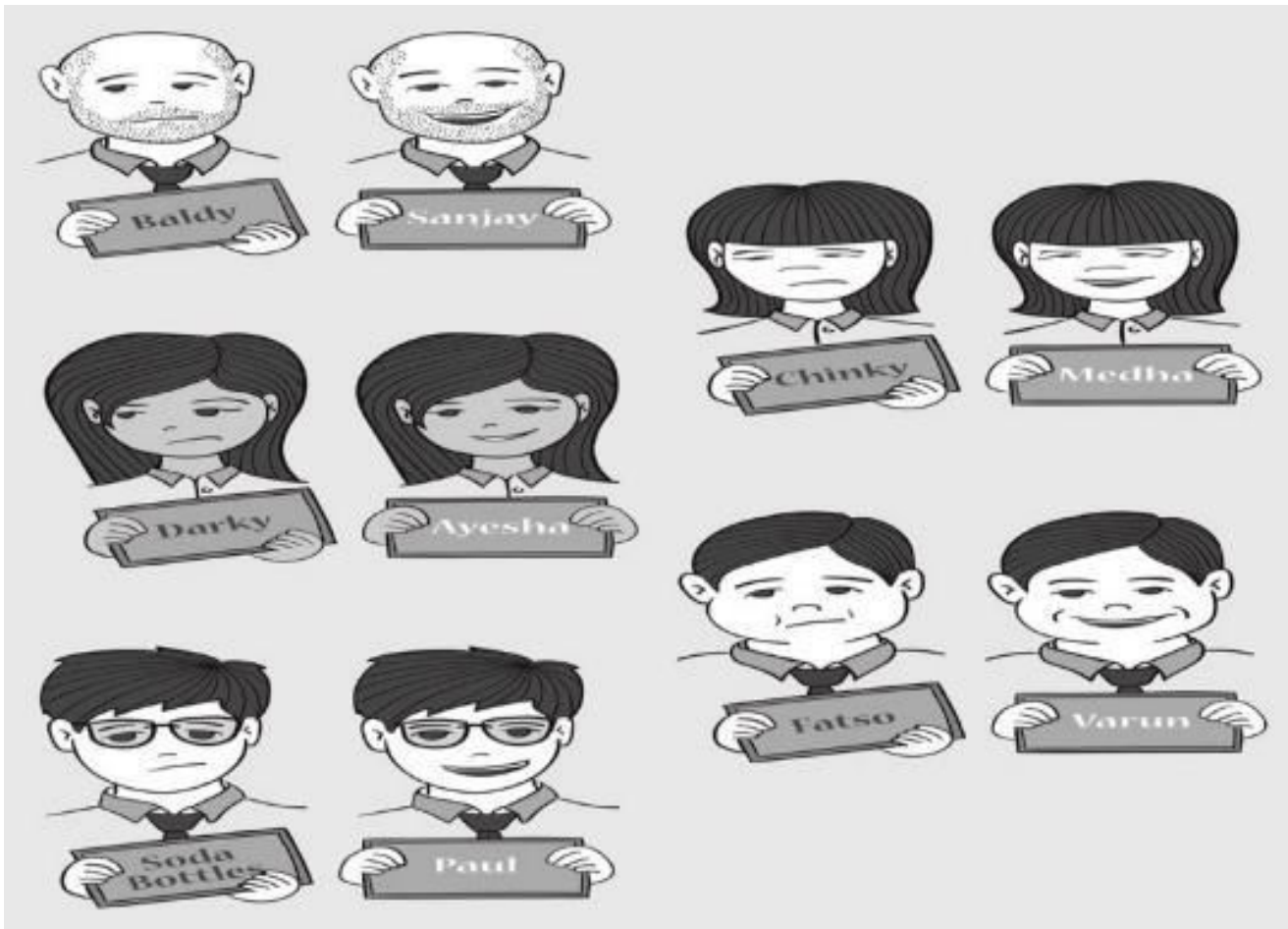
5 Key Types of Workplace Harassment and Ways to Stop it.

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- You are so fat, why don't you skip your breakfast?

- Anila is pretty, she will do a good job in handling clients

- You are 41, when do you plan to get married?

- Jo is gay, it will be odd to invite his partner to the family day.

- Not Sure if Maya will comeback after her maternity, let us defer her promotion to the next cycle.

- Your presentation is as sexy as you are.

- I just don't want to hire women in my team, they take too many leaves.

Aren't the above common comments that we over hear at work? Filled with stereotypes and bias, they are hurting and are classified as workplace harassment.

Harassment on the basis of the following prohibited grounds of discrimination: race, colour, religion, national origin, ancestry, place of origin, age, physical disability, mental disability, marital status, sexual orientation.

Because our unconscious bias has caused us to assume that someone who speaks slowly is unintelligent, we assume the speaker is unintelligent. Everything they say or do for the rest of the conversation, is clouded by our judgement

5 Different forms of Harassment

Discriminations:

The more common and recognizable forms of discriminatory harassment are on the basis of Race, Skin Colour, Religion, Gender , Disability, Sexual Orientation, Age based Harassment. Any preferential or detrimental treatment can be reported and calls for Disciplinary action based on the gravity of the incident.
E.g.: Preference to a fair skin person; male over a female;

Power-Play:

This is a common form of harassment based on the differences of the Superior and the Subordinate. A manager could be giving all important tasks to the most talented person as it will be executed to perfection. This may over a period of time may cause over load and stress to the best performer in the team and the others will be demotivated as they don't get good opportunities to work. Alternatively, a subordinate also gives specials gifts to the manager, hoping for some favors at work in terms of Work scheduling/promotions/performance ratings/travel opportunities/project allocations etc.

It is essential for the Manager to be fair to all the team members and not have any relationships with subordinates.

Bullying:

It is a personal form of harassment of passing hurting comments based on one's appearance and looks. Bullying in its most basic form is not illegal but can be damaging nevertheless.
Personal harassment includes:

- Inappropriate comments
- Offensive jokes
- Personal humiliation
- Critical remarks
- Ostracizing behaviours / Blackmails
- Intimidation tactics / frightening tactics
- Or any other behaviour that creates an intimidating and offensive work environment for the victim
  Cyberbullying and online harassment are a serious concern for employers.

- Share humiliating things about the victim on Social media or WhatsApp
- Spreading rumours, lies or gossip about the victim on social media
- Send harassing instant messages or text messages directly to the victim
- Uploading, downloading and distributing of pictures without their permission
- Virtual stalking

The above are considered as a punishable Offense under the Information Technology Act of our country and calls for fine and jail term.

Retaliation:

The following are considered acts of retaliation if they happen because you reported or supported a charge of sexual harassment

- Isolation or exclusion from any normal work activity
- creating a hostile work environment

Retaliation harassment occurs when a person harasses someone else to get revenge and to prevent the victim from behaving in such a way again.

Retaliation harassment could be a subtle form in terms of excluding a colleague from team outings. Or can be grave as to fire a junior employee for having filed a complaint against a senior person.

Sexual Harassment:

Workplace Sexual Harassment is a **behaviour** defined as **unwelcome** and **sexual in nature, a subjective experience, IMPACT** is what matters not intent, often occurs in a matrix of **POWER,** whether **directly or by implication.**

Any behaviour that is
- Unwelcome
- Sexual in nature (Physical, verbal, non-verbal)
- Has an Impact on the victim whether or not the Harasser intended to harass

Sexual Harassment against women is punishable as per the Prevention of Sexual Harassment Act, 2013. In the wake of the #metoo movements a lot of victims have come forward to report these incidents and this the most prevalent form of harassment at most workplaces. Organisations take this seriously and Act on this immediately.

Where to Report Workplace Harassment?

Document and capture the incident specifics, along with any evidence, time of incident, witness present and report it to the specific authorities as per your organisation.
- The disciplinary Action policy of your organisation should clearly list the forms of harassment that can be report and the consequences or penalties for different forms of harassment. For grave instances Whistle Blower or grievance redressal can also be approached
- For any sexual harassment related complaints, report to
  - The Prevention of Sexual Harassment (PoSH) Internal Committee
  - **SHe**-**Box www.shebox.nic.in** Online Complaint Management System, This Sexual Harassment electronic Box (SHe-Box) is an effort of Government of India to provide a single window access to every woman, irrespective of her work status
- When in Doubts always approach your manager and HR to seek clarification on the next steps

What do you do, if you are a Victim?

- **3S tips for a Victim:**
  - **Speak up:** Make it clear to the harasser that you consider the behaviour as harassment
  - **Say No:** Say a firm 'NO' and tell the person to stop contacting you
  - **Stop:** Stop answering the person's calls, emails, and other messages
- Delete or mark the number as spam in your phone and social media accounts
- Inform your friends and family what's going on
- Don't publicize your location and daily habits
- Keep records and evidences
- Talk to the HR, Internal Complaints Committee or Harassment cell at your institution or workplace

What do you do, if you are a Witness?

Many a times, witness keep quiet for the fear of the impact on their job status and don't want to get in the bad books of their managers. Most witness prefer to ignore the incidents that they have witnessed. But witness do play a key role in getting justice to the Victims. If you are a witness to a harassment incident:
- First step is to get the victim out of the situation
- Encourage the victim to report the incident

- Document and report the incident to respective HR or the committee
- Do not spread rumours or gossip of what you have seen, confidentiality is crucial

What do you do, if you are a Harasser?

How do you know if you or your behaviour is harassing someone or not, intentionally or unintentionally?
Follow the **4-check challenge** and stop if you think you may be harassing someone.
- Watch for the body language, are colleagues uncomfortable or take a step back when you are around?
- Will you exhibit the same behaviour or language even if your family was present?
- Will you like it if the same behaviour was done to you or to your loved one?
- Would you like it to be reported to the media under #metoo now or 20 years later?

What do you do, if you are a Manager?

Managers and supervisors have an additional responsibility in maintain the organisations Culture. They are the first and single point of contact for the employees. Hence managers need to:

- **Set an Example** - Do not participate in any inappropriate behaviour **Zero Tolerance Policy** to any behaviour that is harassing in nature
- **Do not ignore** a case of Harassment
- **Act** on any complaint of Harassment **immediately** - as per the guidelines laid out and regardless of your personal opinion
- **Treat everyone** you manage **fairly**
- Encourage your members to speak up
- Do not cross **personal boundaries**
- **Do not retaliate**

What to do, if you are the HR?

HR plays a very crucial role; it is important that they are seated among the employees to understand the pulse of the employees. They need to

- Implement, update and review the company policies time and again.
- Train the employees
- Look out for preventive measures
- Create more awareness among employees on a frequent basis
- Ensure employees are trained well during the induction
- Ensure the complaint process and the complaint committee is robust
- HR team should also be trained and empowered to handle such situation

Workplace harassment often impacts the productivity of the team, hurts the morale of the employees and impacts the work environment. It is best to prevent and arrest at the earliest stage.

Author notes: if you have faced any form of workplace harassment or if you found this article helpful, or need more inputs, then please do share your thoughts with Viji Hari – viji@kelphr.com.

About the author

A Professional Speaker, an active blogger and columnist on various online HR forums. Viji is actively involved champion in creating awareness about Diversity and Inclusion, PoSH at work place and setting up prevention and redressal committees in the corporate world. With 19 years of industry experience in MNC's in India & USA, she has Co-Founded KelpHR in 2013 and authored the book BCC:Behind Closed Cubicles. Viji helps in enabling safer workplaces across India. She aim's to impact not just a brand but also the enhance productivity, work culture, the values of the organisation. She has been associated with 100+ organisations across India in creating Diverse, safe and Harassment free workplace.

The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 is a legislative act in India that seeks to protect women from sexual harassment at their place of work. It was passed by the Lok Sabha on 3 September 2012. It was passed by the Rajya Sabha on 26 February 2013. http://bit.ly/2I9bBtR

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Length: 4-5 pages in about 2500 words. (longer articles will also be considered)

Format:

- Word document file format.
- Single Column
- Single Spacing
- Times Roman Font in size 10 Point.

Please keep minimum level of indentations while formatting the article. Aligning to the left is always welcome.

Pictures: Apart from embedding the pictures in appropriate places in the article, please send them additionally as individual jpg files.

References: To be listed at the end of the article (please do not include in individual pages)

Please provide also, the following for inclusion in the article.

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