DECEMBER 2020

VIEWPOINT

OFFICIAL QUARTERLY MAGAZINE OF CEAI

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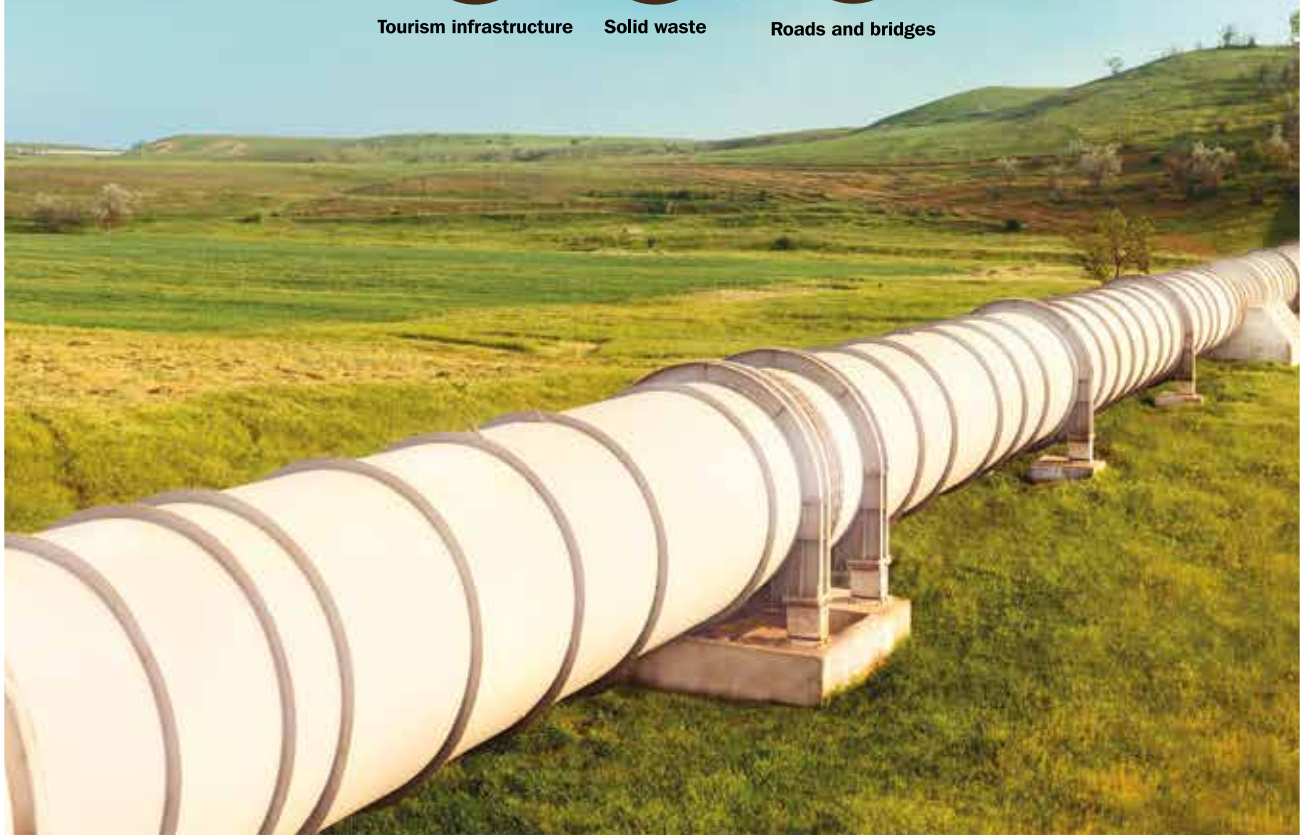

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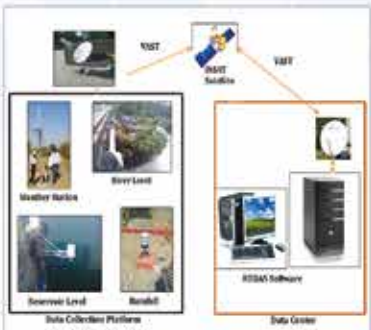
Smart Digital Integrated Water Resource Management & Control System

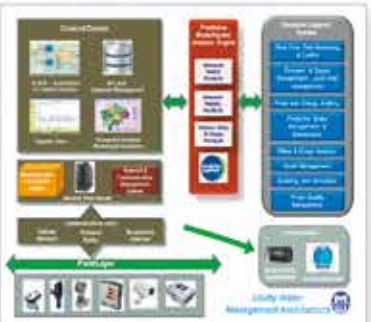


Real Time Hydro Metrological Information System(RTDAS)

Flood Forecasting & Flood Management System with Dam Automation

Canal Automation & Smart Irrigation Management System

Water is Life... Conserve it !!!



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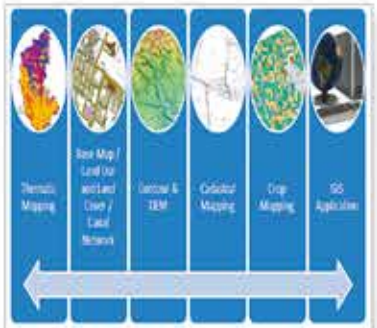

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Message from Chief Editor

Dear Fellow Consulting Engineers & Readers,

Wish All A Happy New Year
Free from Lockdowns

2020 will go down in history as having catapulted the world on to a different platform. It enforced sweeping behavioural changes that resulted in transformations in the ways that people live, interact, communicate, shop, transact, do business, conduct meetings, construction practices, machines operated, etc. All aspects of human life underwent and are continuing to go through kaleidoscopic changes on account of the impetus that Robotics and AI technologies received because of the pandemic. The other side of the coin showed that the quality of life really did not improve in toto since the lockdown and the resulting sedentary 'Work from Home' routine led to drastic reduction in physical activities which led to all the associated physical and mental health issues. It took counselling thorough digital as well as physical means to ignite the dormant resilience and get the people to adjust to the new situations and continue with living a fulfilling and meaningful life.

In keeping with the imperatives of today, remote control and remote operations are becoming a necessity and wellnigh essential for safe and secure working. Digital Transformation is helping mankind to move towards those objectives.

To achieve the aim of living a fulfilling life one needs to adopt and adapt judiciously the various apps and programmes, the gadgets, machines, equipment together with all the safety and security systems to move ahead on that path. While doing all that one needs to be cautious so as not to go overboard with digitalisation and digital transformation. Ideal would be to deploy it to take care of the routine processes, transactions and interactions, exchange of information and data, make all of them seamless with less manual interference and also reduce paperwork and the delays associated with that. In all that one aspect has to be kept in mind and that is that of storing data for very long periods of time and being able to retrieve the data as and when required even decades later.

Historical and Legal documents, Land and Revenue Records etc. are some example that need to be preserved for centuries. Digital data systems have so far not been able to demonstrate that such a system exists or is possible. With every incremental change in technology, the operating and the data storage systems change and the old systems can no longer be deployed for retrieving what was stored in them. It has happened time and again in the past decades when data has been lost forever, unless hard copies of the same had been preserved; the simple reason being that the data storage and operating systems changed and were no more available or where they did

exist, they did not work as before and the software for reading and presenting the data also had got corrupted. Classification and control of all the data is another major area where a lot of development still needs to be done, especially for government departments. It has to be ensured and guaranteed that the digital data would be safe, easily retrievable, readable and printable on paper even after a few centuries.

Another essential requirement would be 100% Uptime for all connectivity through the internet, mobiles and landlines. For these, uninterrupted power availability is a prime requirement. There would ofcourse be times such as solar storms, thunderstorms, etc. when any of these could go out, hence some sort of backup system with redundancy would be necessary, especially for life supporting, safety and security systems.

The Engineers dealing and developing the IT systems – hardware, software and accessories have been doing a great job but they need to keep in mind that the new systems still work for the legacy systems. Any development otherwise would be a mere transient one – form like a bubble for a limited period and then burst.

While development is necessary, the issues created of outdated electronic gadgets and equipment by the newer ones needs to be properly addressed so that mother earth does not become their dumping ground. One way perhaps could be to incorporate development in a manner that it is a replacement of only a part or some parts rather than the whole piece or major part of an equipment. Availability of parts and repairs ought to be for at least 25-30 years even though it would affect the monetary growth of the companies. That would not be a small price to pay to adopt more responsible development and be able to close the gap for meeting the Sustainability Goals in an accountable manner.

Another word of caution which has been sounded time and again is to check and validate all algorithms on which safety and security are dependent, since after all they are all the products of the fallible human mind. As the algorithms become longer and more complex the chances of errors also increase and multiply.

Be it as may be, digital transformation is here to stay and is necessary hence the Scientists and Engineers ushering in the changes must find ways and means to address any backlash and shortfall simultaneously with the new developments. That would be truly responsible and accountable development. Talking of accountability and responsibility is necessary and essential for all works done by them. The professionals have been demanding that all Engineering must be done only by qualified, experienced and capable Engineers. It is for that, that all the professionals must be governed by a legislation for the profession of Engineering.

Thank You Dear Contributors & Readers for the Support Through Tiring Times

Looking forward to a Physical Get-together to Celebrate

CEAI's 60 years of Service to the Consulting Engineers

A P Mull

Message from Guest Editor

Humanity is amidst a green revolution in a digital environment focusing on sustainable development goals as agreed by majority of the countries. The pandemic has added resilience to this game. As per a recent ADB report, preparedness and early warning systems provide long term benefits – an oft quoted example is of cyclone Fani that hit Odisha in May 2019 in which there were 89 casualties vis-à-vis thousands of casualties, decades earlier, due to a super-cyclone. Digitalisation plays a big role in such disaster preparedness as well as disaster management.

The entire engineering process across all sectors are under transformation in this Industry 4.0 era – be it smart process plants, smart grids, smart utilities, smart mobility, smart cities, and smart infrastructure. Digital disruptions and trends are reshaping the Indian engineering industries with a focus on smart asset performance management. Digitisation, standardisation and most importantly collaboration will drive growth across industries in India. The future will be more integrated and interdependent.

Digital assets help operations and spends on maintenance to be at optimum levels. Digital twins of plants enable asset performance optimisation at plant as well as at individual system levels. At enterprise level, several plants can be remotely operated from a command and control centre, leveraging knowledge and best practices from one another. Power industry is going through a green revolution and power is no longer a one-way value chain from producer to transmitter to distributor to a consumer – with solar roof tops and battery electric vehicles, the consumer is also a producer (prosumer!). Digitalisation enables one to sell power at peak rates and procure them and store them during non-peak hours – be it an individual prosumer or a plant operator. Real time markets and green term ahead markets enable increase in participation of sellers as well as buyers at competitive costs for power in a transparent and flexible manner. Smart grids enable identification and islanding of sources of failures and reduction in aggregate technical and commercial losses. Digital Asset Management of water utilities enable identification of points of water leakage and pilferage thereby reducing non-revenue water. Digital applications have enabled connected car environment, driving analytics, vehicle communication (V2V, V2G) and intelligent transportation as well as intelligent traffic control. Autonomous vehicles are already plying in developed countries. Smart communities and smart cities enable optimum operation and maintenance of cities. Some countries have mandated 3D digital models for building approvals – so that security and operation of cities can best be maintained from a command and control centre.

The Digital India is a flagship program of the Government of India that aims to transform the country to a knowledge economy with a digitally empowered society. The vision is to provide Digital Infrastructure as a utility to each citizen, governance and services on demand and digital empowerment of every citizen. Perhaps, as several

infrastructure projects are under way, project governance can be handled in a much more efficient way through remote monitoring of construction sites from a central command and control station.

As consulting engineers with domain expertise, it is pertinent to move from a services mindset to a solutions mindset. Developing analytical skills to handle data is as important as possessing domain expertise. To be a part of this digital revolution, engineers should enable collaboration of domain expertise with technology. As India approaches its 75th year of Independence, the country is embracing digital technology and engineers have a major role in ensuring the same across domains and industries.

This issue covers articles from practicing engineers across civil, structural, electrical disciplines, design and construction domain, healthcare along with some fundamental thoughts on Digitisation, Digitalisation and Digital Transformation. Hope you find them interesting and look forward to receiving your feedback.

Though COVID19 cases seem to be on a downward trend, the threat of second wave is still there along with the risk of mutated strains. Stay healthy and stay safe.

Wish You and Your Families, Good Tidings and a Happy New Year

Dr. Rajashekhar Malur
Vice President and Head – Power Business
Tata Consulting Engineers Limited

Message from Immediate Past President

Dear Members & Readers,

We are at last, coming to the end of a year that started with lot of hope and hype, for being a special year of Twin Twenties, but got messed up with the arrival of an unknown virus that scared the wits out of humanity across the globe. All of a sudden, we found ourselves to be on the same boat - rich and poor, men and women, aged and young, developed country and under-developed country citizens, members and non-members…!

Through the year we gained in knowledge about the unknown, floundered to arrive at a more effective course of treatment for the affliction, that initially took lives of a larger percentage of those affected, and as the year ends, we have the solace of effective vaccines being available, and Hope is reborn!

On the work front, the total lockdown and a passive workforce slowly gave way to the concept of 'Work from Home' (WfH), and Digital Technology took over. Zoom, Webex, Team… became household words for young as well as the old. We found ourselves spending increasing hours on mobile and laptops, pouring on Amazon instead of visiting the favourite Mall; fixing digital meetings in place of booking air tickets. Life style was changed and we climbed on the digital platform for getting more out of life. The advances in Digital Technology that were slowly creeping in our day-to-day life suddenly became our savior, and now we are in the midst of a Digital Revolution.

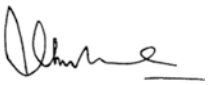
CEAI responded by organizing a series of webinars for the benefit of the Engineering community, starting with hands on training for facilitating WfH experience of members of the fraternity and then a training session on the new technologies like AR (Augmented Reality), VR (Virtual Reality), AI (Artificial Intelligence), ML (Machine Learning). Very recently a largely attended and lauded webinar on "Digitalisation in Engineering" made the participants wiser on the Future to come.

This issue of View Point has the objective of making readers aware of the huge potentiality that Digitalisation has for Engineering per se and would help us Engineers to cope with the forthcoming changes that will be on us much faster than we expect. It is our fervent hope that the efforts of the Editorial Board will succeed.

On a personal note, friends, following the inevitable law of nature the old GC has given place to a new one with greater vigour and the new President Dr. Ajay Pradhan's message to you all is alongside.

I can now immerse myself in writing my book on an engineering marvel – the Howrah Bridge

Wish You All A Vibrant and Productive New Year



Amitabha Ghoshal

Message from President

Dear Colleagues,

It was with great humility and a great sense of duty that I accepted the privilege and the responsibility of the office of the President of the Consulting Engineers Association of India (CEAI) for the term 2021-2022. Leadership is an awesome responsibility, so let me begin by personally thanking my predecessor Shri Amitabha Ghoshal sab and all the able Executives for the excellent work during the tenure of the previous Governing Council even during the ensuing pandemic and working towards CEAI's aims and objectives.

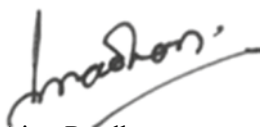
The goal, undoubtedly, is to continue to promote, protect and support the Consulting and allied Engineers. The theme therefore is "Strong CEAI, Strong Societies" since Strong Consulting Engineers exert an impact on society and the various developments on account of their knowledge, skills and dedication. CEAI can grow to contribute to building stronger communities and societies.

The theme supports and promotes the CEAI Strategic Plan for 2019–2024 and the Key Initiatives based on it. The newly launched CEAI's Initiative "Engineers Go Social" will be a significant avenue for CEAI's engagement with the communities.

A strong CEAI can be defined as one that has adequate capacity to meet the information and business needs of its Members. Thus, CEAI would continue and even step up further its function of being the advocate and the spokesperson for its Members to make the decision-making authorities and all other relevant stakeholders, aware not only of how sustainable development is transforming and can transform the society but, also of the role it plays in fulfilling the vision of Atmanirbhar Bharat.

Dear colleagues, I solicit your continued support and request you to repose confidence in the new Governing Council to ably discharge its responsibilities. With all putting their shoulder to the wheel, CEAI's goals can be achieved for advancing and building a strong organization for strengthening the fraternity of Engineers and in particular the Consulting Engineers who are the King Post for all projects.

Wishing All Our Readers and Members A Happy and Purposeful Year Ahead



Ajay Pradhan

Digitalization – A Perspective through 5W 1H, RBV and KBV

Shantanu S Apte
Vice President
Head of Delivery – Hydrocarbons and Chemical Business Unit
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Abstract

Digitization, Digitalization and Digital Transformation are part of modern business lexicon. In today's global and competitive business landscape, the race to achieve competitive advantage is ever accelerating. Digitalization is at the core of the fourth industrial revolution aka. Industries 4.0. This paper explains the core concepts through classical 5W 1H approach and then takes a Resource Based View (RBV) and Knowledge Based View (KBV) to provide a theoretical foundation to articulate strategic importance of Digitalization.

Introduction

Pick up any business article of repute and the odds of not finding a mention of something related to Digital, Digitalization or Digital transformation are very low. As these terminologies are used interchangeably, it is essential to first understand what these terms really mean. A classical investigative approach of 5W 1H of asking questions comprising of, What, Why, Who, When, Where and How is used to simplify the jargons. The second part of paper links Digitalization to proven management theories like Resource-Based View (RBV) and Knowledge-Based View (KBV).

What is Digitalization?

The common wording of Digitization, Digitalization and Digital Transformation, creates much confusions. The terminologies, although used interchangeably, are far from being synonymous. One should have a clear understanding of these terms before proceeding further. An activity of conversion of attributes of physical entities in the machine recognizable data form is Digitization. LASER Scanning of plant floor to generate "As Built" drawings that are machine storable and readable is an example of Digitization. Another example is converting engineering design specifications written on paper into machine storable and readable format. An example on shop floor is data generated through simple temperature, pressure and velocity sensors and other devices to store into memory of electronic devices. In a way, Digitization is a very basic foundation of interface between a physical world and software.

The Digitalization is more about digitizing underlying processes as against digitizing mere physical attributes. It is about making sense of such data and taking some actions, which could be either transactional or strategic. Once armed with capabilities to measure a parameter say, bearing temperature of a motor, one can build the logic in Programmable Logic Controllers (PLC) to observe the trends and apply statistical tools to estimate Mean Time Between Failures (MTBF) for the bearing. Data related to several such motors can be monitored from one plant or several plants. Such data can be further analyzed to identify root causes. Analysis may show either equipment related deficiencies such as shaft misalignment, soft footing or underpinning plant

process deviation responsible for bearing overheating. These are examples of digitalization.

The next step to Digitization and Digitalization is that of Digital Transformation – in which Information Technology (IT) and Operations Technology (OT) overlap significantly and positively affect both equipment performance and business performance. Digital Transformation is about a larger goal – what is to be done with Digitization and Digitalization to transform business to ensure sustainable competitive advantage. Example of Digital Transformation from motor manufacture's perspective is ability to gather and analyze bearing temperature monitoring data from its vast end users to make sense of the same and giving inputs to its own procurement team as well as alerting the bearing manufacturer. Bearing temperature is just one kind of data. Motor manufacturer can define their own set of parameters to monitor to derive competitive advantage. It could give rise to entering into yearly maintenance contract with large users and make use of big data analysis. Such actions help connect both supply and demand sides of motor manufactures' business to stay responsive and competitive.

Why Digitalization?

After clearly understanding what Digitalization means, the focus should shift to WHY it is needed. The Why question is always a profound one as it provides a sense of purpose to undertake the journey. The industrial revolution has seen four distinctive phases. The first phase was about mechanization, steam power and waterpower. The Second phase was about electricity and mass production. The third phase consisted of automation leveraging advancements in electronics and IT Systems. The fourth phase, that is being experienced today is about cyber physical systems. Every organization has choices to make about its existence and future. Digitalization is relevant in answering both questions. Hence adaptation of Digitalization is no longer optional as it is already a business essential. With increasing attention to cost and quality, the real time measurement and visibility gives opportunities to managers to ensure timely interventions for continuous improvements. Digitalization makes it happen. Thus, the simplest answer to why Digitalization – it is to stay relevant.

Where to implement Digitalization?

Every organization operates in a competitive landscape with its own unique ways of working both with internal and external linkages. The internal operations of various functions such as Engineering, Sales, Procurement, Production, HR, Finance, Admin and others need to establish Digitalization within own functions and with all other functions. On similar lines, Digitalization is necessary in ensuring interfaces with the outside world of Suppliers, Customers and Society at large. The answer to this question is also simple - Digitalization needs to be implemented in each facets of a business both core and non-core, both strategic and operational. It needs to be implemented within the organization and also in the larger eco-system.

When to begin Digitalization?

Organizations must move all their paper based and manual processes onto a digital platform to create a base for Digitalization. Inter and intra stakeholder processes must be well defined and operational to start using and generating data in a digital form. Thus, the first step towards Digitalization journey is about achieving proficiency in Digitization. It also means, Information Technology function moving from the role of support to that of the business core. Data is fast becoming the bloodline for an organization. Digitization needs to reach a certain stage of maturity before real Digitalization kicks in. Digitization and Digitalization stages are closely interlinked and keep overlapping continuously. The phase of asking the question of when to begin Digitalization is over. As they say, the time is now.

Who should be part of Digitalization?

Everyone who is part of the organizational eco system must be a part of Digitalization. It includes all stake holders, both internal and external. Organizations need to invest in educating various stake holders on

essentials of Digitization and Digitalization. Every activity from strategy to operation must be part of Digitalization to reap the real benefits. Unless the Top Management embraces Digitalization earnestly and whole heartedly, Digitalization stays patchy showing syndromes of "start-stop-start-stop". Digitalization is all about inclusivity and not at all about exclusivity. Everyone must be on the bandwagon.

How should we go about Digitalization?

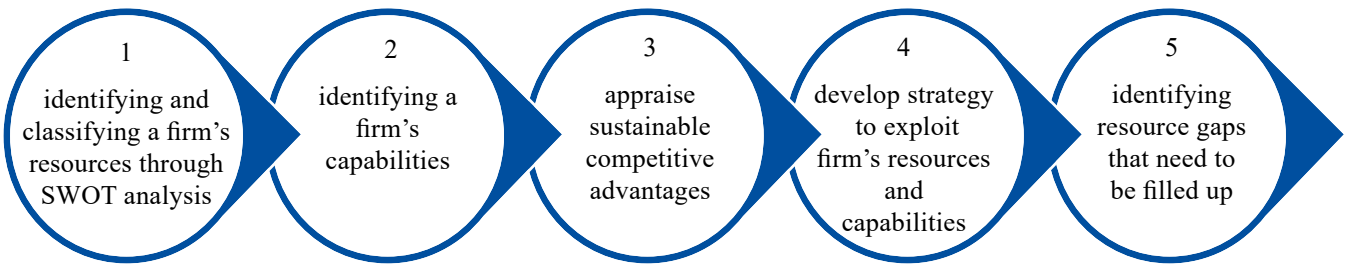
As is true with every major change, Digitalization needs a good framework and proper planning. It begins with Top Management's commitment and unrelenting support. The Apex layer of management needs to thoughtfully define the charter from the perspective of its strategy. The team responsible for operationalizing should consist of top functional experts having intimate knowledge about their core functions. The members need demonstrable behavioral attributes related to cooperation, collaboration and teamwork. The exercise is never about oneself but is all about everyone. There are many examples of failures of digitalization as the existing manual processes were simply digitalized or team responsible for implementation lacked ownership and cooperation. If one fails to review each process critically before deciding on Digitalization, it would end up in replicating (and in some cases worsening) the existing inefficiencies in a digital way. Digitalization is a big Change Management exercise. It is time to look at all activities in the context of relevance, efficiency and quality. Communication forms a basis of any change management. Effective, timely and purposeful communication helps binding resources together to make the journey purposeful and smooth.

After having understood Digitalization, the next step is to discuss how it all fits into the leading organizational management theories. As management theories are outcome of research carried out by collaborative minds in industry and academia, understanding of the theories provides one confidence and support throughout the implementation process. It helps to learn from somebody else's experiences without a need to over-experiment. As an example; two of the profound theories viz. Resource Based View (RBV) and Knowledge Based View (KBV) are discussed briefly.

Resource Based View (RBV)

In a landmark study **Barney, J (1991)** tried to find an answer to a simple yet critical question as to why some organizations perform better than others while operating in a similar business environment. The landmark paper continues to act as a leading light for management studies over the last 3 decades. The research looked at a firm's competitive advantages through two perspectives - one was through analysis of internal environment and second one was through analysis of external competitive environment. The analysis follows a five-step approach.

The proposed model gained prominence as the VRIN model since it proposes resources as Valuable, Rare, Inimitable and Non-Substitutable. The resources could be either Tangible or Intangible, Heterogeneous and Immobile. Thus, if resources cannot be easily imitated by competition (Inimitable), if resources cannot get substituted by some other means or if the resources are rare and valuable then the competition finds it difficult to imitate success. Such resources help provide sustained competitive advantage to the organization.



Digitization is not a mere technical exercise. It is driven through strategic intent and it helps organizations to critically look at both internal and external landscape. Thus, Digitalization helps to unearth, create, enhance and leverage resource capabilities satisfying VRIN conditions. Thus, well thought through and implemented Digitalization exercise can help provide a sustained competitive advantage.

This is an era of standardization. Increasing Industrial bodies are making it ALMOST mandatory to adapt host of standards while some are recommendations, some are mandatory. The government agencies adapt standards that are mostly regulatory in nature. Thus, adherence to relevant standards becomes necessary to ensure ease of procurement, integration, replacement, substitution, operation and maintenance. While such standardization approach is good for user, it creates too much similarity amongst competition forcing them to increasingly compete on price points. The market keeps demanding differentiation too. It means there are two forces with equal measure, driving businesses to achieve diverse goals that appear to be mutually exclusive and hence difficult to achieve. How can one develop standard product or service like a competitor's and yet provide differentiating experience? The resource-based view can provide answer to the question. Digitalization can provide data and analysis enabling managers to keep eliminating waste and improve efficiencies to stay relevant on price. It also throws open possibilities to take a Resource Based View through hard data to keep working on resource acquisition and development to fuel development that can provide differentiation. Thus, Digitalization coupled with RBV can help achieve both standardization and differentiation by providing all the necessary real view visibility to Managers to keep taking necessary actions.

Organizations need to pay attention to their resources and relentlessly keep tracking VRIN characteristics to ensure the differentiated resources keep driving differentiated products or services while adhering to standards.

Knowledge Based View (KBV)

Knowledge Based View treats knowledge as organizational resource and positions it from the perspective of an organization's differentiation strategies. The four aspects of Knowledge Management are shown below.

Knowledge Management
1. Knowledge Identification
2. Knowledge Generation
3. Knowledge Acquisition
4. Knowledge Deployment

Once they get combined and managed, they can provide a unique competitive advantage to an organization.

As per **Grant, R. M. (1996)**, organizations possess knowledge that may be classified under two categories viz. tacit and explicit. The knowledge that is held by individuals and cannot be easily codified and communicated is a tacit knowledge and the one that can be codified and communicated is explicit knowledge. **Nikolaos, Aggelidis, V., & Georgios. (2009),** argue that the organization has unique interplays of tacit and explicit knowledge. The RBV and KBV provides framework for organization's differentiating strategy.

As Digitalization helps to unearth and channelize such explicit knowledge, firms can reap benefits of their vast knowledge repository. It helps drive down costs, reduce efforts and cut down time to market through reuse and automation. The IT security and data management policies need to be in place to ensure such knowledge does not find its way out of the organization but rather stays within. The enhanced collaboration and cooperation as a result of Digitalization gives rise to leveraging tacit knowledge too.

Digitalization not only helps in making a process driven approach possible, but it interlinks various functions of an organization. Enhanced Digitization and Digitalization ensure knowledge generation and absorption can happen at an increasing pace and across an organization. The Knowledge Based View coupled with Digitalization can thus make organizations reap benefits of Knowledge Management to not only stay

relevant through standardization but also differentiate on products and services.

Summary

Digitization, Digitalization and Digital Transformation mean entirely different things although they are used interchangeably. Digitization is preparation phase, linking the physical world to software. Digitalization is a process driven approach linking strategy and operations. Digital Transformation is about achieving strategic differentiation through Digitization and Digitalization.

Digitalization needs as much attention as any large-scale change management activity with careful preparation, planning and implementation. RBV and KBV provide theoretical frameworks to justify investment in Digitalization. Both RBV and KBV perspectives can help organization to achieve both standardization and differentiation. Such frameworks help organizations to learn through collective experiences and to aim for industry leading performance.

Whichever name one may call it either Digital Transformation, Industries 4.0 or Cyber Physical Interface, at the core of all these lie carefully planned and implemented Digitalization.

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THE ECONOMIC TIMES E-PAPER DECEMBER, 15, 2020

DIGITAL ECONOMY

Legacy-infra weight, conservative IT spends: why Indian banks could see more HDFC-like outages

Synopsis

A spurt in digital transactions has caused massive data proliferation. But existing banking technology-solutions cannot scale to keep up with present-day needs. Outages might exacerbate problems unless banks substantially increase their investments in IT infrastructure. But a full transformation is easier said than done. Here's why.

Call it a data blackout. Internet banking went cold, payments through UPI got stuck, ATMs fell silent. In late November, as a power disruption at a data-centre pulled the plug on HDFC Bank's digital services for around four hours, customers got the short end of the stick till backup data centre brought operations back on their feet. A few days later, the Reserve Bank of India (RBI) cracked the whip. Soon after the HDFC Bank incident, SBI's

Source: https://economictimes.indiatimes.com/prime/fintech-and-bfsi/legacy-infra-weight-conservative-it-spends-why-indian-banks-could-see-more-hdfc-bank-like-outages/primearticleshow/79726416.cms

Digital Technology Comes Home

Amitabha Ghoshal
Immediate Past President
Consulting Engineers Association of India

We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run. - Amara's law

PREAMBLE

Human civilisation has evolved through the ages, stepping up on new inventions that have pushed the horizons of its outreach wider.

The learning of controlled use of fire was one such benchmark, in the dawn of civilisation, that opened up new opportunities to its users and ultimately changed the way humans protected themselves, searched for food and changed their eating habits.

The knowledge of planting seeds, nurturing them to grow crops and creating stores full of grains changed the way of life altogether- humans learned to form communities rooted to their farms and the nomadic life gave way to the serene pastoral lifestyle of agriculturists. That started families, properties belonging to individuals and their descendants, and ultimately acquisition of wealth.

Expanding population and the demands for faster production of the growing needs for the users led to industrial revolution, banking on the invention of steam engine and then the internal combustion engines. After mastering the use of heat energy, knowledge of the use of electrical energy gave humanity a big push forward. Civilised society, as defined today, was in place.

The next development came with the invention of electronics that revolutionised the way of life, the way of communication, manufacturing and entertainment. Its exclusive domain did not last long and has been taken over by the latest inventions in Digital Technology, that is changing even the way one thinks!

The Digital World

It started with the use of computation machines that used to require a whole shed to accommodate them and today the same work can be done much faster with an instrument that one can carry in the brief case or even the palm! The use of punched cards for conveying the binary language augured the Digital wave that is sweeping humanity to new crests every day. Humans are in the midst of new technology and accompanying abbreviations like AR, VR, ML, AI, IOT have become part of the daily conversation.

The Pandemic, that has changed the definition of normal life, has only forced this pace of change faster. It is the digital technology's support that helped humans to survive, and in some areas, improved their productivity. Overnight everyone moved to "Work From Home", with the help of their laptops, that was till then used more of a communication aid to access mails and for joining Facebook. People moved effortlessly to

Shop From Home, Bank From Home, even Play From Home, ... and the list goes on! For the technocrats, seminars were replaced by webinars that could bring on the same platform specialist speakers from across the world and assemble large number of participants with a short notice. The number of dedicated participants jumped and all of a sudden, the method of knowledge sharing got a boost. Video calls, that were for fun time, became the serious communication mode.

And all these were possible because many people were already under the umbrella of digital technology, sometimes without even realising the same. The pandemic can be credited with forcing people to achieve the digital transformation in six months, what in normal circumstances would have taken five years.

The effects have been far reaching and in different mode. Suddenly people were forced to replace travels by video meetings, social get-togethers by Zoom calls, and the work time got extended to 24x7! What have been the indirect effects - travels went down, except for in emergency. Engineers and other professionals saved time and the strain of commuting, the carbon footprints consequently went down, cost of operations reduced - and productivity did not suffer except during the transition stage. Looking back, one cannot but realise that the digital technology, that was already there, was not being taken full advantage of. It took a pandemic to make everyone realise the benefits of the new technology. Today everyone is embracing the uses of the technology in their day-to-day life.

Digitalisation in day-to-day activities

How the technology is supporting people in daily life can be best understood by studying the changes that are being introduced in the gated communities, where life was harshly affected with restrictions on entry and availability of service personnel. Many of the uses that were already in place had to be strengthened when the crisis situation was faced.

Entry of non-resident visitors had to be controlled and passengers screened for temperature check and sanitisation. It became necessary to stop the outsiders at the gate and allow the permanent residents to move unhindered. Entry barriers have been put in place, fitted with remote sensors as as to admit a resident's vehicle by identifying the number plate.

At potential collision locations sensors were introduced to warn cars moving beyond permitted speed - a simple application that improved safety.

CCTV usage was increased to replace security personnel, because only the security persons staying within walking distance could report for duty during the total lockdown.

To ensure limitations imposed by social distancing needs, lifts and elevators were fitted with CCTV and overload switches, and lifts would not move if the number of passengers exceeded the limit. For saving power consumption, lifts were fitted with sensors that would allow illumination only when a lift is in use.

For saving wastage of water, all overhead water reservoirs have been fitted with level control trip switches, that would stop operation of pumps automatically.

Street lights and garden lights have been equipped with sensors to reduce power wastage as soon as daylight is available. Encouraged by the reduction in power consumption, similar coverage is being extended to all common areas including building lobbies and entertainment areas like Gyms and sports halls.

Video transmission between entrance areas and the apartments are being strengthened to do away with the need for security at entry of each tower, now used, for monitoring visitor entry.

Negotiation is being made with telecom operators to explore the added benefits that would be available with the introduction of the 5G services, that are still away in the future. It only shows the awareness that has come with the realisation of the benefits that digital technology has brought closer home, in the daily living.

Another very innovative use of technology was visible

during the Puja festivities during autumn in the gated community, where the author lives. Attending the Puja mandap was being actively discouraged due to the fear of contamination, especially for the senior citizens. However, to address their emotions of being deprived from offering "*Anjali*" to the Goddess, arrangement were made for live coverage of the Puja being performed by the priest through YouTube and the residents were allowed to offer *Anjali* with flowers, as guided and directed by the priest chanting the shloka. Arrangement were made to collect the offered flowers from each tower and then put under the feet of the idol of the Goddess, that was being worshipped by the community. It just shows how life is being remodelled by the use of digital technology, steadily.

Future scenario

The technology is here and till another invention dislodges it, people are going to be under the umbrella of the same. All need to embrace it and count the blessings that comes with it.

One cannot but try to guess what is going to be the future!

The day is not far away when robots will be there in the housing complexes, enforcing 'social distancing' and disinfecting common spaces; have holographic projections of people attending meetings in the designated spaces on the meeting table, from the comfort of their home, sipping coffee produced in a self-kitchen; and tele-consulting with a medic (the home Doctor), instead of queuing up at the Doctor's chamber!

VIVA LA DIGITAL TECHNOLOGY!

Digital Transformation in Engineering Sector – Challenges and Trending Perspective

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INTRODUCTION

The art of creating, capturing, integrating and transforming data into useful information which could be utilized effectively for the intended application by means of digital skills and tools is deliberated as digital engineering. Using advanced technology, designers capture and design data in digitalized environment and develop innovative solutions in virtual environment. Some of the simplest and widely used examples in engineering industry are extraction of engineering deliverables like AutoCAD drawings, simulated spread sheets derived from digitized environment of already developed 3D models, 5D models, simulation software, etc. Digital transformation is largely an integration of relevant digital technologies of corresponding business area initiating changes enabling enhanced value deliverables to clients.

Digital transformation varies for each company and needs to be defined considering respective organizational requirements. Further, this requires a major cultural change in the organization coupled with challenge(s) and incessant, reformative updation(s) until the desired result of "improving client experience, increasing productivity and profitability" is achieved. The advent and progression of digital technology in human lives and enterprise on a daily basis has brought in digital acceleration process impacting 3 major area - Labor and Social Relation, Marketing & Sales, and Technology.

Further, the pandemic has had its impact on world economy, business and human life. However, digitalization has supported many an enterprise(s) to adapt, utilize and overcome the adverse circumstances and reduce the complete collapse of well-established systems. This makes it more pertinent to encourage the emergence of new digital products, services and digital talent.

1. Need – Digital Transformation

With the rise in tide of Digital Transformation as an enterprise, considering the management level issues today - technology is enormously integrated with business in such way that it is impossible to name at least one industry which does not utilize digital framework in one form or the other. Industries need to adapt to digital technology in the process to address changing business needs and gain profit to stay in competition.

Time and again, digitization is assumed to focus on fixing pain points and not on installing IT solutions. Few enterprises are just upgrading and replacing legacy systems with new software with the intention of increasing engineering and field productivity. This can lead to digital organ rejection wherein the installed systems fail to deliver visible benefit and the workforce notices it and rejects the system. Hence, process centric digital transformation approach promotes focus on "use case" as real business needs delivery benefits by promoting identification and conviction of working

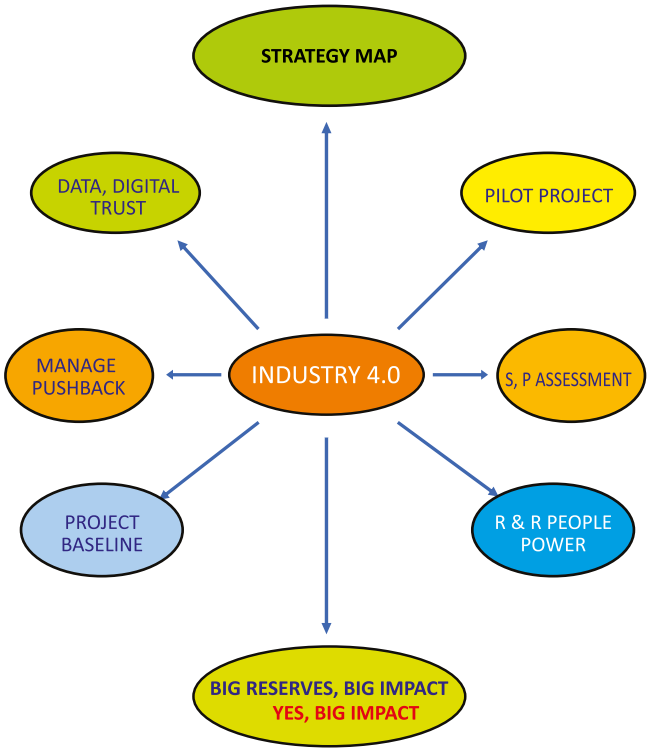
personnel. A good process centered use case always specifies 3 things – Process Change, required Enabler, i.e. Data, technology tools and competency, and finally the Benefit.

Few of the digital transformation area sensitized for industrial attention are:

- Digitization of business
- Transformational – Leadership driven technology decision
- Data security, privacy and data ethics
- Evolution of service and processes
- Integration of all data systems
- Change management
- Technology
- Focus on People and Culture to drive transformation
- Digital trust and Data Analytics

2. Blue Print for Implementation and Digital Success

The various steps and strategies involved and the methodical implementation of blue print are discussed below.



a. Map out Industry 4.0 strategy

As part of Industry 4.0 initiative, the process needs to be digitized in a step-by-step mode with a time frame – also factoring due advantage in the market. To do so, the existing business activities, processes and competencies to perform must be reassessed and leveraged for best outcome before redefining a strategic solution.

Due diligence study, risk analysis and cost impact study based on market dynamics need to be carried out considering already available systems in place. Prioritization measures are to be framed in a manner to bring more value to business coetaneous with enterprise overall strategy; fully supported by business leadership with an ambitious look ahead paving way for successful disruptive business models. Conclusively, it could reshape the competitive landscape and bring about fundamental changes with transformation in core business of the established enterprise.

Strategy road map should also consider future technological changes and customer behavior changes without limiting vision on current constraints. The most important one is engagement of champion to lead implementation of digitalization in the enterprise, since activity of building capabilities, adapting processes, IT and driving culture shift commands strong leadership and time management.

b. Create an initial Pilot Project

To mitigate initial challenges and gain confidence to secure funding, best way is to plan and execute a pilot project to substantiate the appropriateness of concept selected, gain confidence and demonstrate technology readiness and requirement. Pilot projects help to address the issues for a successful flow path. In case of early success, they can secure funding and have fast roll out of the platform. Otherwise, they could provide information enabling study and correction to the process making it suitable and work for the enterprise.

Selection of the right pilot project with both vertical

and horizontal integration providing overview of complete business model of the enterprise plays a key role in this model. Once again, creation of dedicated cross functional team(s) with freedom to think out of the box in the interest of the project and enterprise regarding technology selected, way of working and eco systems is vitally a good strategy. Resource(s) from information technology and human resource teams shall act as enablers and be part of cross-sectional pilot team. Also, to accelerate the digital innovation team can associate with startups, Universities and Industrial R&D centers.

c. Assessment of Systems or Process that need to be digitized; Planning schedule and how exactly systems are to be digitalized?

Existing business activities, process and competencies utilizing available company manpower with minimum guidance to perform must be reassessed and leveraged to ensure best outcome before redefining them. Conscientiousness study needs to be done in consideration of systems available within the organization with reference to systems used or available in external markets proliferated with cost impact.

With mercurial market and challenging customer needs, quest to survive and earn profits is inexorable. Enterprise needs to balance existing internal technological capabilities and future trends and take care of the new digital shift, economy, market and internal competition.

Factors to be considered to synchronize digital disruption and deliberation of human factor leading to digital transformation are:

- Every system be a legacy or new one, should be reviewed to ensure return on investment.
- Better understanding of present day and future client's requirements.
- Focus on governance and improvement of existing technology portfolio.
- Building a digital on demand workforce.
- If pilot project is being executed, outcome to be reviewed and conclusion to be implemented.

d. Define Capabilities requirement, Reskill and Restructure People Power

Case 1:

After augmenting on "Lessons Learnt" from pilot project, comprehensive work out of the enterprise architecture required along with capabilities needed, are to be formulated i.e., enterprise should asses the human resources and associated capabilities. To ensure that right digital competency is available at every level which shall assist in executing the digital strategy efficiently, existing adaptable talent to be exposed to futuristic digital flow path of the organization. To maintain a cut-throat competitive edge, organizations take measures to build digital workforce internally since availability of digital talent with domain knowledge are limited and finding the expertise to lead digitization could be exhaustive. Thus, developed digital engineers or digital talent implies people with basic understanding of specialized expertise who can adopt to technology changes and support complete digital transformation. In addition, when new generation talent encompassed with digital technology enter the enterprise, the emphasis of training would shift to empower them to innovate and apply latest proven technology to industry upgradations with due consideration of enterprise need of the hour.

Case 2:

In addition to developing ability to conceive original system design elements, a generative design must be examined and optimized leading to standardization, storage and retrieval of design elements from a design library for reuse of already available plethora of data/ information. In this trending design process, designers need to adopt a new mindset expending their design experience intellectually by envisioning model design enhancement with standardization, templatization to avoid repetitive work- thus, refining generative design.

Profound changes are introduced in engineering design by introduction of new digital technologies wherein new generation design tools automatically propose a range of design options in line with user defined requirement/ specifications leading to enormous time reduction and improved accuracy in design development. A designer, instead of using already available routine traditional and linear design process could reinvent personal skills in an innovative manner with an agile approach consisting of fast iterations in short test and refine loops.

e. Adjust Project Base Lines to Capture Value; Establish Value and Return On Investment (ROI)

Although companies could build productive gain from digitalization, however, that may not necessarily make an impact on bottom line, since savings from productivity does not cover the cost of software and manpower utilized during initial introduction and stabilization upfront. Managers should adjust base line to eliminate unproductive time to generate and understand real value saving. Enterprise can also trade contract and incentives to share benefit and risk appropriately across the value chain to create a "Win-Win situation".

Many enterprises try to measure qualitative aspects and find difficulty with hard metrics; problem is due to lack of alignment of individual value solutions and collective value of solution across the enterprise. To measure the ROI of the technology, there is a need to establish predefined current base line with due consideration of people power, technology introduced and its associated significance.

It is easier to assess the impact of technology after implementation. Once ROI is realized after the implementation, results are to be communicated across the corporate. This further gives impetus for extended development and support. The ROI case selected should be simple and relevant to individual and enterprise as well as, generate visibility.

f. Big Investments with Big Impact

While an enterprise focuses on investment on technology, training employees, recruiting specialists and driving changes in organization, the investments are done methodically and stepwise. It isn't the time to wait for a perfect technology, since that would be short sightedness with calculated risk. The enterprise or first mover to make investment and create game changing improvements to increase the operational efficiency could emerge as an industry pioneer and innovator. Any delay in this area may put the enterprise in an inept position with competition loosing advantage in the Digital eco system which could prove too costly in the long run.

g. Handling Employee's pushback during Digital Transformation i.e. securing adoption

By law of nature, humans like routine work and get into their familiar comfort zone. New ways of work or changes in routine start looking grim and herculean, uncertainty sets into the process. For example: Introduction of digital transformation could create discomfort to workforce. Even for those familiar with digital technology could get frustrated at times, if new systems are not able to interact with each other which makes it important for enterprise to invest in integration and interoperability of humans and digitization tools.

One of the major challenges is that enterprise needs to make sure that employees know the changes and be part of it. Multiple internal issues like culture. organization, leadership and skills are most likely challenges rather than external issues. Creation of digital culture and appropriate skill training is important right before digital transformation. It's not just having new people at new jobs but developing competencies in the existing workforce is crucial and important to develop analytics

capabilities. During Digital transformation, the doubt and uncertainty in the minds of the workforce must be alleviated and erased. The workforce must be empowered and kept engaged through the whole process. A companywide digital transformation strategy must be developed. Digital transformation journey should not be aligned towards an individual or even just one department, but must address the whole enterprise which should then be work towards common goal. Success of digital transformation needs a combination of talent and technology i.e. one without the other would not synchronize well and give benefits.

A robust change management system is required not only to implement new technology but also, to enable users find new ways to execute them in a new format creating a culture of customization. In congruence, adoption of same technology outside the enterprise creating a digital relationship is also important i.e., roping in few empowered customers, sub vendors to adopt provides long term value and ROI, open more collaboration opportunities, value add services to create significant partnership benefits and improve performance relationship, interoperability allowing enterprise and clients to integrate seamlessly.

h. Data and Digital Trust

Digital eco systems function efficiently if all data is secured and utilized efficiently. Since data analytics is critical and it fuels industry 4.0, it is important to understand what data is available and its worth as a part of Data analytics and drive decision making with due consideration of basic requisite of an enterprise to protect its intellectual property. A good risk management and data integrity system is mandatory to avoid disruptions and breaches to manage operation better and efficiently.

Data- in an organization comes from different sources in various formats and is analyzed, processed and distributed after decision making based on algorithms as predefined to users. With multi-interactive points, there is a need to take proactive approach to ensure data security and related work to build digital trust.

3. Key challenges

Key challenges across the globe include:

- Integration across ecosystems
- Rationalization and Standardization
- Building digital talent
- Securing digital adoption, and
- Establishing value and return on investment.

4. Key available solutions

- A few solutions generally adopted to meet above challenges are listed below:
- Edge solution facilitating end device data acquisition, analysis and control.
- Pervasive technology like Artificial Intelligence, Machine Learning, Augmented Reality and more innovation.
- Using all the above to combine process design and design system integration of the Industrial asset operation knowledge.
- Predictive Data Analytics, Document Digitalization, Search Engine, 3D simulation, Test and Validation to get the best of Digital Transformation.

5. Trending perspective

Based on the organization process, structure and business requirements – the most suitable digitization and digitalization approach needs to be determined and implemented to enable digital transformation which is key to digital success.

Digitization and digitalization have widely infiltrated into our daily routine to the extent that it is being used to envision simple activities like streamlining and scheduling Activities for the Day, Prioritization, Reminders for Meetings, etc.

To spin an engineering enterprise into a digital one requires little more than just a new technological

adaption. The enterprise and its personnel need to evolve new ways to operate proven hyperconnected platforms and exploit data analytics with all its super collaborative capabilities.

The challenging period during digital transformation is to get over the initial hurdle of establishment of vision, ensued by progressive realisation of associated triumph which creates an optimistic impression among comparable organizations or lagging peers. With pandemic stretching over months and the end not in sight there is utmost urgency to meet digital transformation. Contemplating the fact that the major portion of the work force is working in remote mode, digital experience for employee has changed from "Nice to Have" to the **"The Only Way to Work**".

As discussed above, digital transformation would vary with an enterprise's challenges and requirements. However, certain basic important elements are a must i.e. Client Experience, Operational Agility, Culture and Leadership, Workforce enabling and Empowerment and Digital Platform Integration.

To conclude, the most important factor is the general management evaluation criteria for digital transformation project and measure proficiency in 3 areas:

- How quickly the work is done and speed of the processes,
- Effectiveness of analytics to automate and facilitate decision making, and
- Experience which drives correct behavioral and economic outcome.

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Digitalisation in Civil Engineering

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Digital Transformation in Civil Engineering

Computer Aided Design in Civil Engineering in India began way back in 1960s with the developments of Numerical Methods in Engineering. At that point of time, it was mostly for analysis of structures and later moved to other sectors of civil engineering. FORTRAN was the programming language that most engineers learnt and used.

Main frame computers were the order of the day initially and one had to go to wherever the facility was available. The Personal Computers made their appearance in India in the 1980s. From then the transformation moved at a rapid pace and soon the PC had even greater computing power and speed than the Main frame computers.

The other sectors of Civil Engineering also started to use programming and then there was no going back, as far as analysis and design in civil engineering was concerned.

On the other hand, when one talks about the use of digitalisation in construction, maintenance and operations, 'Civil Engineering easily may be the least digitised sector among all', as per a McKinsey Report, Decoding Digital Transformation in Construction, August 2019

There are many reasons for the relatively less digitalisation at construction sites as against that in offices. Some of the reasons are:

1. Construction projects are of short duration and the projects vary greatly in their requirement making it difficult to use common digital tools without customisation across the projects
2. Multiple agencies are involved and each are at different levels of maturity in capability of digitalisation and their willingness to change. Consultants may be more willing compared to labour contractors and small material suppliers, and
3. Most construction projects, especially infrastructure, are executed in remote and harsh environments, where availability of network, software and hardware were an issue, till satellite systems came into being.

Though adaptation of digitalisation in the construction industry is slow, stakeholders have now started to realise the benefits it has to offer and have started to adopt it.

Digitalisation in Various Stages of a Project

Digitalisation in Engineering projects, especially Civil ones can be done across all the stages of a project.

1. **Conceptualisation** – use of customised Building Information Modelling (BIM) tool can help in very quick and reliable test fits at the Concept Stage. Visual representation of various options also helps in getting clear and precise views for all stakeholders to see and assess.

2. **Planning and Scheduling** – Advanced scheduling software seamlessly transferring data to and from integrated BIM model, ensures real time updating of time schedules, material, labour and cost parameters of the project.
3. **Analysis and Design** –Analysis and design software integrated with a single BIM model allows real time and accurate data transfer to and from the single BIM model, avoiding loss in exchange of information from one agency to other on real time basis.
4. **Construction** – Use of 5D beam, enables real time, accurate updating of time and cost parameters of the project based on construction progress.
5. **Operation** – Use of IOT based smart system ensures safety, energy efficiency, comfort and convenience during entire use of the facility and structures. Drones and CCTV cameras can be used for remote monitoring and even quantification of construction progress, and
6. **Maintenance, Life Extension and Decommissioning**: Smart embedded instrumentation giving real time information on the health of the structure helps in proactive preventive maintenance, possible life extension and safe decommissioning of the project at the end of its useful life or even change in usage. The instruments also generate data used for research and advancement of Engineering.

In addition to above, the following digital intervention can be used for development of the organisation and Industry as a whole:

1. Use of Virtual Reality, Augmented Reality and simulation to skill construction worker in a cost effective, efficient and effective way.
2. Use of social media insights to know changes in customer preferences may lead to development of new products of improvement in existing offerings. This may be specific to customer focused segment like real estate.

Some of the major digital interventions being adopted are discussed below.

Digitalisation in Design Engineering

As stated earlier, use of digitalisation is already mature in design engineering. Almost the entire analysis and design in all engineering disciplines is now done using software specific for the work and discipline. However, there are some adverse effects to this development. The main one being the current trend, especially with the new generation, to model everything digitally and use it without ensuring that the behaviour predicted by the software is in line with basic engineering principles. Validation of any software for the use on a case-to-case basis is very essential before using it on mass scale since any bug in it could even result in the failure of a structure.

Building Information Model (BIM)

Conventionally, though structural analysis and design are now completely digitised, design and detailing of various disciplines by most designers are being done independently by using respective specialised software. Interdisciplinary coordination is thus done manually, which has many issues viz.

1. Time lag and loss of data affecting quality, cost and project schedule.
2. Manual change management could lead to mistakes and may become painful
3. Separate discipline wise construction drawings could lead to error in construction coordination, and therefore may lead to rework with cost and time overruns.
4. Periodic maintenance of the projects is often missed due to dependency on manual system.

BIM helps in resolving most of the issues of conventional independent modelling since -

1. All stakeholders work on a single digital model, enabling real time and transparent availability of data to all,
2. Changes done by one stakeholder are available to all on real tine basis which makes change management effective, and
3. Changes made by one stakeholder in the BIM model, automatically alters other related aspects of project like cost, time and schedule. This provides reliable insights enabling stakeholders to take timely corrective actions on real time basis.

However, BIM is not being adopted in India as quickly as it should have been. The factors for that are:

1. All stakeholders are at different stages of maturity in digitalisation and consequently in the adaptation of BIM.
2. There is no compulsion either from Approving Authority or from clients due to increase in cost for all concerned. It is this aspect that needs to be understood that the increase in cost actually gets more than offset by saving it brings in due to reduction in time for verification and approval, rework not only in design but also in actual execution.

Most of the advanced countries have adopted BIM to a great extent and in many of them it has been made mandatory by the Authorities. Similar measures are being discussed in Indian municipal corporations, MCGM is one of them.

There are also some misconceptions about BIM, which is restricting its adoption:

1. BIM is a tool to merely identify interferences – This is not factual. Interference identification is not the main purpose of BIM but it is an added advantage as BIM provides information availability across various engineering discipline in real time.
2. BIM's utility is limited to design engineering – This again is far from true. The main advantage of BIM, especially 4D and 5D BIM are during construction to manage project schedule, manpower and cost of the project very effectively and on real time basis and also during occupancy of the project for preventive and scheduled maintenance.
3. BIM adds to the cost of project – There is additional initial cost which when considered over a period is insignificant compared to cost and time savings it brings in by helping to minimise rework at all stages of project and by bringing in saving in maintenance cost.
4. BIM is only useful for complicated projects like industrial, petrochemical and not very useful in building projects – In fact, building industry suffers much more on account of 'cost of poor quality' which results in rework. Maximum saving could be achieved by using BIM in the realty sector.

Instrumentation and Structural Health Monitoring

Although monitoring of structure using instrumentation is being done for many years, however, its utility was limited to where reading could be taken required physically by accessing the instruments. Smart micro wireless instrumentation devises coupled with IOT have now enabled remote automatic monitoring on a 24x7 basis. They intelligently send updates and raise alarms based on the health status of the structure.

Advantages of Smart Structural Health Monitoring System

1. automated systems enable continuous monitoring, inspection, and damage detection of structures with nil to minimum involvement of personnel.
2. Absence of physical connection between instruments and reading device, make it a highly flexible system
3. The system is cost effective
4. Data availability is real time
5. Fibre optic sensor used for smart instrumentation are not affected by disturbances like electromagnetic radiation, hazardous environment and are therefore more reliable
6. The system enables prediction of upcoming accidents and estimation of the useful residual life of the structure
7. The data generated can be used for life extension of the structure

Digitisation in Construction Monitoring, Remote Survey

Use of smart wireless CCTV system and drones are changing the way large construction projects are managed. The smart CCTV system can be programmed to detect the level of threat, and take action quickly in ways that, formerly, only humans could. The smart cameras:

1. Use solar panels and wireless communication to provide robust security, even on empty, undeveloped land.
2. Have night recording capabilities – perfect for unlit areas.
3. Offer HD footage for clear close-ups.

4. Can be connected either to a DVR for recording or to the Internet to allow real-time monitoring.
5. Can detect unusual activity and send real time signals to the relevant authorities
6. Can also be used to quantify work progress at large construction sites using AI algorithm combined with HD quality video stream.

Use of Drones for Construction Supervision and Quantification

Another fast-growing area using modern digital technology in construction is the use of drones on large construction sites, roads, highways, railways, etc. They can be used at all stages of projects from determining feasibility, understanding constructability, and helping owners visualize what the project would look like on completion. The data could also be used to identify areas of risk. Drones could be used to estimate progress and detect quality issues from the office in areas otherwise difficult to approach physically.

The advantages that drone provide when used at large construction sites are:

1. Enable better construction site monitoring
2. Calculating stockpile volume and material types for inventory
3. Calculating length, width and elevation for roads and structures
4. Annotating images and maps for easier communication
5. Calculating overburden to plan for efficient removal

Limitation on Drone use for Construction

1. Legal restrictions – there is legal restriction of use of drones above particular heigh and in some areas in India
2. Though drones are unmanned, they are controlled by human operator and therefore errors could lead to accidents and injury.

3D Printing in Construction

This is a promising innovation being looked forward to by the construction industry which could change the way construction is done. Though various pilots and some commercial projects are already built using 3D printing, the technology is not yet fully ready for wide spread use, due to limitations such as -

1. Printable, sustainable materials: Major limitation in use of 3D printing in construction is availability of material which can be printed and is strong in both compressive as well as tensile nature of stresses. Currently two stage printing is used wherein concrete is printed first, leaving cavity for insertion of steel reinforcement in second stage, increasing time of construction
2. 3D printing of structures requires very large printers mounted on cranes
3. 3D printing is not yet ready for printing an entire house. The various components have to be printed separately and then assembled.

Conclusions

Digitalisation has entered every stage of Civil Engineering from concept to handing over the facility and thereafter its operation, health monitoring of the structure and the utility/ service systems, life extension and even change of usage/ decommissioning/ demolition/.

It has improved safety, security, quality, efficiency and sustainability of the entire life cycle of a built environment and has potential to change the way projects are to be managed throughout their life cycle.

Various digital technologies also have potential to work in synchronisation with each other to improve their effectiveness multifield, for e.g. Structure being 3D printed may use information created in BIM to print the structure, it may use smart CCTVs and drones to remotely monitor and control printing activity, smart sensors may help to monitor and improve response of the structure to stresses it may experience while it is being constructed and may continue to monitor stresses and event it may experience in the life time of the facility.

Digital Engineering in Structural Design – A Case Study for Extension of Existing Plant

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ABSTRACT

The use of 3D modelling tools has revolutionized our approach towards engineering. The ability to design, plan and execute using digital platform has given freedom to the imaginative power of the human mind to express thoughts and concepts in visual form in a virtual setting. The previsualization is of great advantage in carrying out the critical tasks accurately, quickly and without having to waste precious resource of material and time in rework. The additional facility of collecting scanned information from existing features and structures through 3D laser mapping has extended the ambit further by helping to extend this mode of engineering being applied for retrofitting, remedying or extending existing structures or facilities. The integration of these two forms of data seamlessly through computer-based 3D models has opened new horizons of engineering suitable for setting the new design against real context. This article describes the development of these techniques in brief and presents a case study on using this integrated modelling approach for extension of a plant facility in an overseas project.

1. Introduction

Structural engineers in design and construction sectors together have created some of the most impressive and stunning products of human imagination since historical times. The principles of structural engineering have slowly evolved through observation of the various constructs in nature. Nature has been and will remain man's greatest teacher. Structural construction replicated the materials and arrangements of natural elements to create units for human occupation and use like dwelling units, places of worship, places of festivities and gathering for sports and cultural events and structures for providing various services for human life. The use of mathematical principles helped lay down rules for standardizing the loads and the strength of members and with development of understanding simple shapes transformed to complex shapes. The improved knowledge allowed human beings to create structures using imagination to go beyond the simple rules. The complex structure design involved the use of imaginative powers to visualize elements that were not obvious in natural elements. This was a deterrent to widespread use of the knowledge of engineering since visualization plays a very important part in engineering. Scaled models were one way of creating replicas of the intended design element that helped to visualize the real-life product, but it required great skill, special materials and time to create realistic models for pre-visualization. The advent of digital tools helped unleash the potential of portraying the power of imagination onto a canvas albeit through a virtual digital model.

2. The Advent of 3D Modelling for Engineering Applications

Roots of the use of geometrical principles in design and construction can be traced back to many ancient

civilizations epitomized in the construction of pyramids in Egypt and temples of the Mayas and Incas. Even the architecture of the cities of Harappan civilization demonstrate knowledge of the rules of geometry and Vedic geometry is recorded in the Sulbasutras, dating between 800 and 500 BCE.

The concepts of 3D modelling can be traced back to the development of geometry in western world by Euclid in 3rd century BC and analytic (coordinate) geometry by Rene Descartes in 1600s. The mathematical framework that facilitated use of computers for graphical display was bolstered by the invention of matrix mathematics by British mathematician James Joseph Sylvester in mid-18th century. The first computer-based 3D modelling tool known as "Sketchpad" or "Robot Draftsman" was invented by Ivan Sutherland in 1960s. General Motors and IBM partnered to present the first system DAC-1, Design Aided by Computer in 1964. Further development took place in great leaps and strides and different procedures for 3D modelling using algorithms, hand drawing on pad/ screen and scanning techniques were developed. 3D models, in general, are of three basic types:

a) Wire frame model – network of lines and arcs on transparent surface,

b) Surface model – collection of surfaces like paper models to build shapes, surfaces are opaque or translucent with textures giving more realistic representation, and

c) Solid model – filled solid shapes which include properties like density, strength to create fully realistic models of engineering products.

The degree of complexity and the amount of data used to represent the models increases from wire frame to solid and so does the amount of computer programming effort and hardware requirements.

The widespread adoption of the digital 3D modelling tool has been possible due to its many advantages; apart from only visualization, the model is geometrically accurate with complete technical details. It also helps better planning in the process of creation of the actual model and gives flexibility for option studies without wasting precious physical resources. All such iterations and combinations can be tried out on the virtual model and the end product along with its features can be created at great speed and reviewed virtually for deciding on the desired option for output.

3. Bim Based Design

The acronym BIM can be interpreted either as "Building Information Modelling" or "Building Information Management". Various definitions exist in technical documents like American Committee of the National Information Model Standard Project Committee, U.S. Government General Services Administration, and British Standard Institution Specification. BIM can be defined as a process of designing, constructing, operating and maintaining a building or infrastructure using virtual objects having physical and functional features through digital representation. This tool gives the architects, engineers and construction functions and operators useful insight to more efficiently perform all the functions throughout the life cycle of the structure.

BIM tools are used to design, and document all features and details of the building. The model is used for exploring design options, creating visualizations prior to actual construction and then generate standard construction documents. The level of detailing (LOD) in BIM refers to stages right from concepts (LOD 100) to As-Built (LOD 500) and further into operations and maintenance. Post construction, the digital model can be used to manage the building operation by integrating all the operation processes. The technology is available to extend a 3D BIM to further dimensions that include schedule (4D), costing (5D), sustainability (6D) and facility management (7D).

BIM usage help professionals by enabling them to cast the design against real site settings for better visualization, putting intelligence in the components for complete data capture and avoid design miss-outs and clashes, keep control on changes to design, enable better collaboration amongst the various design and construction functions, create submodules according

to construction sequence, and provide all details in construction document forms. BIM acts as a single repository of all project information.

4. 3D Laser Survey or Digital Engineering

The use of 3D modelling tools gained popularity and were widely adopted in engineering design applications for new constructions where it was easy to build the model from scratch. However, drawbacks of integrating and superimposing the digital model of new structure onto an existing facility were impediments to extending the use to the case of retrofit designs. The appreciation for sustainability caused shift of focus to maximize asset usage and operational improvement projects and this required design to fit into existing systems. Since most of the previous assets were not designed on digital platforms the need for mapping and creating digital versions of existing asset gained importance. It is in this perspective that 3D laser scanning gained importance for creating a digitally mapped version of the existing asset onto which the new design could be dovetailed.

Laser scanning generates 3D point-cloud data with millimeter level accuracy and high point density. Various types of items are identified from the point cloud data using image processing algorithms. This data is coupled with BIM tools identifying various elements of the building/ structure which can then be used for development of engineering on the model.

5. Case Study on Combining 3D Laser Survey with 3D Engineering

The case study presented refers to a steel manufacturing facility at an overseas site where the owner had planned to enhance the capability of its Hot Strip Mill (HSM) by installing two new Walking Beam Type Furnaces (WBF) in the Reheating Furnace area. One furnace was to be installed in area created by demolition of an existing older Pusher Type Furnace (PTF) and the other would be installed by extending the furnace building. The engineering work involved developing project design details to enable an accurate estimate of the construction works to be prepared during the final detailed stage of engineering.

The existing plant building of the furnaces comprise three bays. To enable space for one of the new furnaces, two of the existing halls required extension by 45.1 m from the existing frame structure at the gable end. The existing gable end was to be dismantled, and a new gable end erected at the end of the extended portion. One existing column needed to be dismantled to accommodate the new furnace. The existing roof system of the main hall that was supported on that column was to be supported by the existing roof girder along with two sets of new columns clearing the space for new furnace at the junction of the two halls.

The scope of the 3D engineering work encompassed the following activities:

a) Structural analysis and design

b) Importing 3D model of existing structure

c) Preparation of 3D model for Civil & Structural works, Piping, Electrical and Mechanical works

d) Integration of all the models, and

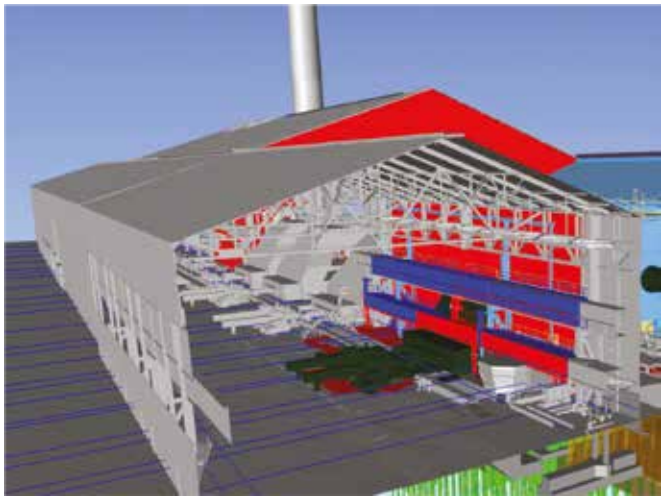
e) Marking the structures and other utility lines to be dismantled on the 3-D model of the existing structure using colour coding scheme.

6. Development Of The 3D Model Of Structure

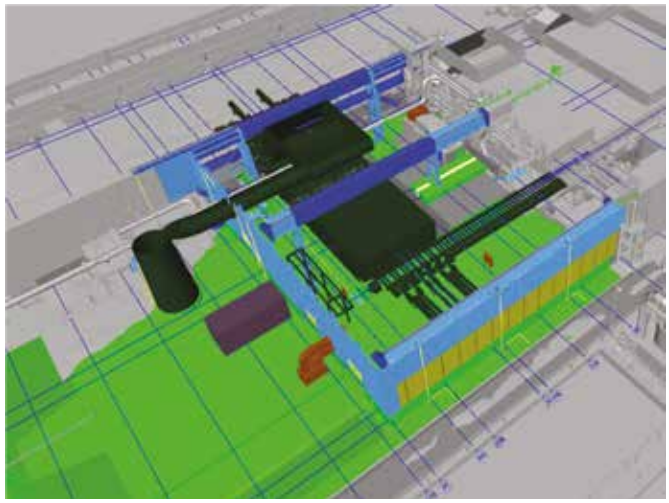
One of the main objectives for the project was to integrate the model for the new structure in the extension part of building with the 3D model of the existing part. This model of the existing structure was a non-intelligent model since no design related data could be extracted from the model. Only the existing geometry and drawings were available to be integrated with the model to be developed for the extension part of the structure. Many challenges were faced by the design team in collating the existing 3D model and reconciling it with the "As-Built" information available from 2D drawings. The scan data in raw point-cloud form had to be processed and formatted through various software tools to make it ready for import into 3D model. Critical problem was encountered in fixing the baseline of the scan model with that of the design model since

the coordinates (X-Y-Z) of the scan camera point had to be exactly matched to the plant grid coordinate system to ensure proper fitment between existing and new structure.

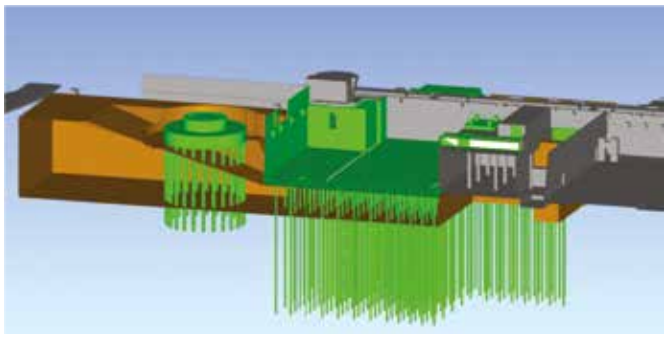
The information on substructure portion of the existing plant comprising foundations, cellars, basement, tunnels, flume channel was available only in the form of two dimensional (2D) drawings in "As-Built" status and from the details available in previous study reports. These were converted to 3D model in Revit to correctly integrate and engineer with the facilities required for the new plant in the extension portion. Model snapshots are shown in Figure - 1.



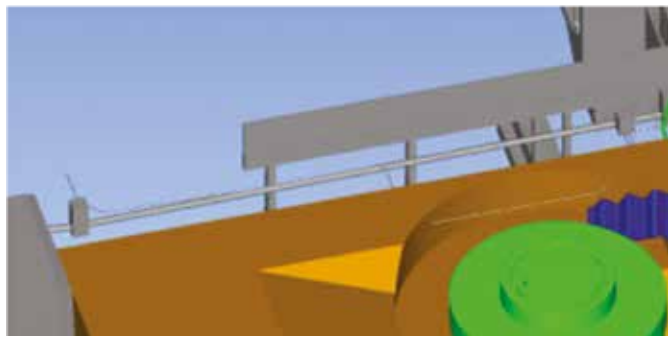
View of Main Hall of Furnace Building



Section view of Furnace Building



Excavation and Foundation view



Earthwork and Soil Protection

Figure – 1: 3D Revit Model Snapshots of Building Extension, Foundation and Earthwork

7. Engineering Work for the Project

The engineering works for design of the various components of civil and structural elements for the project were carried out in stages. In the first stage, concept drawings for both substructure and superstructure were developed. These were primarily developed as 2D drawings using the specifications in the earlier study report as the baseline and existing drawings and modifying these initial concepts to the extent necessary to better suit the new plant requirements and the design basis. The purpose of these scheme drawings was to frame the basis for further detail engineering and 3D model development.

The demolition drawings were prepared in 2-D based on the above discussion and existing drawings. This was shown in the integrated 3-D model in Naviswork platform in appropriate color.

After confirmation of the concept and design basis, detail calculations for the various elements of the superstructure and substructure were carried out. Simultaneously, the development of the 3D model for superstructure and substructure also progressed in Revit.

The highlights of the 3D model for superstructure and substructure developed in Revit software are:

a) Items of existing structure identified for demolition are marked in RED in the 3D model.

b) Items of existing structure that would be reused in modified structure are marked in BLUE in the 3D model.

c) 3D model was finalized based on member sizes obtained from detailed structural analysis and design.

d) Connection details of members are not shown in the structure 3D model since these would be designed in subsequent detail engineering stage. Preliminary base details for the structural columns were designed and are shown in the model.

e) Interface data for new equipment was not available hence the foundation interface elements of equipment like anchors and embedded parts are shown as per existing furnace.

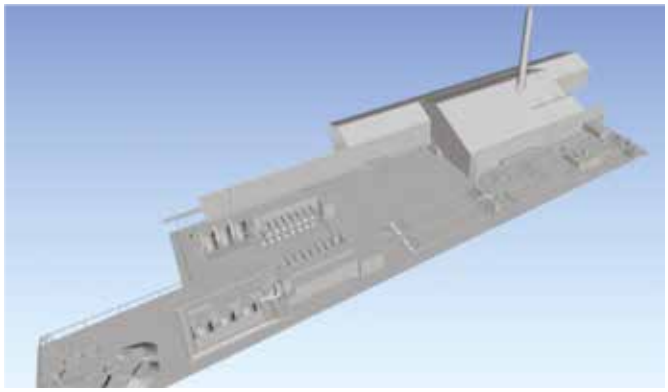
f) Earthwork for excavation including excavation protection requirements like sheet piling work was also built into the 3D model.

g) Final 3D model was developed in 3 parts – existing, dismantling part and new structure. These models were then combined in Navisworks to generate model for required modification.

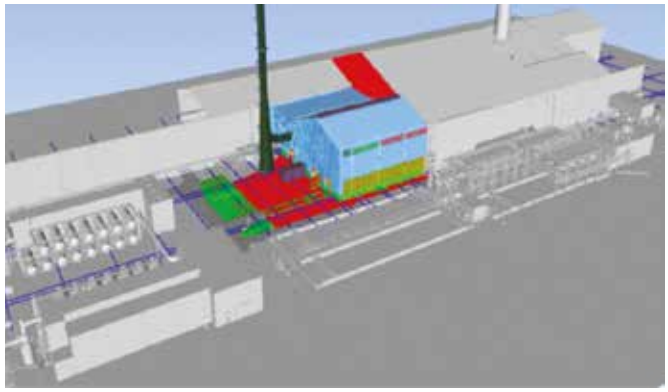
h) All 2D design drawings including excavation drawings and dismantling drawings were extracted from the 3D Revit model.

i) The BOQ of the new structure was extracted from the 3-D model.

Snapshots in Figure 2 show existing model from laser scan point cloud data and merged model with the new extension.



Model of Existing Plant from 3D Laser scan



Merged model of existing and proposed Extension

Figure – 2: Model view from Laser scan and Merged Model

8. Conclusions

The execution of the project demonstrated the advantage of combining the power of 3D engineering together with 3D laser scanning for integrating the new structure with existing facilities. The point cloud information provided by the 3D laser scan helped accurately model the existing facilities. The technique used allowed the work to be carried out harmoniously in a 3D environment with multi-disciplinary engineering involvement. The entire modelling and engineering were carried out in 3D environment and all engineering reviews were done on the integrated 3D model. The integration of the new and existing models helped visualize the various challenges that could not have been captured otherwise and would have led to substantial error in detailing and execution. Successful execution of the assignment for a facility that was physically at a distant location demonstrates the power of digital technology in helping visualize the engineering inputs and outcome from remotely located office and truly unbind the power of imagination of human mind.

9. Acknowledgements

The author gratefully acknowledges the technical details shared by the project team from the project work executed in the office of Tata Consulting Engineers Limited, Jamshedpur. Information from relevant articles, papers and blog sites in publicly available domain available from internet is also acknowledged.

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Digital Engineering - Adoption Scenario at Construction Sites

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Some years ago, there was a shift towards emerging digital technologies which were creating new processes, new business models and entirely new businesses. Digitalization and digital transformation were sweeping the business world.

The projects within engineering, procurement, and construction (EPC) industry impact millions of lives - and run into billions of dollars. Hence, the question that arose was - Why should this industry *not* benefit from the advances in technology?

Figure-1: Left side- EHS ***SAFETY*** App: For Safety inspections and compliance at Site;
Right side -***Ib4U*** Mobile Application for Construction Equipment inspections

As a result, L&T, one of Asia's leading Engineering and construction companies, started the digital transformation exercise within its construction business, creating a new digital group from scratch. The digitalization exercise within the group was carried out by strong determination and executed at a good speed and scale.

Mobile apps have digitalized every process relating to safety, quality, activity completion and materials tracking enabling real-time information flow from the sites to the monitoring offices. The ***Safety App*** (Figure-1) digitalizes all the processes on the site relating to Safety and reports them along with analytics. Geospatial technologies using drones, Lidar, 3D scanning to BIM, Photogrammetry, etc., have transformed the accuracy and time of geographic information to make engineering and estimation more accurate and competitive.

Figure-2A: Robotic Process Automation (RPA)
A dashboard tool for automating routine tasks like processing of vendor bills, etc. at sites.

The objective was to leverage the power of data-producing computing technologies to significantly improve core operations that utilize workers, machines, and materials to save costs, to improve productivity, identify poor performing machines/ equipment, to support decision makers with meaningful data and to reduce execution time. Underlying the organizational goals, however, was the existential need to ensure that both management and employees on all levels engaged with these technologies, and that the team could make adjustments to improve their performance based on analyses of the data provided by the technologies. In a few years, every possible technology like IoT, Cloud, Mobility, Drones, BIM, AR, VR, Analytics, Machine learning, Vision Technology, Extensive usage of Robotic Process Automation ***(RPA)*** (Figure-2A & 2B) has been tapped and put into use.

Figure-2B: ***Robotic Process Automation (RPA)***; Solution brief functions

For a workforce adapting to a data-driven mindset, a change of this magnitude can be overwhelming. It took time and effort to help managers understand how access to real-time analytics on projects - created through an integrated mix of technologies like Artificial Intelligence (AI), the Internet of Things (IoT), Virtual Reality/ Artificial Reality (VR/AR) and geospatial and cybersecurity technologies. VR safety video was developed to bring in a live experience to the workers on Safety & Health Risks.

There are a number of digital solutions that are in use and widely used by thousands of the operating staff at hundreds of project sites. Every single project site has a slew of digital solutions working. Through "***Asset Insight***" Digital Solution; over 11,000 construction equipment (Figure-3) have been connected providing real-time visibility into the operations of these machines at remote project sites using IoT technology and Analytics. This visibility enabled improvements in productivity and utilization of these machines, better maintenance and uptime, better fuel efficiency all leading to faster completion of work and savings in costs.

Figure-3: Digital Solution; ***Asset Insight*** *for Construction Equipment tracking*

Digitalization is top-driven and these slews of digital solutions have already started making a difference in the business. Some of those deployed are use of VR Safety Training for workmen and supervisors, **Quality App CONQUER** (Figure-4.) to monitor and report quality incidents, WISA - Workforce Induction & Skills Application, Installation of IoT in all P&M assets, Smart Energy meters, Remote Monitoring cameras on site at multiple locations and **PROCUBE** for Project Progress Monitoring are prominent DIGITAL initiatives.

Figure-4: Digital Mobile App: CONQUER; transforming Site Quality Digitally

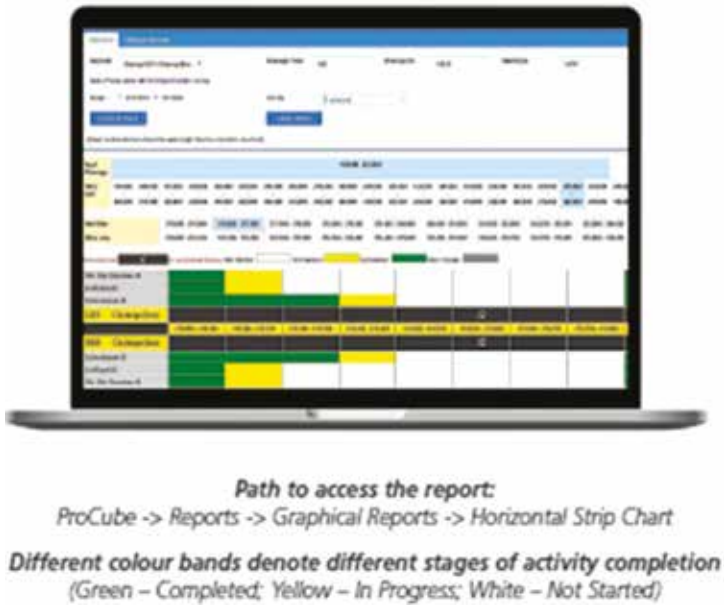

Figure- 5: Digital Solution; PROCUBE; Monitoring Progress at site Digitally

The Progress of projects is monitored not only by numbers and quantities, but also by pictorially displaying the progress on a "Strip Chart" that portrays the progress in terms of various layers within another digital Solution "***PROCUBE***" (Figure-5).

Over the years the digital transformation has started to give benefits in the form of a well-implemented and comprehensive data strategy. Most Construction equipment are connected across all sites. Workplace Safety has improved due to immersive training with VR, the use of mobile apps for process compliance, alerts on entry into hazardous zones, and the use of sensors and beacons.

Using ***Safety App***, site engineers and supervisors can instantly check good compliance of processes such as pre-start inspection, incident reporting and rectification and others.

L&T's milestone project, where technology played a very big role was the Statue of Unity - the steel, concrete and brass clad statue of Sardar Vallabhbhai Patel, located in the Narmada Valley in Gujrat. Geospatial technologies like LIDAR survey were used to get the intricate details of terrain of the site, the island and the riverbed during various stages of construction.

Radio Frequency Identification (***RFID***) technology was used for correct identification and installation of over 6000 bronze panels that went into the making of the statue.

RFID and Bluetooth technologies are being used at construction sites to match workers for their assigned task locations. A detailed skill set of all workers available in the digital platform, assist the managers to assign the right resources to the right job.

While these statistics are promising, it's a promising new phase that has been started in form of "Digital Construction". It goes to prove the adage that "***DATA IS THE NEW OIL IN THE UPCOMING ERA***".

Digital Transformation for Plants

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Introduction

The digital foot print is increasing in every walk of life and plant engineering is no exception. In the last two decades, plant engineering has steadily progressed on digital front by adopting 3D, 4D, 5D, Asset Information Management systems, etc. and was successful in meeting the capex market demands. The digital journey is continuing with a fast-evolving technology eco system driving a value centric and people centric digital transition. There is a clear shift in the market trend too and the new focus area for plant engineering is the operation sector. Plant Operation is undergoing a massive transformation with the advent of Industry 4.0 technologies and Internet of Things (IOT). Large volumes of digital data generation and acquisition, quantum leap in computation power, high speed reliable internet, young digital savvy work force, Artificial Intelligence (AI) /Machine Learning (ML), etc. are driving the fast penetration of the digital technologies in the plants. Asset sweating through performance optimization, Reliability Centric Maintenance (RCM), Advanced Pattern Recognition and Predictive Analytics, Real Time Location Tracking Systems (RTLS) and remote monitoring, digital worker, Augmented Reality (AR)/ Virtual Reality (VR) and Acoustic & Image Analytics are changing plant operation and maintenance processes, systems and methodology significantly. Many industries are taking steps to reap the benefits of advanced digital technologies in their day-to-day operation. It is a challenge and opportunity for the engineering community to become the leading partner in this transition by offering reliable digital solutions leading to better plant operation.

This article covers different factors that drives digital transformation, benefits of plant digitalisation, major challenges in the process and also examines the reasons as to why a domain leader is preferred by industry to lead the digital transformation of the plants.

Driving factors of Digitalisation

Digitalisation leads to an increased level of human comfort which is the primary reason its fast progression. It would be interesting to analyse other factors too that aid digitalisation in plants and the ways and means in which the digital tools help the operator to operate the plant better.

Process Optimisation

Better yield or productivity is the aim of every industry and various process optimisation measures are being implemented and experimented continuously to achieve this goal. Digital tools are proven to be reliable means for Real Time Analysis and Optimisation. Most of the industrial plants are instrumented adequately and are generating a large amount of digital data related to the complex processes. In case of analog signals, Analog to Digital Converters (ADC) are used to get the data converted to a digital format. The digital tools analyse the data quickly and provide the operator with useful

insights and actionable information into the processes which otherwise would not be available to the operator in the plant. The digital tools can streamline the data ingestion of structured or unstructured data on a real time basis using the Machine Learning (ML) pipe lines. The performance optimisation/ improvement tools use AI/ML based hybrid algorithms and advanced analytics to yield desired results. The Level-1 (L1) type of digital tools assist the operator to initiate optimal data-based actions in a complex process scenario. The digital tools that directly take control of closed loops are Level-2 type and they intervene in the process based on analysis results from the digital tool and send signals to change the process variables or state of equipment involved. For critical process, plant operators prefer to adopt L1 currently and it may take a while for adoption of L2 type tools as it would need an increased level of confidence from the operator community in the maturity of digital technologies.

A plantwide performance optimization covering all critical equipment and process is normally planned though a digital platform capable of customizing process/ equipment, interfacing and data ingestion, data analytics and visualization. Plant/ Fleetwide digital transformations are normally implemented through such digital platforms.

There are micro/ point solutions which run on open architecture and address issues of specific process or equipment which are of priority. Such point solutions can be implemented quickly and independently as per requirement in a plant to take advantage of time and cost. Depending on the requirement, these point solutions adopt data processing tools like SQL, NoSQL, Kafka, Apache Spark, etc., high level languages like C#, Python, R, etc., Machine Learning, deep learning applications like TensorFlow, Pytorch, Keras, etc. in their solution architecture. Most of such point solutions are cloud or edge deployable and are offered in Software as a Service (SaaS) model.

An example of a point solution related to condenser performance monitoring and diagnostics is given below. This digital tool can assist the operator in monitoring the steam condenser performance and analyse multiple influencing parameters in near real-time to ensure optimal performance levels throughout plant operation.

Few of the capabilities of the digital tool are listed below.

Real Time Monitoring of condenser Key Performance Indicators (KPIs)

1. Anomaly detection based on historical behavior
2. Recognise deviated parameter and provide early warning alerts
3. Predict the condenser performance for different load conditions
4. Provide insights into factors influencing condenser performance
5. Helps to plan the maintenance actions.

Courtesy : Tata Consulting Engineers Ltd

Energy and Utility Consumption Optimisation

There is a focused drive in every plant to minimise the energy and utility consumption to run the plant optimally. Considering the complexity of process, continuous attention is required from the operator to achieve and sustain this goal. The advanced digital tools can continuously monitor and provide insights into the conditions of critical equipment/ process that are leading to excursions in energy/ utility consumption

by detecting anomalies and providing timely alerts to the operators.

Need to Preserve the Operational Knowhow and Practices

The operation and maintenance of critical equipment in most of the plants are normally performed by highly experienced and skilled operators. The knowhow and operational practice with respect to such equipment are important to ensure safe, trouble free operation of plants. The complex nature and aging of equipment, retirement of skilled operators, discontinuity of OEM support for a model, etc. call for structured process and tools for preserving the knowhow and transfer the learning to another set of operators. AR/ VR assisted digital tools can aid this process by recording the best O&M practices, training the operators in virtual environment and making the knowhow available to the digital worker while they perform operation on the critical equipment.

Improvement in Safety

Safety measures have no substitutes. In 2017, one worker died in every 2 minutes, as per National Safety Council and this shocking fact points to the need of better safety measures and tools at work places. Better process designs can enhance safety at workplace and digital tools can support this cause to a large extent. Safety Surveillance Systems powered by deep learning algorithms and Real Time Image Analytics/ Location Tracking Systems/ Geographical Information System (GIS) can help to detect and alert safety violations in plants. Detection of fire, hot objects, unauthorized entry of personnel or vehicles into restricted areas, safe distance from rotating equipment, ensuring PPE for the workers, etc. can be easily managed through such digital tools.

Maintenance Optimisation

A well planned and coordinated maintenance strategy key for the success of any operating plant. A careful selection should be made between the different maintenance strategies, namely, Run to Failure, Preventive Maintenance, Predictive Maintenance and Reliability Centric Maintenance. The digital tools can help to categorise the assets based on their criticality through Failure Mode Effect and Criticality Analysis (FMECA), record the maintenance and repair events systematically along with associated costs on a continuous basis to find the optimal approach for maintenance of equipment.

Emission Control and Compliance

The international drive on climate change is directing the countries to cut down air polluting emissions on a continuous basis. Emission regulations are tightening around the globe and in India too. As per the World Air Quality Report, 6 of Indian cities appear in the World's 10 most polluted urban areas. One of the latest researches funded by Indian Council of Medical Research (ICMR) found that 1 in every 5 deaths in India is attributed to air pollution. Such reports and findings are pointing towards a tighter environmental regulatory framework in future. The plants which come under emission regulations are bound to monitor and control the emissions in all operating scenarios. The emission control under part load conditions is challenging for most industries. Digital tools can help to make proactive adjustments in process variables to eliminate emission excursions during such part load conditions to help the plants in achieving environmental compliance.

Young O&M staff and their preference for digital tools

The Newgen O&M staff do not prefer to operate the plant in the conventional way. They prefer digital tools and gadgets in plant operation which also appears be a pride factor. These Newgen staff's involvement in the transition process makes digitalisation effortless and sustainable for the plants.

Benefits from Digitalisation

The digitalisation of plants results in both visible and intangible benefits. In the Oil and Gas sector, plantwide use of existing digital technologies could decrease production costs between 10% and 20% as

per published data. In the Power sector, the digitalised process optimisation can lead to about 5% increase in the electricity output per unit of fuel input for all subcritical and supercritical coal-fired power plants. Further, about 5% reduction in O&M costs in power generation and electricity networks can be achieved from digitalization as per IEA report of 2017. There would be remarkable reduction of safety violations where digitalised Safety Surveillance Systems are in place. The digital tools can also help to reduce emission resulting in better environment. The digitalisation initiative has potential to attract, engage and retain talented young O&M staff in the plants.

Challenges to Digitalisation

The challenges to digitalisation are varied across different plants and industries. However, there are few common factors as given below.

Cultural change

Any small step on digitalisation would need involvement of people who are the ultimate beneficiaries. Their commitment and continuous intervention are necessary to sustain the benefits from digitalisation. A complete digitalisation of plant is a big leap which involves disruption of conventional workflows, method changes, change in interactions which are possible only if people are taken along the transition process. However, this journey can be made effortless by adopting a step-by-step approach and by reaping early benefits from the low hanging fruits in the process.

The digital point solutions are a good step to start the digital transformation in the plants. It helps the operators to become familiar regarding the process involved in digitalisation and the operational benefits can be seen from such deployments.

Lack of adequate data in old plants

Plant design and operational data with respect to multiple disciplines is essential for building an accurate digital twin model which is most important step in the digital journey. An accurate building of digital twin involves benchmarking of the current performance of equipment with expected performance considering aging and design performance of equipment. In old plants, some of the design information may not be available which would impact the accuracy of digital twin in normal case. However, rich experience of a domain leader from multiple plants and multiple OEMs will help them to make best assumptions and fine tune the digital twin quickly to reap early benefits from digital deployments.

Cybersecurity and Data Privacy concerns

Increased instances of cyber-attacks are a concern for every operator who intent to venture on digitalisation. It could lead to stoppage of plant and data privacy breaches if not taken care properly during the digitalisation of the plants. Stronger measures for cyber security should be planned and risk analysis carried out for people, products and process participating in the digital transformation.

Plethora of Digital Solutions- Which one to choose?

Most of the plant owners/ operators are faced with the issue of the real intent and path forward on digitalisation. There are many digital solutions/ technologies in the market and many operators continue to evaluate one solution after other and loose precious time in the process due to lack of proper direction. Digital transformation is more than glossy dashboards and analytics. This initiative demands a reliable partner who know about the plant and who can advise, integrate and coordinate the transition than just a vendor/ supplier selection. A domain player with good collaboration/ partnership echo system on digital front would be an ideal choice.

Need for a Domain Leader to Lead the Digital Transformation of the Plants

The success of digitalisation in plants depends on the accuracy of the digital twins created of the equipment and process that exist. Plant operation involves complex scenarios and plant engineering involves analysis of many such operation scenarios to assess the impact

on equipment and process in different operational contexts. Normally, it would take years of operation of the plant for occurrence of all possible scenarios. The digital twin should capture all such scenarios so that its predictions/ actions/ recommendations would be comprehensive in such conditions and ensures that efficiency, emission levels and safety of the plant is not compromised. Domain player can build accurate hybrid digital twin models taking advantage of their collective domain knowledge, historical operation data and by incorporating all critical plant scenarios to the benefit of operator. It gives the operator a comfort and faith that they are handholding with a safe partner for digitalisation who understand the complexity of the processes involved in the plant design and operation.

Digital Transformation for Existence

Currently, many plant owners have visualized digital transformation in industries as means to increase operational efficiency and an aid to get better predictions on the machine conditions. Looking at the trends and statistics, experts point out that 40% of the industries which are around now will not exist in another 10 years because of slow adoption or no adoption of the new age digital technologies. India is going to be hub for AI/ ML technologies and it would be in the best interest of plant owners and operators to take advantage of the emerging scenarios in technologies and become early movers to reap the benefits.

Acknowledgement

The author expresses his gratitude to the management of Tata Consulting Engineers Ltd., for the encouragement and grant of permission to publish this paper.

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Dawn of Digital Twin – Leading a New Engineering Landscape

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ABSTRACT

Most of the industries are preparing themselves for the fast-embracing digital future, guided by more encompassing business strategies. Adoption of digital technologies would bring new business models, opportunities for value-creation and new source of revenue, in aligning to the customer demands. Digital Twin (DT) is emerging as a technology tool that enables digital transformation in many industries. This article focuses on the state-of-art of the digital twin technology and its role on product life cycle and various other applications.

Key words: Industry 4.0; Digital Twin, Applications; Implementation stage; Life cycle.

1. Introduction

Digital Transformation is shaping conversation across Industry 4.0, with new emerging technologies such as Artificial Intelligence (AI), Internet of Things (IoT) and Edge Computing and making promises on their ability to optimize processes and create value. Industry 4.0 comprises three main key technological components such as the IoT, Cloud and a Data analytics engine. IoT provides interconnectivity of different smart devices and systems which allows sharing of the information through data transfer. The Industry 4.0 helps in developing the digital economy of any organisation through enhanced transparency, visibility, predictability and adaptability. An innovative concept of Digital twin (DT) is leading the Industry 4.0 revolution, supported by tremendous growth in IoT connectivity and advanced data analytics.

2. Digital Twin

Digital Twin is the next big thing in the fourth Industrial Revolution for the development of new products and processes. It is a comprehensive digital depiction of an individual product or entire process plant that plays an integral role in a fully digitalized product life cycle. Currently, digital twin is mostly adopted in manufacturing, automobile, oil and gas industries, healthcare and smart cities. Industry typically follows 'first build and then tweak' concept. However, the digital twin concept will introduce a new virtual system-based design approach. The digital twin concept links the physical and digital world. Its concept can drive innovation and enhance performance of the entire plant or process. This technology helps companies in better understanding of their customer needs, development of existing products, operations and services.

The Digital Twin concept involves making a complete 360-degree digital replica of either part of the physical assets (such as plant machinery) or the entire plant. It is useful in accurate prediction of the present state of the machinery and can be further used to predict its future healthiness. Figure-1 depicts a typical schematic diagram of the digital twin process's concept, which essentially consists of three parts such as (a) physical plant in real space, (b) digital twin plant in virtual space and (c) connection of data and process information that ties both physical and virtual plants.

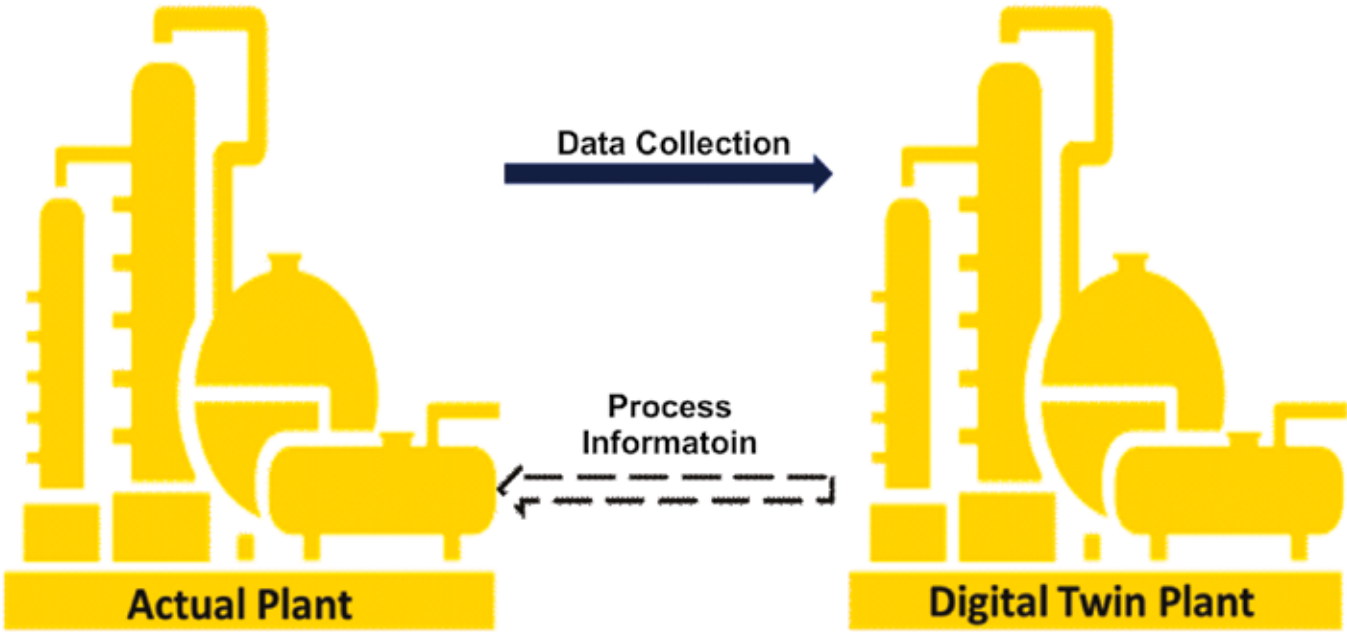


Figure-1: Schematic diagram of Digital Twin process

The concept can be used throughout the product's lifecycle including product design, manufacturing, product use, maintenance support and parts replacement. It can be applied for any new project which covers all phases of the life cycle or to any brownfield project. Today, the customer would like to digitize their plant/ process in 3D environment as a process of digitalization. The 3D model along with real time operating data can be transferred to virtual mode of digital twin for simulation, which along with data analytics offers greater depth into the operational environment, enable to improvise the process and operational efficiency for the existing plant.

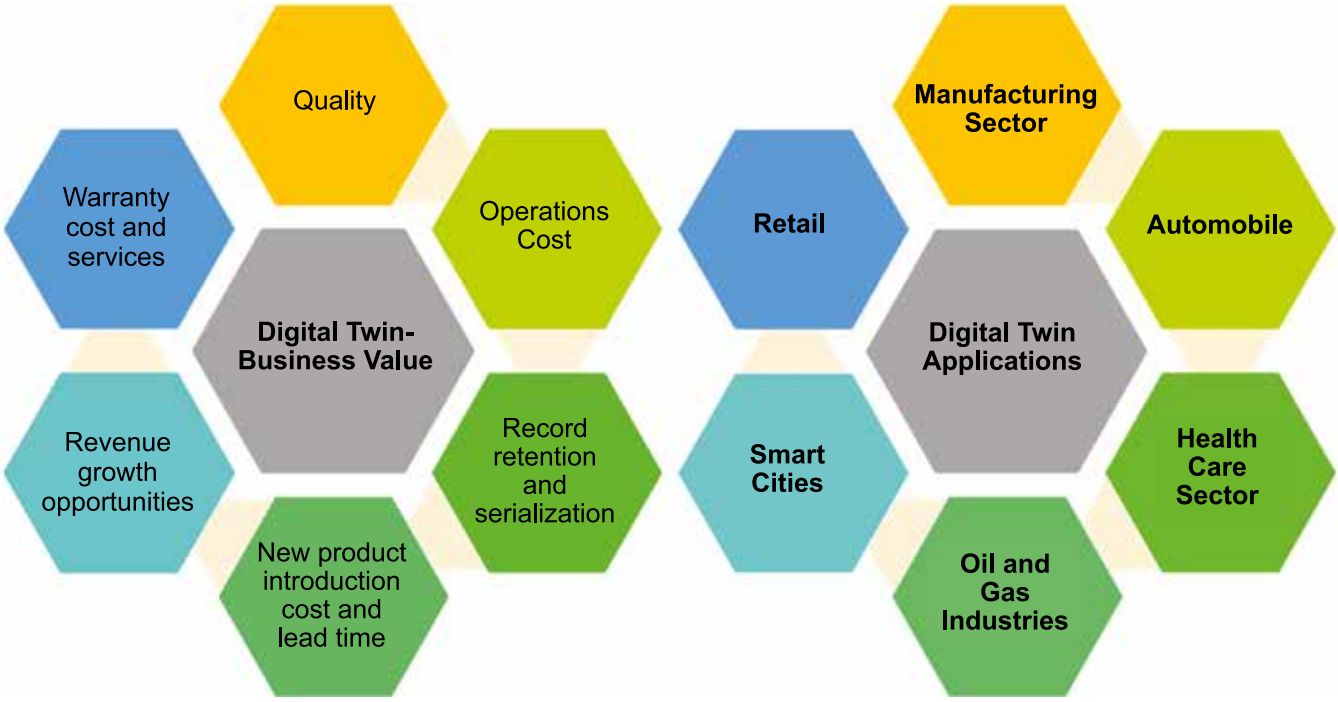
Digital Twin is mainly used for analysis of data and monitoring of systems to (a) find the difficulties at the process or product before failures occur, (b) preventing downtime and (c) new opportunities for business improvement [1].

Today, many industries are implementing digital twin to realize the following benefits.

- Improved plant /process/equipment performance monitoring
- Detection of equipment problems before failures
- Reduced scheduled and unscheduled maintenance events
- Reduction in waste generation or raw material consumption
- Better operational excellence
- Lengthened service life of process equipment
- Improved customer service

3. Digital Twin Application

The Digital Twin could enable extraordinary understanding of real-time insights of an asset. Figure-2 shows the application of digital twin for various sectors and benefits associated with it.



(a) (b)

Figure-2: (a) Various business values and (b) Associated with several sectors

- **Manufacturing:** Digital Twin is used in manufacturing sector at various levels such as (1) component level, (b) asset level, (c) system level and (d) process level. It is changing the entire face of the manufacturing industry. It could decrease the costs, control assets and decrease the downtime caused by equipment failure.
- **Automobile**: The Digital Twin can enable convergence of existing gaps between physical and virtual versions of product prototypes, shop floors and actual vehicles on the road in the automotive industry. Further, it can capture the behavioural, operational data of the vehicle and analyse the overall vehicle performance efficiency, which delivers tailored service for customers.
- **Health Care**: Digital Twin can play a vital role in hospital design, patient care, diagnose issues and their data management. It would be of great help to precautionary alerts to avoid health deterioration, reducing the expense for the patient, and giving tailored health support system. Typically, healthcare sector demands higher accuracy in diagnosis and treatment, which can be predicted from data analytics tools. This would be of great support especially in developing countries like India.
- **Oil and Gas Industries**: The Digital Twin can be used in the upstream oil and gas industry, which includes exploration and production (E&P) cycle, modelling of subsurface, the design of rigs to optimize production, increasing safety and reduce field personnel, etc.
- **Smart Cities**: Digital Twin coupled with IoT data can enhance the efficient planning of a smart city and

its construction by supplementing financial progress, effectual administration of resources, lessening of environmental impression and improving the complete worth of a resident's life.

- **Retail**: Digital Twin supports enhanced planning of stock maintenance, safekeeping procedures, and human resource administration.

Industries would adopt DT as an evolution, at different rates, depending on their business, resources and environment. DT enables data extraction, management and analysis to provide users with insights and predictions on their assets. Industry adoption of DT is shown in Figure-3.

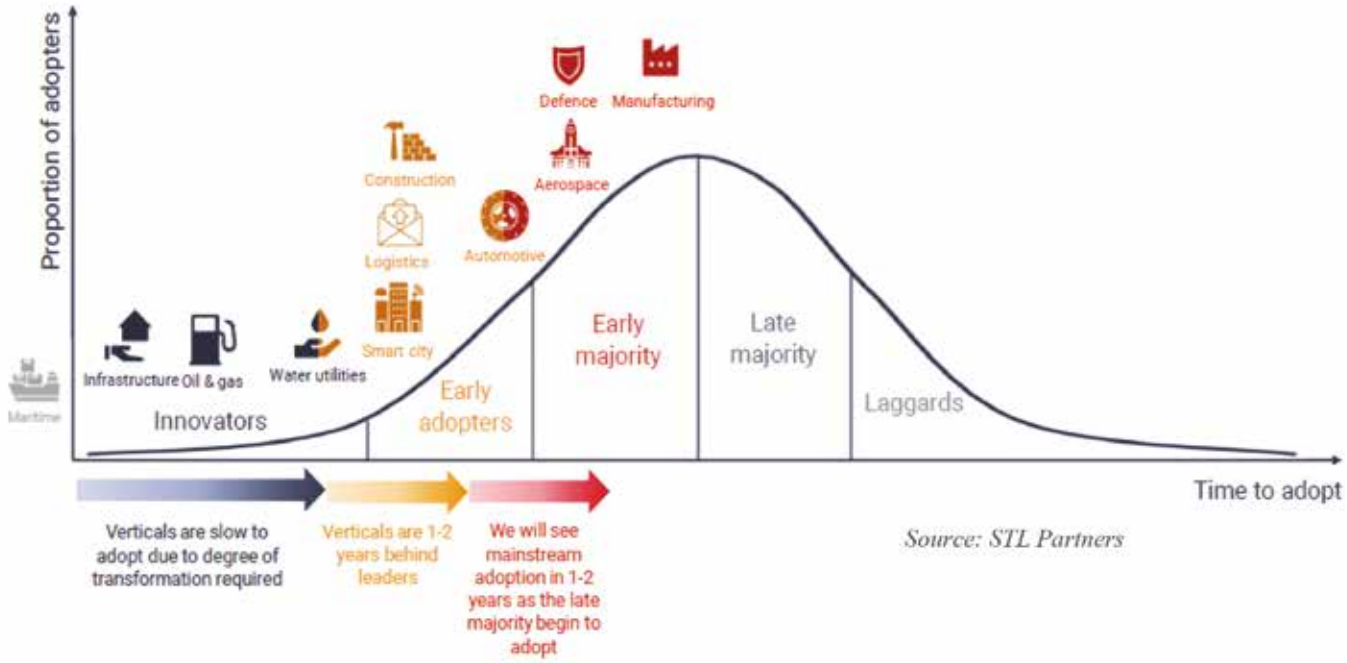


Figure-3: Digital Twin Adoption curve [2]

Industries, such as manufacturing, aerospace, and defense are already beginning to adopt the digital twin technology. Handling critical processes, manufacturing high value assets and capacity to invest could be some of the factors that have put these industries ahead in technology adoption. The manufacturing sector is widely perceived as a leader in digital transformation and adoption of emerging technologies since manufacturers always look for continuous improvement of their processes and effective usage of their data. DT offers advantages in precision monitoring and control, tracking of their products and advance visualization through Augmented Reality (AR) and Virtual Reality (VR) in enhancing its existing data capabilities.

4. Simulation vs Digital Twin

Traditionally, engineering design has been using prototypes for developing and testing of new product designs. Digital twin eliminates the need to build multiple prototypes prior to product launch. Simulation technology and digital twin share the ability to execute virtual operation, However, simulation and digital twin are not the same processes. Some of the differences are highlighted below:

- Simulation is used for design and static/ offline optimization activities. Digital Twin is used for entire life cycle including design, in real-time.

- Simulation may display the real-world conditions, but Digital Twin would replicate real time scenarios.
- Traditional simulations don't offer acumens into the interactions of the physical assets. But the Digital Twin can overcome these issues.
- Digital Twin provides valuable information from the hidden insights, which can drive business decisions more than traditional simulation.

There are some common misconceptions in the literature, unable to distinguish Simulation Models, Digital Shadow and Digital Twin. Figure-4 distinguishes between these [3].

- Digital Model is a digital version of an existing physical object, without any form of automatic data exchange between the physical and digital objects. Most of the static/ offline simulation models are considered as digital models. e.g. CAD models, plans of buildings, 3D model, product designs and development.
- Digital Shadow is a digital depiction of an object, which has an automated one-way flow of data between the physical and digital objects. If there is a change in the state of the physical object, then that leads to a change in the digital simulation object and not vice-versa. e.g. real-time sensor data are used as inputs for the simulation model.
- Digital Twin is a digital representation of an existing physical object and a digital object which are fully integrated with bidirectional flow of data between them. In this situation, the digital object might also act as a controlling instance of the physical object. A change made to the physical object automatically leads to a change in the digital object and vice-versa. e.g. on receipt of the real-time data from the physical object, the digital object processes the data in the simulation model to optimize the process and updates the physical object.

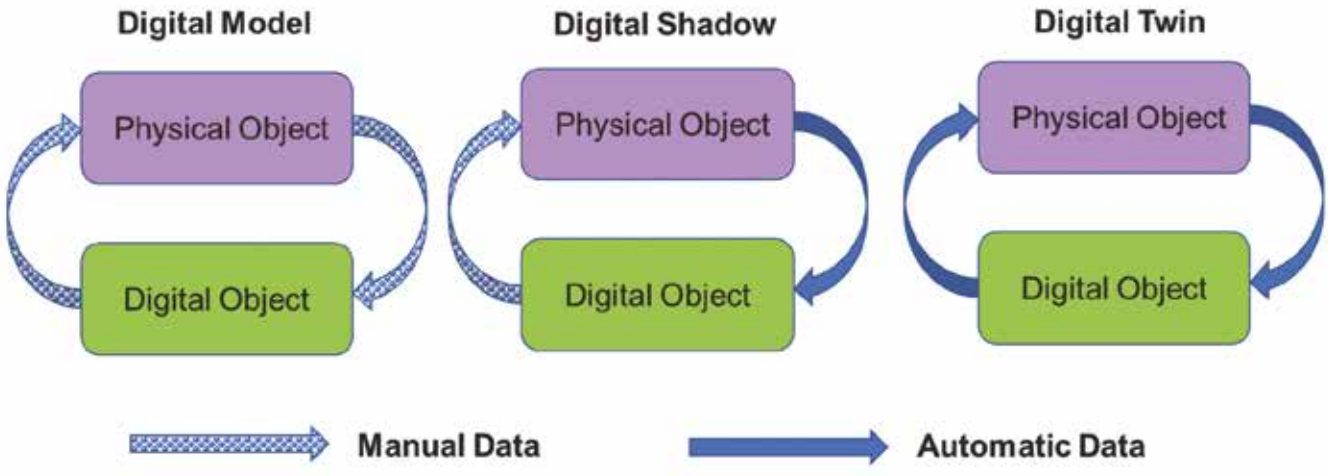


Figure-4. Digital Model, Shadow and Twin

The Digital Model can be a lighter version of the physical model, with the required geometry, characteristics and attributes. A Digital Twin may be a partial representation of a physical system, which consists of only relevant data and models to meet the intended purpose.

5. Industry Implementation

Digital Twin can leverage availability of integrated engineering data, information management and document control processes. Typical details required to build a Digital Twin for an asset information, which includes equipment design data and operating data, geometry, layout, connectivity of key components and process data. The information is then shared across all engineering departments. All the design and operating data is integrated to create a digital copy of an asset. This digital copy would enable the performance monitoring of real time operations. Besides, a data based mathematical model can be developed to analyse process trends and predict future trends. The Digital Twin build-up method consists of many stages such as collection of input data, modelling, pilot a program, industrialising it and then scaling it up and monitoring and measuring as shown in the Figure-5.

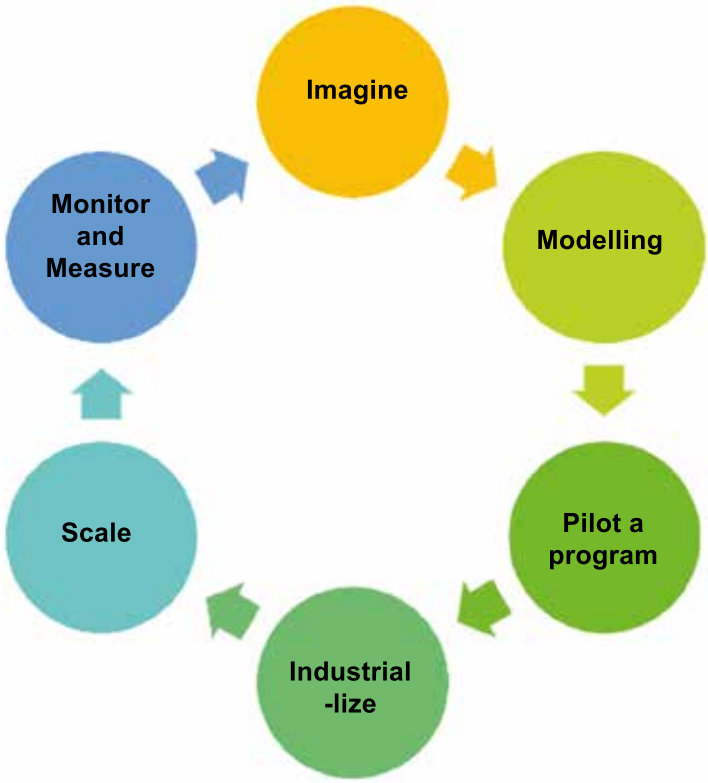


Figure 5: Build-up method of Digital Twin

- **Create/ Imagine**: Process imagination and data collection is an important preliminary stage for creating a Digital Twin. It includes equipment design and operating data, geometry, connectivity of key components and process data.
- **Modelling:** Algorithmic simulations and visualization routines are used to analyses the data, which are used by the Digital Twin to produce insights.
- **Pilot a program:** A pilot design is to be developed by using an iterative process, which would accelerate learning, manage risk proactively and maximize return on initial investments.
- **Industrialize:** Once a pilot program is stabilized and mature, it needs to be developed for deploying the process using established tools and technologies.
- **Scale:** Add to additional areas/ processes that have interconnection with the pilot.
- **Monitor and Measure:** This stage involves monitoring and measuring the delivered value or data through the Digital Twin. It would recognize tangible benefits in the cycle time, yield throughput, quality, utilization, incidents, and cost per item.

The life cycle of a project or an asset comprises basic design, detailed design, installation, commissioning, followed by operation and maintenance till the end of its life. The entire lifecycle carries numerous data/ information from engineering through procurement to construction and commissioning to decommissioning.

Digital Twin always ensures valid data / information consistently throughout the lifecycle of the asset. It can

identify where physical clashes may occur, thus avoiding heavy equipment utilization while retrofitting of the plant. In a way, it helps to reduce overall operating and maintenance costs while increasing availability and safety.

The major players are continuously investing money and time on development of Digital Twin projects such as IBM Corporation, General Electric, Siemens, Microsoft Corporation, Dassault Systeme and ANSYS Inc. Many academic institutions like European Business School, Massachusetts Institute of Technology (MIT) and Reutlingen University are also working on the Digital Twin technology. Many opportunities are available for using Digital Twin technology such as testing a new system prior to manufacture, improving efficiency and productivity of existing assets, managing real time performance of assets, understanding of run time data to plan maintenance services, etc.

In addition, Digital Twin can be used to

- Increase operational efficiency and enhance process safety
- Predict and plan maintenance schedules
- Study Risk Assessment
- Maintain documentation and communication.

6. Conclusions

The Digital Twin is an innovative concept that has come to the growth stage and has a huge business potential. There has been growth observed both in research and applications in various industries. Industrial leaders are introducing Digital Twin into their offerings, which focuses on all the areas of the Product Life Cycle and demonstrates its superiority over the traditional solutions. Many industries like manufacturing sector, aerospace and defence are already implementing this concept. Several upstream 'oil and gas processing' users are adopting the Digital Twin concept to maximize oilfield recovery. Enabling technology like 5G network with high bandwidth will enhance the growth potential of Digital Twin sooner than expected.

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Digitalisation for Success in New Normal

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COVID-19 crisis is having a significant impact on how technologies and businesses manage technology transformations. Despite the pressures it has added to costs, however, the urgency to get moving and transform has never been more imminent according to directors of many multinational companies. While the demand placed on the technology functions have grown, so too have the opportunities. Experience suggests that the most effective transformations are not only comprehensive, covering the function's role, delivery model, and core systems, but also sequenced to ensure that changes that reinforce each other are carried out together. Leading Indian companies have shown that with up-front planning focused on business value and careful delivery, a company can bring its technology function forward and gain the capabilities to thrive in challenging digital markets.

COVID-19 has brought around a major change that the development has to be "society-centered" rather than "technology-centered alone". A key question to consider is whether emphasis should be switched from the pursuit of "quantity or output" to "the quality of life" and from "consumption" to "fulfillment and happiness".

Flexibility Required in Regulations

With more accessible digital technologies, less capital-intensive business models, and quicker positive cash generation has become priority. In recent years, the listed companies have no longer been the preferred vehicle of many entrepreneurs. Excessive regulations and onerous and inflexible requirements are considered barrier to enterprise growth. Amendments to Companies Act approved by the Indian Parliament in September, 2020 is expected to afford ease of doing business.

Digital experts tend to think of the digital transformation and acceleration in terms of technologies, business outcomes, process changes and their impact on people. But they often overlook the massive disruption that kind of transformation generates for leadership – and the enormous impact that can have on the success or failure of their organisation's digital transformation.

Today, the term 'digital business' mainly is used in a context of digital transformation, the exponential technologies, holistic business optimization, integration and convergence. It is much more than that. It is also about digital disruption and innovation caused by complete re-construction of business value chains and emergence of new digital platforms, aggregators and market places.

A key part of it all is information put at work, which requires putting a new approach and is called future of work- and also includes the connecting network that enables creating value incrementally throughout the entire digital ecosystem.

Digital Strategy Premises

Digital strategy is not about automating process or introducing in the technologies in the organisation. It is about making conscious choices around the intent of the digital strategy and the expected outcomes, including impact on the organisations' performance.

In their essay 'Making Conscious Choices' Prof. R. Srinivasan and Prof. Rishikesha Krishnan of IIM, Bangalore have defined four premises around digital strategy. They have laid out four core premises and state that much like business and corporate strategies there is need to provide unequivocal attention to the environment, choice and implementation issues, digital strategy also demands the same treatment. Digital strategies need to be aware of the external environment of the business and the industry it operates in, pace and direction of (digital) technology evolution and the impact it would have on industry structure, firm resources and capabilities, and the firm economics (demand, costs and prices). Additionally, given the origins of digital technologies, it is crucial that digital strategies work with complements, both within and outside the traditional industry boundaries.

Digital Thinking in Three Layers

Experts believe that there is need to understand the digitalisation eco-systems in three layers.

At the base of the pyramid is the infrastructure layer, that sets standards for all firms and applications to interact. Much like the hardware (servers and PCs) in computing eco-system, the infrastructure layer most often defines the limits of the eco-systems. On the top of the infrastructure layer sits the network layer that allows from multiple uses of the infrastructure – similar to the operating system that allows computers to connect with each other and to the rest of the world. On top of the pyramid is the application layer that allows for each computer to perform specific tasks, either using data from within, hardware/ operating system, or accessing them from outside through the network.

Digitalisation of Both Front-End and Back-End Necessary

There are few elements that must be remembered. The first of these is that digitalisation of both front– and back–ends of the process are required. A lot of organisations undertake digitalisation process as projects. It is important that the digitalisation projects focus on both the front and back ends. Firms can reap the benefits of digitalisation only when they digitalise both the customer–facing processes (front-end) as well as employee-facing processes (back-end). Equally important, but commonly under-represented are digitalisation efforts targeted at improving employee experience. Such digitalisation of employee experience enhancing process would surely contribute to firm efficiency, and in most cases, may also significantly enhance customer experience. Superior customer value cannot be provided unless the organisation focuses on re-engineering its back-end processes.

Re-imagine Processes for the Digital World

When legacy processes are digitalised, it is important that firms re-imagine the processes for the digital world, rather than digitalise manual processes, without modification as done by much of the hotel industry. It is important to have entire process systems redesign for the digital world, rather than digitalising each process independently. Such re-imagination of processes would help firms eliminate redundancies, enhance employee experience, contribute to process efficiency, and consequently enhance customer experience.

There are two kinds of firms in the digital world - firms that were born-digital and those that were founded as traditional firms, who digitalised subsequently. App-based ride-hailing would not be possible if not for digital geo-location of drivers and riders; as is discovery of used goods available for sale in C2C markets without a digital interface. These are instances of born-digital firms.

However, when traditional firms such as airlines, railways and banks digitalise, they are helping change consumer behaviour. When incumbent firms digitalise

and impact the interactions with the consumer or other stakeholders in the eco-system they have a potential to create sustained behaviour change.

Perception of Digital

Presently, the term digital businesses mainly is used in a context of digital transformation, the exponential technologies, holistic business optimisation, integration and convergence. It is much more than that. It is also about digital disruption and innovation caused by complete reconstruction of business value chains and emergence of new digital platform, aggregators and market places.

A key part of it all is information put at work, which requires putting a new approach and is called 'future of work' – and also includes the connecting network that enables creating value incrementally, throughout the entire digital ecosystem.

Exponential technologies led by Artificial Intelligence are disrupting geo-political scenarios, global markets, customer experience and buying behaviour; carrying incredible implications for businesses and just about anything where customers are involved. The real challenge and opportunity in digital transformation and disruption lies in the evolution of the customer and employee behaviour, values and expectations.

Digitisation and Digitalisation

Digital strategy is not about automating processes or introducing new technologies in the organisation. It is about making conscious choices around the intent of the digital strategy and the expected outcomes, including impact on the organisation's performance.

Digitalisation of firms involves organisation–level transformation rather than small changes and adaptation at the periphery. It is important as how to highlight the difference between digitisation, digitalisation and digital transformations.

Digitisation is the conversion of objects and artefacts from analogue to digital forms; whereas digitalisation refers to the application of digital technologies to redesign processes. For example, a bank passbook that is computer-printed is digitisation (of the object called passbook). However, implementation of technologies such as core banking solutions and/or robotic process automation in the bank is digitalisation. In summary, the processes are digitalised, whereas objects/ assets are digitised.

Digital strategy refers to the continuous application of digital technologies in transforming business process and as such conscious adoption of digital technologies in transforming business process. Such conscious adoption of digital technologies requires that leaders view the entire strategy as one of the transformation rather than piecemeal and interdependent projects. Much like how the internet transformed businesses in the early 2000s, digitalisation has the potential to transform firms, industries and the entire economy in Post-2020 world.

Societal Implications

There were major impacts of digital transformation, which is generating a fierce debate among policy makers, economists and industry leaders about its societal impact.

The first of these is "employment". Current estimates of global job losses due to digitalisation (as projected by World Economic Forum) range widely, from 2 million to as high as 2 billion by 2030. This analysis suggests that digitalisation can be a net job creator in some industries. But, with both winners and losers resulting from digital transformation, a huge premium rests on the near term ability of businesses to up-skill employees and shape the next generation of talent. This is now unavoidable and in the new normal it is taking shape at a fast pace.

"Sustainability" is the second aspect. It has not yet been possible to decouple, economic growth from an increase in emissions and use of resources. Currently business practice would contribute to a global gap of 8 billion metric tons between the supply of and demand for natural resources by 2030, translating to US$ 4.5 trillion of lost economic growth. The analysis suggests

that digitalisation could make a positive contribution to the challenge.

"Trust" is the third element. Social media, user-generated, websites, and other innovations have been instrumental in increasing transparency and overcome information asymmetries. However, trust in all technology based sectors declined in 2015. Beyond privacy and security concerns, broader ethical questions about the way organisations use digital technology threatened to erode trust in those institutions.

Professional Services: Digital Themes and Initiatives

Disruptive technologies are fundamentally changing the economics of professional services, and that includes engineering consultancy services. Four themes are identified to be central to capturing digital value for the industry and wider society.

The first of these is the "Business Model Transformation". Digitalisation empowers firms to change every facet of how they go to market, including their services, value proposition, target customers and prices. The key initiatives are enhancing go-to-market strategy and fostering a digital environment.

"Intelligent Automation" is the second aspect. Emerging technologies such as Block Chain, Artificial Intelligence and Deep Learning are augmenting professionals' abilities to do, think, learn and feel. Major initiatives include modularizing work and augmenting human intelligence.

"Digital Agility" is the third aspect. Companies with an agile work culture and smart infrastructure can react quickly and adapt strategies and processes to disruptive events. Important initiatives are developing a flexible work force, nurturing an agile culture and investing in smart infrastructure.

"Talent Empowerment" is the fourth aspect. In a digitalized world, there is a need to re-imagine what it means to be an employee and revisit the employee value proposition for the work force. Key initiatives include reimaging hiring, training talent and designing the employee experience.

New Normal and the Consulting Engineers

Expertise is the primary product of professional services. Consulting Engineers need to consider that machines are augmenting key human capabilities so that expertise can be provided to clients more efficiently, using combinations of humans and machines. A large number of digital companies prepared courses and conducted virtual classes for professionals to understand the importance of mastering the new way of working with new digital tools. It is time that associations of consulting engineers introspect to find out how they can make themselves suitable to the changing normal. The Fourth Industrial Revolution is underway. Also, Society 5.0 has taken roots and is all dependent on digitalisation of the processes. Digital innovation can benefit by mastering Industry 4.0 as a revolution to serve Society 5.0. The digital innovation can benefit society by creating jobs, saving lives and reducing emissions and providing safe and healthy working places. These gains can only be attained if appropriate decisions are taken and the digital transformations are implemented across both the ends, that is, the employee (professional consulting engineers) end as well as the customer end.

Post COVID situation has made it abundantly clear that the way-ahead to 2030 is totally dependent on appropriate digitalisation. A review of opportunities and challenges presented by digital technology across many industries has made it clear that the world is at cross-roads. New technologies are opening up opportunities to increase economic growth, reduce inequality and promote inclusivity. At the same time the world is changing very fast due to the pandemic effect. An important choice must be made between a more open, inclusive and interconnected world, or one that is closed, siloed and unequal. The fast changing situation over the last 10 months have put heavy pressure on the consulting engineering community who have to learn a new way of functioning and then advise the industry to transform and change at a fast pace. Digitalisation is inextricably linked to the social and economic forces fueling a

conflicting world view. Change in the "new normal" for the better would depend on how the professional engineers behave. Do they run faster lead and show the way to others to follow? Digital innovations can, for example, drive society towards UN Sustainable Goals, by 2030, and shore up the three pillars on which they are built, improving the quality of life, fostering equitable growth and protecting the environment. It is not a simple process in the undertrained post COVID-19 world. However, the most positive results have to be attained. The digital revolution provides a chance to drive radical change across the global economy. But this transformation will not happen by itself, and its negative, unintended consequences must be managed. It is necessary to have a clear understanding as to what part of processes would be benefitted by digitalisation and should be subjected to rapid transformation. Collaborative action is needed today to bend the curve of digital transformation towards a more prosperous tomorrow. Here is an opportunity for the consulting engineers to serve the humanity effectively and open opportunities for prosperity for them.

INTERNATIONAL
WATER POWER
& DAM CONSTRUCTION

22 / 12 / 2020
WEEKLY NEWSLETTER

World Bank approves dam safety project in India

17 December 2020

The World Bank has approved a $250 million project designed to improve the safety and performance of existing dams across various states of India - described as the world's largest dam management program.

The Second Dam Rehabilitation and Improvement Project (DRIP-2) will strengthen dam safety by building dam safety guidelines; bring in global experience; and introduce newer technologies. A major innovation envisaged under the project, that is likely to transform dam safety management in the country, is the introduction of a risk-based approach to dam asset management that will help to effectively allocate financial resources towards dam safety needs.

Source: https://www.waterpowermagazine.com/news/newsworld-bank-approves-dam-safety-project-in-india-8415705

Digitalisation - Asset Performance Management for Electrical Assets

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Abstract

Performance of electrical assets is of paramount importance in today's world which is energy dependent and especially so in industrial plants. A majority of the plants in operation today, practice time-based maintenance instead of proactive strategies. The traditional approach of managing assets is both time consuming and cost intensive. With the advent of digital technologies, many effective and emerging digital solutions for Asset Performance Management (APM) are being deployed by various industries. It comprises of data acquisition, integration, visualization and analytics, all harnessed to improve the reliability and availability of the physical assets.

As per "ISO 55000", APM includes condition monitoring, predictive forecasting and reliability centred maintenance. Many predictive techniques are developed for monitoring in-service electrical assets like transformers, circuit breakers, motors etc. Precise information about various aspects of an asset's performance are presented to the user. The online static and dynamic data recorded from the asset is captured and tailor-made predictive maintenance module is devised to monitor the health status of the asset. Thus, APM substantially decreases the maintenance cost and reduces unplanned downtime.

In addition to financial benefits, implementation of APM would result in the reduction of the company's overall Environment, Health & Safety (EHS) risk rating. Fewer than 5% of companies have effectively implemented APM program as of 2019.

This article showcases an approach for the development of APM system and presents a case study where an APM tool was deployed in an existing plant.

Introduction

The electrical equipment that are an integral part of any industrial or commercial establishment are critical to their functioning. Breakdown of these equipment often come with huge physical and financial implications. Apart from these implications, failure of electrical equipment may pose health and safety risks too. For example, an abrupt failure of a power transformer in any critical process plant, may temporarily cause process shut down, which may result in environment and safety issues apart from a loss of production and a loss of revenue. It is imperative to have an effective maintenance strategy in place, to avoid unexpected downtime.

The prevailing maintenance practices are largely confined to i) reactive maintenance, which involves repairing the asset once it fails and ii) preventive maintenance, which is periodically scheduled to ensure the healthiness of the asset. These conventional maintenance approaches are expensive, labour intensive and increases the downtime. Maintenance was revolutionised after the introduction of Condition-Based Monitoring (CBM) tools, which provide real time data of the assets, to be analysed by the user. The main setback is the requirement of skilled and expert professional to interpret the data.

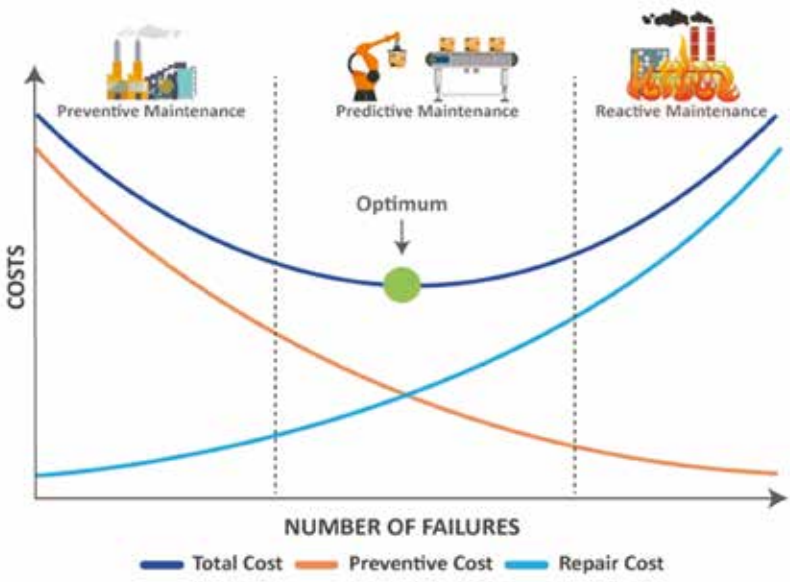

Figure-1: APM General Cost Analysis based on Maintenance strategy [7]

The APM approach focuses on predictive maintenance. It measures and analyses the operational behaviour of an asset for all loading and operating conditions. The real time operating data is compared with the recognised patterns using advanced analytical modelling techniques to determine subtle deviations from the standard behaviour. The tool also carries out the root cause analysis and fault diagnostics to determine the nature and severity of the problem and suggests an appropriate remedy. Such an approach facilitates the segregation of assets based on its present operational behaviour. This facilitates in scheduling maintenance in an efficient and effective manner. It also helps in identifying low performing assets. Predictive maintenance is cost beneficial when compared to the conventional approaches as shown in Figure-1

APM Tool – An Overview

APM is a set of software tools that are used for managing the health of physical assets in any industry, especially in asset-intensive sectors like power, oil and gas, process plants, utilities etc., They alert based on the health status of an asset and recommend corrective actions to be initiated based on the in-built model. Asset Health Index (HI) is the key parameter used to compare the asset health status and to schedule a maintenance.

Earlier, engineering equations, statistical techniques and rule-based engines were developed to assess performance of an asset. The rule-based algorithms rely on explicitly stated and static model that work on pre-set threshold values. Models based on threshold values have lesser specificity and sensitivity. Technological advancements like cloud computing, data science and machine learning has improved the precision of the tool. These technologies are integrated with automated methodologies to form an efficient APM tool.

Machine Learning (ML) helps in transition from traditional engineering calculations and statistical models to measuring patterns of asset behaviour. To build a ML based tool, obtaining the relevant database is important to train the model. The database has to be structured and the important attributes that contribute to HI are to be identified. These attributes are assigned with predefined weightage factor as per the attribute's impact on the asset's health. Other arithmetic operations are performed to eventually provide the HI value, which ranges between 0%

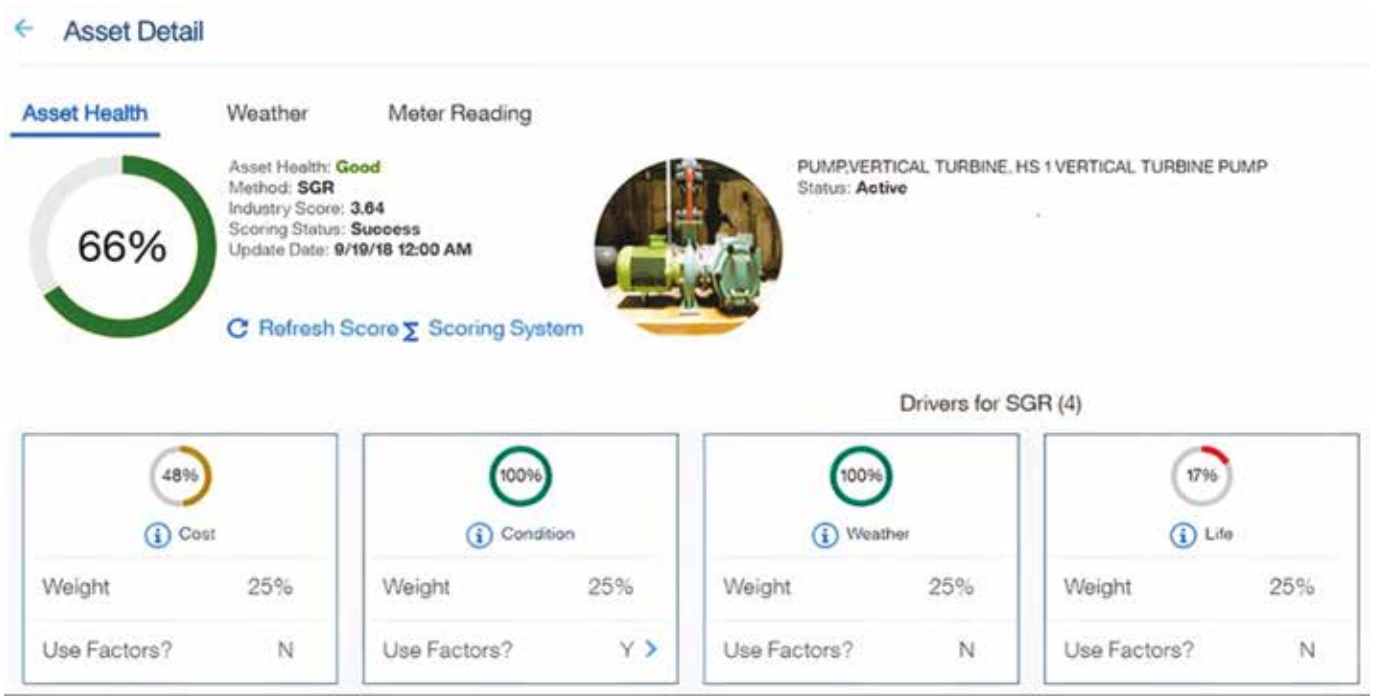

Figure 2: APM General Dashboard displaying Asset health score [8]

and 100% (where 100% is the healthiest possible condition of the asset). Based on the HI value the sampled data is categorized into one of the health band (Good, Fair or Bad) as indicated in Figure-2.

The Asset Health Analysis precision improves with the increase in the quantum of data. Pattern recognition or classification models are trained on the database for the effective operation of the algorithm which can yield faster results.

APM System – Architecture

The APM Tool is installed in an APM Application Server. The APM system is a paradigm where equipment installed with sensors, actuators and processors which communicate with each other to assess the performance of an asset. The system requires the physical world to interact with the digital world. It can be implemented using the IIoT (Industrial Internet of Things). The two architectures (as shown in Figure-3) that are popular are, (i) Three Layer Architecture and (ii) Five Layer Architecture.

The most basic architecture in IIoT is the three-layer architecture. The three layers comprise

(a) The Perception Layer comprising sensors

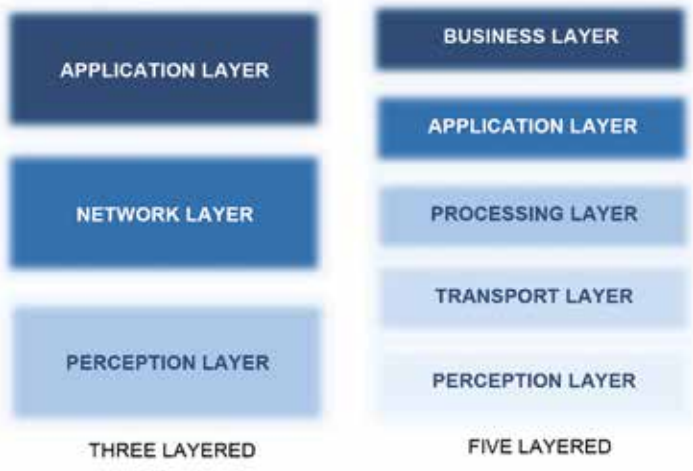

Figure-3: IIoT Architectures – Three and Five Layered

and actuators that collect physical information about an asset and the environment. The major types of devices that collect physical inputs are such as wired or wireless sensors, relays, RFID tags etc.

(b) The Network Layer connects the smart devices, network devices and the servers. The devices in this layer are responsible for transmission and processing of the data received from perception layer.

(c) The Application Layer consists of application specific tools to serve the user. It includes servers installed with application-oriented software.

The three-layered architecture defines the core idea of IIoT, but to offer a finer solution more layers were introduced. One of them is Five layered architecture. It additionally comprises processing and business layers. The role of Perception and Application layers remains the same as in the three-layered architecture. A typical five-layer model is shown in Figure-4. The function of the remaining three layers is explained below.

(a) The Transport Layer transfers data to and from between the perception layer and the processing layer.

(b) The Processing Layer stores, analyses and process the data received from the transport layer. It employs database, cloud computing, big data processing modules, etc. to manage the substantial amount of data. The processing layer could either be an on-premise or cloud-based solution.

(c) The Business Layer includes business and profit models and it manages the whole system.

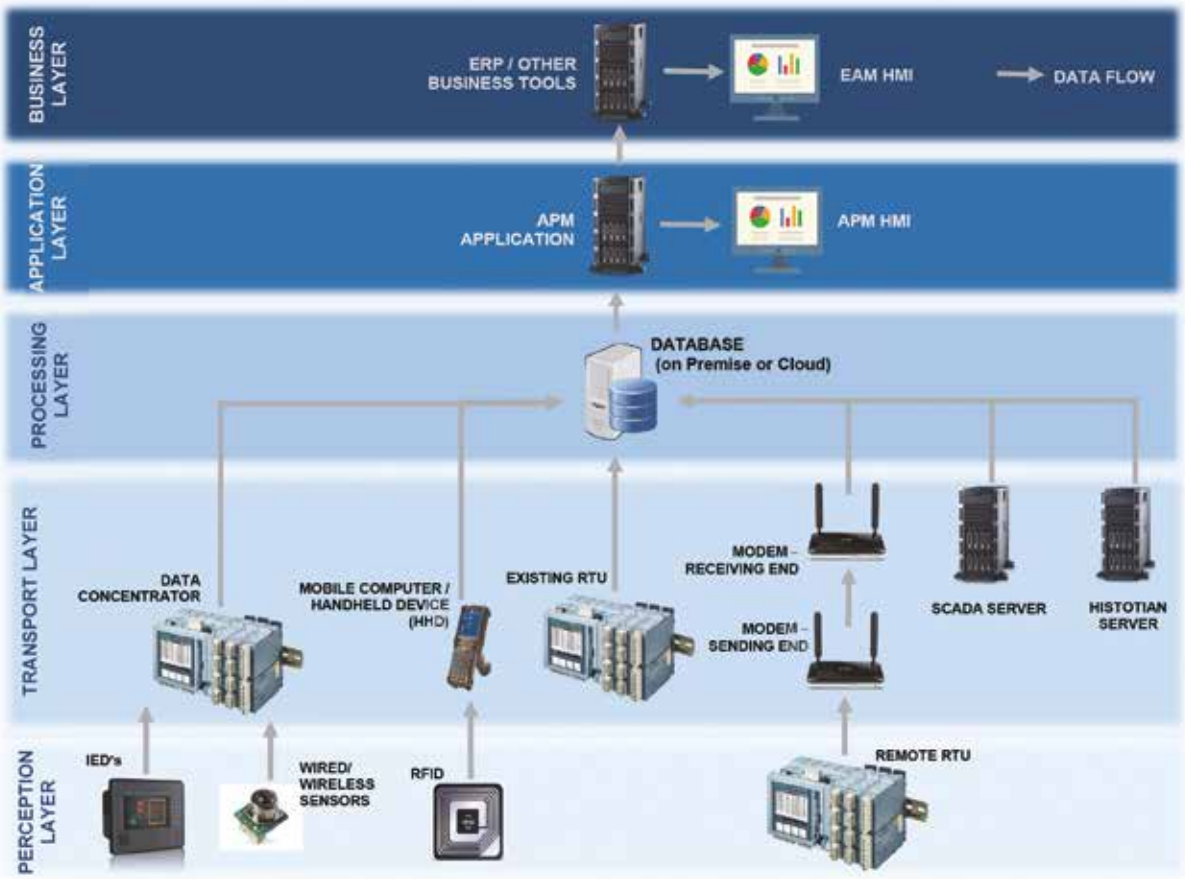

Figure 4: Typical Five layered Architecture – Asset Performance Management System

The APM system present in an application is integrated with the systems like Enterprise Resource Planning (ERP) etc. on OPC to monitor the financial aspect of an asset.

One of the main architectural components is communication. Thus, selection of networking technology is vital. The protocols can be selected based on the nature of obstacle, range of communication, ambient noise, signal distortion, data transfer rate and size of data. The networking devices is the backbone of an architecture. It is build based on various topologies. The APM tool in the application layer provides alerts and recommendations based on the data received from the network.

APM: A Case Study

Project Brief

Asset Performance Management System for electrical equipment was implemented at one of the running plants as a brown-field initiation. It enables monitoring of more than 5000 electrical assets. It was implemented for 20 electrical assets on a pilot basis, while the deployed system is capable of monitoring more than 5000 assets. The electrical assets included switchgears (including breakers), transformers, motors, etc.

Digitising and Digitalising

The plant physical data was digitized to monitor the health status of the equipment. The following systems along with thee APM was deployed to meet the requirements.

(a) The SCADA system acquired data from the existing devices. The plant contained many IEDs with different protocols (such as IEC 61850, 104, 103, 101, SPA, Courier, Modus Serial Modbus TCP/IP etc.,). Using converters and data concentrators, the data from IED's was transmitted to the SCADA server located at the Control Centre through a network ring on IEC 61850 protocol.

(b) The EDMS (Electronic Document Management System) was used to receive, track, manage and store the documents. It allowed the user to access the stored documents/ drawings by a hierarchical navigation tree. It stored the design documents, drawings, FAT documents, reports, etc,

(c) The Hand-Held Device (HHD)/ mobile computers digitised the preventive maintenance (PM) and the Routine check data. The RFID tags on the asset helped the user to capture the data against the asset form. Later the data from the HHD was transferred to the server.

(d) Wireless self- powered sensors were installed on switchgears and transformers to monitor temperature and humidity. Data concentrators were used to acquire these sensor data on ZigBee.

EDMS, HHD, SCADA, Sensors, Historian are used to digitise the data. APM was integrated with these systems to provide a digitalized solution. It processed the data and based on the in-built model, health index, alerts and recommendations are presented in the Graphic User Interface (GUI).

APM's centralized predictive and decision-support platform monitored the health of all identified electrical assets in real time and automatically presented health status of the equipment on the GUI. The APM collected several types of data as follows:

(a) Operation history data from SCADA on OPC

(b) Electrical Parameters, disturbance recorders, equipment operations, etc. from SCADA System.

(c) Dynamic data of the asset that is recorded during its lifecycle, mostly operation and maintenance data.

(d) Tele-metered data obtained from condition monitoring devices like Temperature Sensors, Humidity Sensors, etc.

(e) Condition data imported from external files such as oil analysis reports, vibration sensors, etc.

The Five Layer architecture was implemented in the project to acquire the above-mentioned data. The tool categorizes the assets based on their failure type and severity. A sample dashboard from the case study depicting the asset categorization is shown in Figure-5. It provided advanced analytics and actionable information that helps in maintenance decisions and investment plans, in relation with Company performance objectives or regulation compliance criteria.

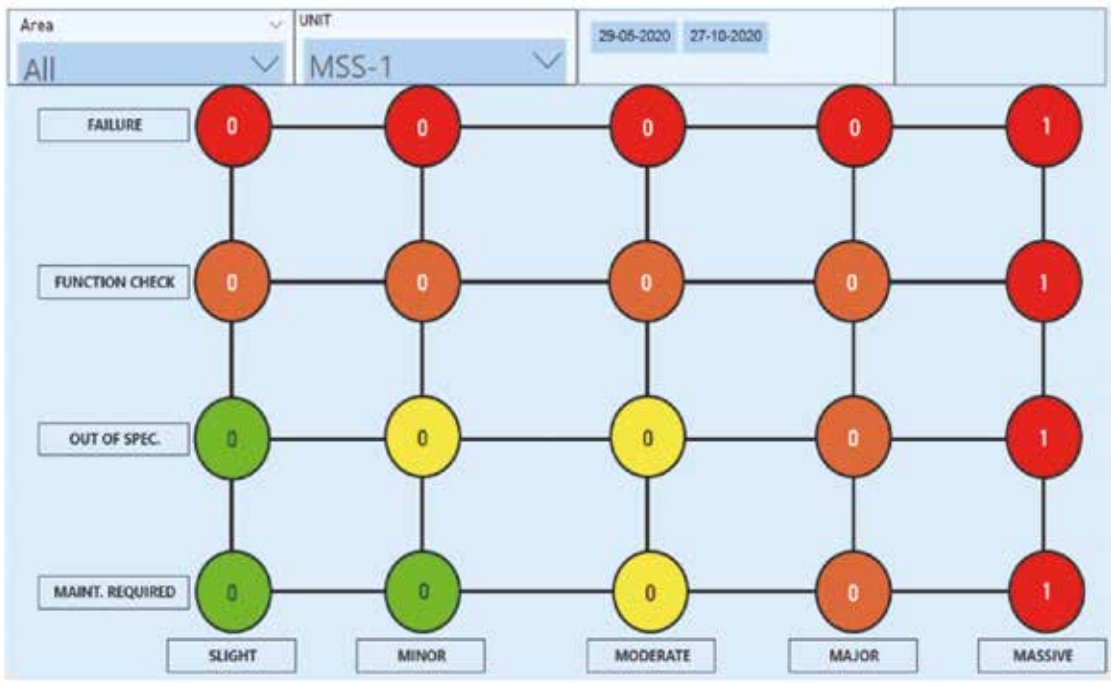

Figure 5: Sample Dashboard-1, categorizing assets based on severity of failures

APM provided the user with necessary trends to monitor the evolution of the asset condition. for example, deterioration in life of circuit breaker when it operates with more that 50% of fault current.

The major attributes that were calculated for the assets are as follows:

- Asset Health Index
- Remaining Life/ End of Life

The in-built model generated the above parameters for all the three assets (Circuit breaker (CB), transformer and motor). In addition to these common attributes, many failure conditions that are specific to assets were calculated. The tool helps user to identify the major failure causes of the assets. The attributes calculated in APM CB module are listed below.

Data Source	Attributes Failure Condition
SCADA System	Mechanical Wear Electrical Wear Breaker Sluggishness Open Breaker Sluggishness Close CT/PT Supervision SF6 Leak Trip on Overload Asset Stress Level Overcurrent – R, Y, B Phase Undercurrent – R, Y, B Phase
Wireless Self Powered Sensors	Cable Termination Temperature for each phase Breaker Chamber Temperature for each phase Busbar Temperature for each phase Breaker Contact Temperature Humidity
HHD (PM and routine Checks)	Dust Corrosion Vibration Noise Meter functioning and indication lamp Mat Condition Breaker Housing

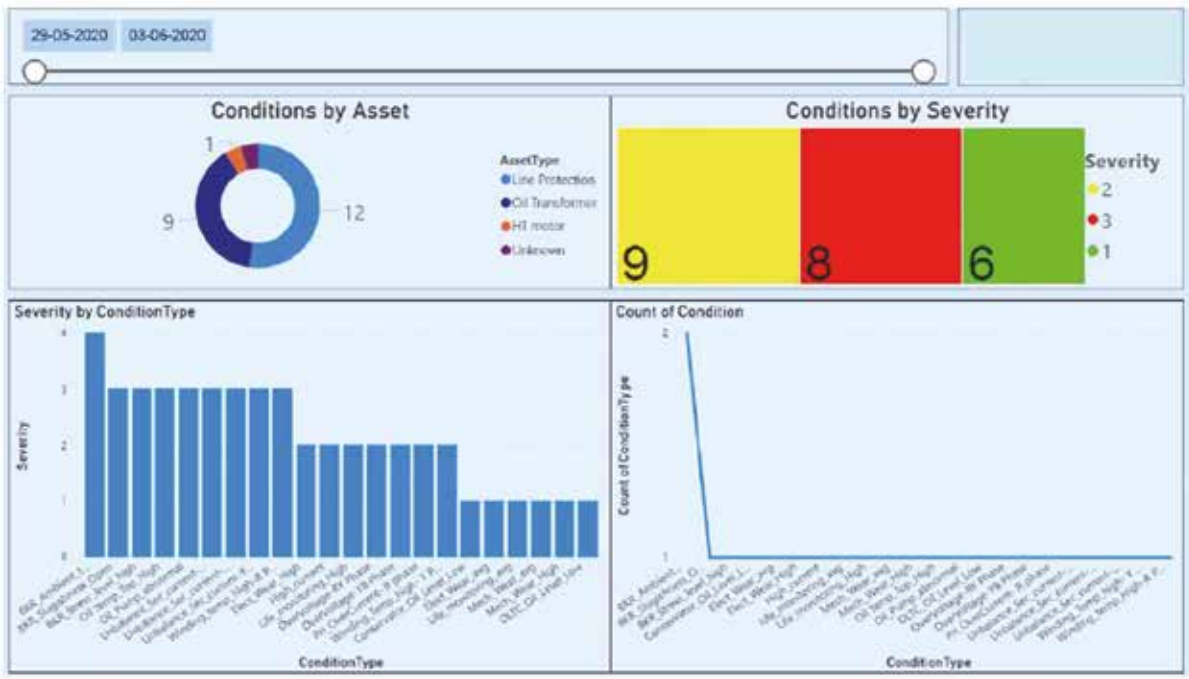

Figure 6: Sample Dashboard-2, categorizing assets based on failure conditions

Based on the health index, condition, severity and priority, the alerts and recommended actions are notified to the user. A sample Dashboard displaying graphical data of Asset Failure Conditions is shown in Figure-6.

Conclusions

This paper brings out the importance of Asset Performance Management system for electrical assets. Architecture and technology for building an APM System are briefly dealt with. A project implemented based on the methodologies is presented as a Case Study. APM allows plants and utilities to better manage and maintain the performance of all the assets that have a direct and significant impact on plant operation and performance. It helps Managers to decide operational, maintenance and investment strategies in a more informed manner. The overall cost benefit of a well implemented APM system is realised from reduction in maintenance cost, reduction in inventory cost, increased availability of asset and reduction in EHS incidents.

Since APM has become the buzz word among industries, there are many solution providers offering a variety of tools. The onus is on the users to select an appropriate solution addressing the requirement.

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Automating the Process of Engineering Valuations

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1.0 INTRODUCTION

Over the past few decades, the Indian economy has seen a shift from being an agrarian based model to becoming a manufacturing & services based one. This has resulted in the development of the built environment and the accompanying infrastructure resulting in a shift in land use pattern - from being agriculture to industrial, commercial & residential. However, many of the infrastructure projects witnessed delays – the main reason being land acquisition related issues. Delving deeper, what emerges is that Land titles in India are unclear due to various reasons, the main being poor administration, updating and safe maintenance of land records. The Land records consist of various types of information like property maps, sale deeds, etc., which are maintained across various departments at the District or Village levels. These departments work in silos with improper data updating, filing and cataloguing thus affecting future property transactions and accounting for land related disputes in 70 percent of the pending court cases in the country. One has to go back several decades of documents including manual records to find any ownership claims on a piece of property. A NITI Aayog paper suggests that land disputes on an average in India takes 20 years to resolve.

Land is often used as collateral for obtaining loans by majority parties. The practice has been that Banks have given loans against a particular piece of land whose title claims are not always clear thus resulting in a lack of transparency and inefficient execution of projects making it liable for Benami properties and generation of Black money or parallel economy in the Real Estate market.

Valuing such properties can be an arduous task and in recent years the need for valuations as a whole and such benami properties in particular has increased significantly. Valuation is a process of determining the price of an asset (say Land) as of a specific point in time (date) with respect to the assets Highest & Best Use (HABU) potential in market called Fair Market Value (FMV). But when an asset is not recognized properly what would be its net worth?

To address the above problems of transparency in quality of asset records/ deals and the net value of a property in the market role, technological developments can and are playing a significant role to bring in transparent in the property registration process by digitalizing and bringing them to an online platform for ease of accessible by Valuers/ Creditors (Bankers). Hence, Network Valuation or valuing assets through an online network collaboration based on comprehensive data placed on portals of such companies like 99Acres, Magic bricks, etc. is considered for research & analysis and improvement in valuation reports.

2.0 BRIEF DESCRIPTION

The valuation profession is likely to face a period of significant change in coming years in terms of

Documentation Management, the role of Valuers and the benefits they can offer to creditors. Valuations have come under increased regulatory scrutiny in recent years with the proposed Valuers' Bill 2020 dangling as the Sword of Damocles. While the Market Value remains the dominant basis for most valuation assignments, the global financial crisis in 2008 showed the limitations of relying on FMV in spite of severe downturn. Megatrends such as changing demographics, increasing urbanization, climate change will likely have an impact on the Long-Term Value as well which is as important as the FMVs. Creditors are increasingly asking for 'Long-Term Value' and different terms are used for it, such as Economic Value or Hedonic Value or Real Economic Value. Thus, looking into the future value of an asset or property might substitute FMV with terms like 'Risk Assessment' or 'Futuristic' or 'Prediction' Value.

A decade or so ago a month or more was required for producing a valuation report but now valuations are delivered within 4-5 days as creditors demand even shorter deliveries (with just a phone call) to accommodate their business schedules. Valuers who can deliver at that breakneck speed improve their clientele and are likely to receive more business assignments but the billion-dollar question is how quality, accuracy and timing can be maintained at such speed. Information Technology (IT), Digitalization and other technological developments are likely to accelerate such valuation process.

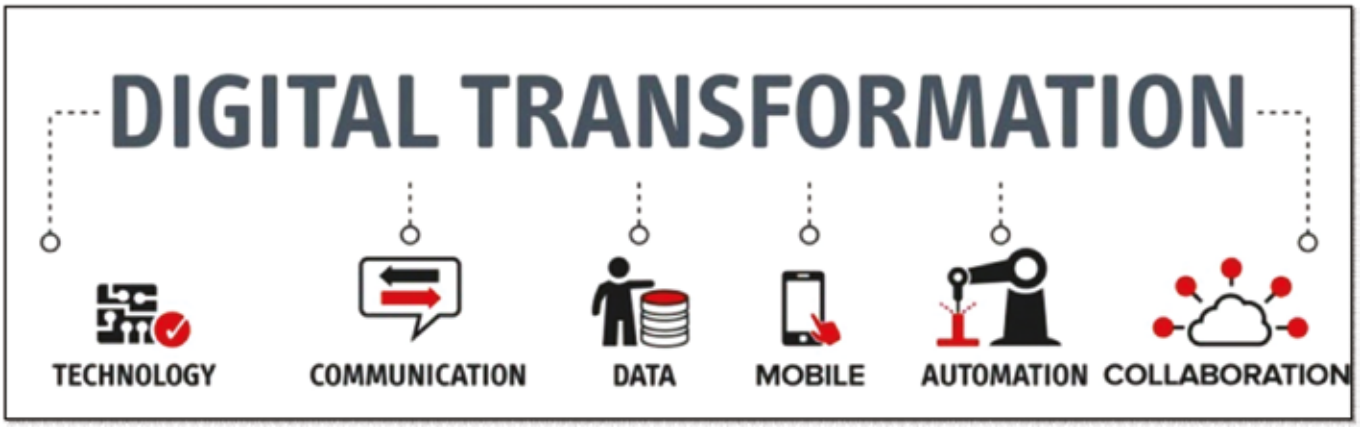
Often time is wasted in Data Mining like finding the status of the valuation, tracking the concerned team, updating bankers, allocating and reallocating jobs to engineers instead of focusing on doing critical appraisals, and generating more business? It is often because of lack of a system that can help us to automate and monitor Data Collection, Analysis & Standardizations.

The different methods of gathering, analysis & standardization of data for land are as follows:

- **Cadastral Mapping for Land Records:**

A cadastral map is a record of the extent, area, value and ownership of the land and is used for taxation purposes. They provide description and identification of a piece of land and its record of rights and they are a result of surveys depending upon such factors like terrain, vegetative cover, built-up areas, timelines, cost, etc.

1. Pure Ground Method – Suitable for small land parcels. It is adopted where Aerial Photography or High-Resolution Satellite Imagery (HRSI) is unavailable. Ground surveys capturing land attributes and other attributes (land use or irrigation status) are carried out and linked with data attributes in a GIS format to create a digital database.
2. Hybrid Technology using Aerial Photography along with ground trothing – Suitable for medium sized land parcels with plain areas/ less vegetation. Aerial photographs are generated after reference points (for positioning aerial imagery data) are generated by data collection on ground/ location. Digital database creation follows the same process



as the Pure Ground Method.

3. High Resolution Satellite Imagery (HRSI) along with ground trothing – Global Positioning System (GPS) coordinates for each ground control point (point used for corelating satellite data with ground boundary) of a land parcel are collected and processed. Cadastral maps along with ground control points are overlaid on HRSI images. After due validation, a single mosaic of all land parcels in a single village is generated. Creation of digital database then follows. HRSI option has a wider error margin and may not be suitable whereas Hybrid methodology is preferable over the Pure Ground Method.
4. Online Panoramic View of Buildings - Several companies in the world specialize in large–scale systematic visualization of environments based on 360□ panoramic photographs which are stored in online database. Their products offer the possibility to view a inspect a property online using Virtual Reality and Augmented Reality without having to visit them physically.
5. LiDAR Technology – LiDAR technology is highly efficient, provides flexibility in working, is very reliable and provides high accuracy. This is now taking over for all major survey works.

- **Block Chain Technology:**

Another relevant and recent technological development the Block Chain, which is used in Bitcoin, (a digital wallet) will revolutionize Land Record keeping. It is an algorithm-based public ledger where transactions are recorded and confirmed anonymously; a decentralized asset database that can be shared across a network of sites, geographies or institutions, requiring no 3rd party involvement. Blockchain is essentially a digital ledger, where commercial information is recorded, stored & trusted but with a key difference to traditional ledgers: Algorithms enabling collaborative creation and information storage.

All participants within a network have their own identical copy of the ledger. Any changes are reflected in all copies quickly, creating full transparency. This information is put in 'blocks 'which are then strung into a 'block chain'. Once something is in the block chain, it is there forever and anyone can check it anytime. Block chains allow transactions to move from the analogue to the digital era in a secure and transparent manner – like internet/e-mail. Once people can easily verify property records themselves and transfer a title digitally, brokers or notaries would not be required.

- **Artificial Intelligence (AI) & Automated Valuation Models:**

AI can perform a task as well or faster than a human with a higher degree of accuracy and in less time. Although AI has been around since 1965 but it is only recently that machines have begun to solve kind of problems once reserved for humans. AI and emergence of software-based programming helps in making Automated Valuation Models (AVM). AVMs can be defined as one or more mathematical techniques to provide an estimate of value of a specified property at a specified date, tagged by a measure of confidence in the accuracy of the result without any human intervention. Use of AI relies on the strength of the input data and the similarity of assets that have been used to programme the original algorithm. In future a majority of valuations would be carried out by AI systems. Big accounting firms are already changing the way they work by replacing human audit work with software.

- **Drone Inspection, Image Streaming & Recording:**

Drones are already being used to inspect property exteriors from different angles and different heights, which were not possible by human means even with aerial photographs. In many countries there are regulations and restrictions on drone usage including India and in any case service of a professional drone pilot is advised.

Not a new technology, but recording devices can also be used when inspecting the interiors of a property saving precious time of the Valuer who may use the services of a professional or anyone.

- **Visualizing – Valuation Report:**

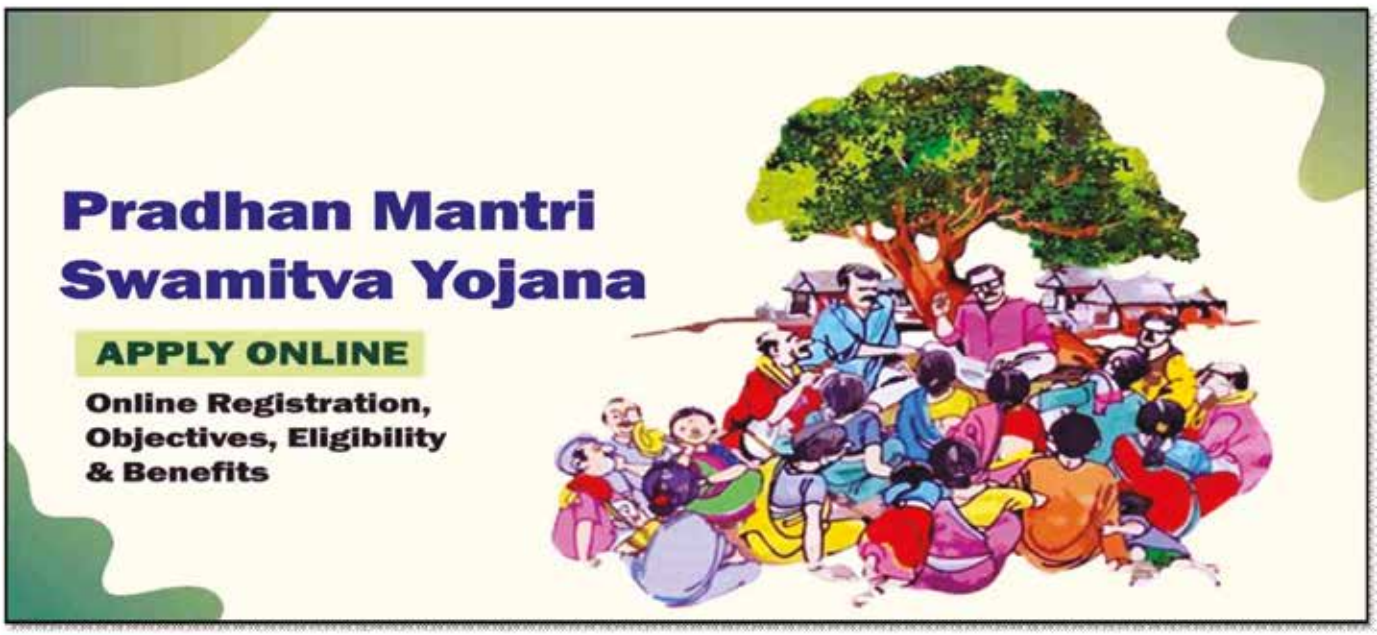
Valuation reports are still predominantly paper based and they can be very much un-inviting to read. Clients at present are only interested in two things – (i) the final value in terms of a numerical figure, and (ii) signature of the Valuer responsible. Technological developments such as videos, 3D (BIM) visualization, and the use of virtual reality could have a positive impact.

There are Made-in-India brand in Retail Valuation software designed to create better Real Estate Appraisal in lesser time with nil or lesser paperwork and also automatically incorporate the Latitude and Longitude of a property. One such software comes in 3 price ranges starting from ₹60,000/-, then at ₹3.00 Lacs up to ₹6.00 Lacs. The starting slab is for its application in mobile and web applications which are used to collect property details from the site by the field engineer and report preparation (Maker & Checker) in office by the operator and reviewer/ approver. The medium slab also has these features along with Data Entry shortcuts and Drop Downs to reduce error and rework, Deduce Functionality to replicate Valuations into various Formats to reduce effort. Lastly the top slab comes with AI for image and numerical value analysis and check the entire valuation report line by line and gives the best price/ value of a property by examining all angles.

Recently, the Union Minister of Rural Development & Panchayati Raj has issued guidelines regarding the SVAMITVA scheme. SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) scheme is a collaborative effort of the Ministry of Panchayati Raj, State Panchayati Raj Departments, State Revenue Departments and Survey of India. It aims to provide an integrated property validation solution for rural India by mapping the land parcels in rural inhabited areas using drone technology and Continuously Operating Reference Station (CORS) which would be done in a phase wise manner over a period of four years - from 2020 to 2024.It is estimated that:

- The scheme would help in streamlining planning and revenue collection in rural areas and ensuring clarity on property rights.
- The scheme would enable creation of better-quality Gram Panchayat Development Plans (GPDPs), using the maps created under this programme.

The program is currently being implemented in 6 States - Haryana, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh and Uttarakhand.



3.0 CONCLUSION

Considering the above, it seems that the futuristic technological developments would have an impact on the valuation process as a whole and potentially on the role of the valuer per se. Lesser time would be spent on investigations as data availability, reliability, accuracy & transparency increases with the use of AI, Drones, IoT etc. An added value of technological developments could be the change in the way a Valuer reports the result to the clients/creditors. That may result in fewer valuers being needed to perform the same service to clients, or to valuers spending less time on individual valuations. Not all technologies may develop as described. Certainly, these technologies will not reach maturity at the same time but certainly valuers who can embrace new digital ways of reporting would be able to provide a different level of service.

The technologies described would also help in assessing the crores of stressed accounts by a mouse-click through a common platform thus reducing the prevalent opacity. Besides, technological developments like AI would reduce the high value difference prevalent of any individual property as reported by various Indian Valuers.

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The Economic Times tech

English Edition | 17 December, 2020, 03:58 PM IST | E-Paper

YouTube, Gmail, Google Docs restored after a major outage in India, other countries

Multiple **Google** services including **YouTube, Gmail, Google Drive**, Google Calendar, Google Hangouts, Google Assistant were down for more than an hour on Monday evening after suffering a major outage in India and several parts of the world.

Google acknowledged the outage across its products on the **company's status page** at 5.25 pm, saying that "it is aware of the problem affecting a majority of users".

The outage also underlined our heavy dependence on online services for work, education, and entertainment, especially amid the ongoing Covid-19 pandemic.

Digitalization of Healthcare Facilities

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Abstract

Today digitalization is being adopted at a great pace in all aspects of life. This article is focussing on the digitalization techniques as applicable to the healthcare facilities right from scheduling appointments, integrating clinical, financial and operational information to diagnosis of critical diseases in a very efficient way with IoT applications. The areas in the hospitalization sector where the techniques can be applied are discussed and a Case Study presented.

Keywords: Digitalization, Hospital, Management, Physician, Healthcare, ICU, Artificial, Intelligence, Telemedicine, diagnostics, IoT

Healthcare systems today are being challenged on account of the growth in aging population, increase in chronic diseases and co-morbidities which have an impact on the healthcare workforce. To improve patient care and clinical experience at a cost that is affordable by all, the health care industry needs to embrace digitalisation.

Healthcare comprises of nursing homes, home care, critical care centres, medications, hospital care, patient management, clinical services, research and development. To implement digitalization in all sectors of healthcare, advanced software and server security are critical. The use of advanced technology in the healthcare industry improves the efficiency, safety and quality of service, placing the patient at the centre of the healthcare system.

Digital health refers to applying the IT principles to medical knowledge with the aim of improving the patient medical care, diagnosis and supervision. Integration of healthcare system with IT enables not only monitoring of vital parameters of the patient such as pulse rate, blood pressure, oxygen saturation etc. but also to verify as to whether the patient has taken the prescribed medicines. Digital technology can also be interfaced with Hospital Information System (HIS) for real time storage of health records thereby making the entire administration process paperless. Hospital Management software uses the information from the HIS and enhances the performance of the hospital. It also helps to reduce the errors inadvertently committed by the staff. It greatly facilitates any individual to retrieve and examine the past reports of the patients from anywhere.

The advantages that digitalization of healthcare facilities bring in are:

a) Better Doctor-Patient Coordination

Patient's medical history is available in digital form for doctor's review from anywhere before commencement of the treatment. Quick access to correct data at the right time greatly enhances patient care.

b) Improves Diagnosis

Digitalization has the potential to enhance and improve the diagnostic capabilities by better management of information flow. Using the powerful computing tools, the collected information can be organized, sorted and filtered logically such that the patient's important clinical parameters become visible for the physician to arrive at an accurate diagnosis. Computer-aided detection helps specialists to diagnose quickly and accurately by analysing the images for patterns associated with the underlying disease.

c) Automate Administrative Tasks

Digitalization reduces doctor's precious time in administrative work such as entering patient's records. Doctor's time is efficiently managed by software tools based on Artificial Intelligence which provide prescription advice and reminders. This would reduce the burden on the doctor and clinical staff allowing them to focus on treating the patients better.

d) Communication Between Multiple Physicians

The medical conditions of some patients require them to consult different specialists for taking their opinion. Digitalization helps in establishing communication among different specialists and arrive at a consensus regarding the diagnosis and the overall best medical plan on case-to-case basis. Due to the constant information sharing, the specialists would also be able to assess the progress of the treatment and make necessary corrections if necessary.

e) Real-Time Health Information

Smartwatches can monitor the vital parameters such as Oxygen level in the body, heart rate, pulse level, count the steps taken and even ECG of an individual. This data is continuously transmitted online for the Doctor to monitor the patient and take preventive action.

Digitalization requires a lot of data for clinical decision making and research purpose with quick access to data made available in the HIS database. The time-consuming exercise of data entry manually could be avoided by using voice recognition tools that can help in converting the voice to data with near accuracy. In this way real time data can be made available for further analysis and logical reasoning.

f) Improve the Quality of Care in ICU

Intensive Care Unit (ICU) has the most critical and diverse data in the field of healthcare management. Digitalization of ICU data and its analysis, to provide timely diagnosis and treatment is a complex process and a challenge to the care giver. ICU has patients with major health complications that require diverse treatments. Multiple processes being delivered to patients simultaneously would mean more patient data and less time to interpret and act which can lead to errors and misdiagnosis.

There are systems and software which can integrate clinical data from multiple sources in the hospital. Using advanced visualization tools, the data can be interpreted to generate actionable insights in a way that fits seamlessly into a Clinician's workflow. The data from the point of care is continuously monitored at the Central Station, where clinical decisions are taken based on the advanced techniques of Artificial Intelligence and then sent to the care provider to enhance the patient care.

g) Online Scheduling

Appointments can be scheduled online with reminders being sent to the patients and the individuals who have booked it. The reminders are sent on a day prior to the scheduled appointment. Automated e-mail and text message reminders are sent when a specified amount of time has elapsed between appointments.

Online scheduling system benefits both – the Administrative staff and the Patients /person who book the appointments. Staff can spend less time on booking the appointments over phone and managing them, thereby freeing up their schedule for more important and pressing tasks. Those who wish to book the appointments can also save time, by making the

bookings online easily, rather than calling their medical, healthcare or wellness provider.

h) Telemedicine

Telemedicine is a system in which without personally visiting the patient, clinical service is provided using electronic communication and software. This technique is frequently used for follow-up visits, management of chronic conditions, medication management, specialist consultation and many other clinical services that can be cater remotely via video and audio connections.

Telemedicine have host of benefits as mentioned below for both the patient and the health care provider.

Patients enjoy:	Health care providers enjoy:
• Normal working hours are not hampered • No travel expenses or time • Don't get exposed to potentially contagious patients.	• More revenue • Increased efficiency • Appointments and cancellations are not missed • Patient follow-up is regularised, and health outcome is improved • Education can be provided whenever required

IoT in Health Care Facilities

Healthcare organizations worldwide are moving towards advanced techniques like Artificial Intelligence, Machine Learning, Big Data and 3D Printing.

Artificial Intelligence and Big Data provide many benefits for individuals and companies which enable:

- Patient with self-service using chatbots
- Faster diagnosing of patients with computer-aided tools
- Molecular structure to be examined by analysing image data - Radiologists can do better diagnosis of patients, and
- Availability of more insightful clinical data for personalizing treatments.

Application of 3D Printing include preparation of 3D models for precise understanding of the anatomical particularities of a patient to prepare for complex operations.

What Health Care Management System should consist

The system should be very user-friendly and provide information in an organized and systematic manner. Providing results that positively impact the safety and quality of patient care, by having their clinical information instantly available across the network is very important.

The tool should be robust, open and on an interoperable technology platform with integration of the best practices, of international and national quality standards, ensuring very effective clinical interoperability.

The health care management system should have the following features:

- Optimize healthcare processes by reducing waiting times for patients.
- Increase prescription safety for patients through integration with standardized drug databases and the creation of drug alerts.
- Improve data quality with the implementation of the Electronic Health Record.
- Increase patient safety and diagnostic accuracy.
- Integrates with various clinical and administrative systems for pharmacy, laboratory, radiology, and blood banks
- Reduce time spent on administrative duties.
- Different medical specialties shall be able to interact with one another Reduce costs by avoiding duplication in diagnostic tests.
- Interoperate with clinical and administrative systems.
- Ensure compliance with national and international standards and regulations.

Paving the Way for the Future

Healthcare industry should focus on generating solutions that work effectively in the existing as well as new setups, so that hospitals can realise the full value of their investments.

To achieve digitalisation, hospitals would require technology which is easily scalable as per their needs. It would help healthcare facilities to overcome the challenge of digitalisation to manageable level by digitalising initially in most critical areas. To achieve that objective, healthcare industries should consider vendor-agnostic platforms that provide support and help customers to customise the features based on their budget.

Most of the new healthcare facilities coming up are adopting digitalisation with paperless concept. In addition, many existing healthcare facilities are transforming their systems towards digitalisation. However, the small healthcare setups, polyclinics, specialist and general physician having individual clinics are still operating with manual systems. For such setups, there is a need for developing affordable systems, which can collaborate with all of them by establishing a good database related to various medicines, contact details of doctors, diseases, diagnostic symptoms, pharmacies, diagnostic labs, etc.

Case Study

TCE engineered a medical centre with state-of-art facilities. The medical centre has around 150 bed and is one of India's first world class comprehensive Research Centre. It houses the most advanced technologies in healthcare, offering hope and strength to the patients and their families. It has advanced facilities that foster communication and interaction among patients, families, clinicians and researchers in addition to having soothing open spaces and greenery.

The medical centre has an Integrated Building Management System (IBMS) which integrates various system and utilities such as highspeed LAN, IP based EPBAX, Access Control System, IP based CCTV system, Smoke Detection and Alarm system, Fire-Fighting system, Emergency Evacuation system, Security for Radioactive Material Storage, Public Address and Music system, Building Utilities viz. HVAC, WTP, Medical Gases, DG set, UPS, Energy Monitoring system, etc. The complete complex was provided with various levels of security at Perimeter, Entry/ Exit, Access Control doors in all critical areas with a CCTV system.

The facility has been provided with state-of-art Nurse Call system which eliminates the need for noisy distracting overhead paging systems. The nurse call system uses advanced IP communication technologies - it includes wireless IP phones provided to each nurse and Doctor. Push buttons or IP phones are also to be provided near each patient bed. In case a nurse does not respond to the call it would be automatically forwarded to higher ups for immediate action.

The medical centre is provided with Hospital Management System which enables health professionals to perform their jobs effectively and efficiently. It manages and integrates clinical, financial and operational information. The integrated system is designed to handle all the procedures of the hospital, such as Electronic Medical Record (EMR), Revenue Management, Patient details, Administration, Appointment booking, Billing, Medical History of the Patient, Bed Management, Drug Management, Inventory Management and so on. The system has made the Medical Centre completely paperless.

The Impact of the Coronavirus on the Global Consulting Industry

Gautam Chheda
Chief Operating Officer (CEO)
Sglobal Acumen Private Limited

Ravindra Shrivastava
Assistant Professor
National Institute of Construction Management & Research (NICMAR)

The coronavirus pandemic has already had a huge impact on economy in general – something which has of course had a knock-on impact on consulting. Just exactly how much of a dent on the industry's growth Covid-19 has had is extremely difficult to tell, but in a new forecast, researchers have tried to put a number to the damage, and have found global consulting could lose some $30 billion of value in 2020.

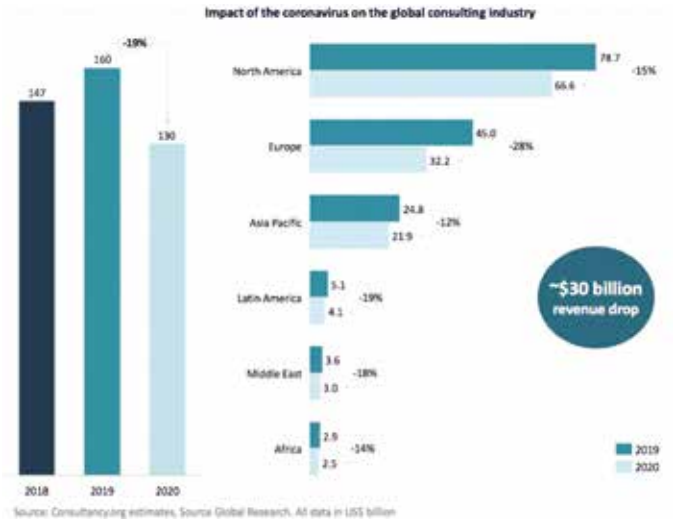
The global consulting industry has grown strongly in the 12 years since the last financial crisis. The planet's consulting scene is now worth a combined $160 billion, but with the coronavirus having pushed many sluggish economies to the brink of a recession, clients are delaying projects, decreasing their scope or cancelling them all together. As a result, the revenue of consulting is taking a big hit.

To understand what this impact of this is likely to be, researchers from Source Global Research has gathered the views of hundreds of consulting firms from around the world. The group has subsequently estimated that Covid-19 could reduce the size of the consulting industry by 19%, from $160 billion in 2019 to $130 billion in 2020, with the second and third quarter of 2020 expected to be the worst periods for negative growth. While the good news is that Source anticipates a rapid recovery, which will likely commence before the end of the year, there will be large variations across regions, countries, industries and firm types.

Regional breakdown

The world's largest national consulting market remains the US, which accounts for around half of global consulting demand. So far, the country has only seen a limited level of domestic disruption; but many believe it will quickly catch Europe's larger Covid-19 cost. While consultants in the region are already taking precautionary steps to mitigate this, Source still anticipates that the North American market will shrink by more than most US and Canadian firms currently expect – possibly by as much as 15%.

On the other side of the Atlantic, feedback from firms in Europe has led Source to estimate that demand across the continent may fall by 28%. The large manufacturing base of German consulting will be particularly impacted



by disrupted supply chains, and could shrink by more than this, along with Britain, where consulting is already experiencing its lowest growth in seven years, and forecasts have notably been downgraded because of Brexit. Italy, the current epicentre of the outbreak in the region, could fall even more sharply.

As was the case after the 2008 global financial crisis, Europe is likely to recover at a slower rate than the US, as American clients tend to show greater willingness to leverage consulting services, and adopt new technology in business. By comparison, Asia is likely to see the lowest impact of any region, due to how effective China was in containing its initial outbreak. As a result, clients in some parts of Asia Pacific are already looking beyond the crisis, albeit cautiously.

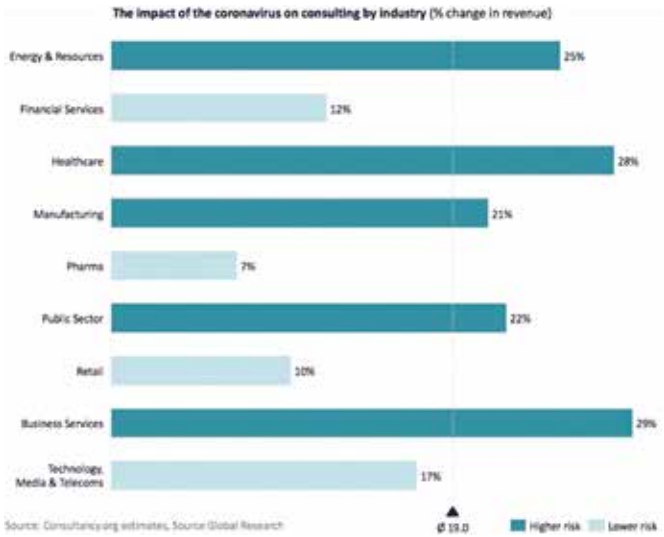
Elsewhere, Latin America is likely to be hit much harder than North America – enduring a drop of 19%. The Middle East is forecast to see a similar 18% shrinkage, while Africa will see its revenue fall by 14%.

Industries

It is important to note that Source's research features forecasts which are something of a worst-case scenario, and intended to be directional only in helping companies prepare for what may be to come. As with the virus' spread, everything is changing very quickly, so predictions can and will inevitably change. With that being said, it is already clear that certain industries will not be able to weather the storm as well as others – and this will have a knock-on effect on the consultants offering services to these sectors.

The financial services sector is likely to fare better than most, but will still contract. Contrary to the financial crisis, when they were bailed out, most institutions have improved liquidity. As they are now better capitalised, banks have the buffers to play an active role in supporting the economy back to recovery, meaning banks will be deploying initiatives, and in a continued competitive environment they continue to invest heavily in digitisation.

Private equity firms will also likely continue to invest



in consulting work, as they seek advice on deals in the latter part of the year. Firms in the sector are likely to be very cautious in the short-term, but Source expects they may become more active in Q3, as valuations fall, giving them an opportunity to cheaply buy companies. Elsewhere, the picture is far less rosy, however.

Source's modelling suggests that the demand in the services sector, which includes leisure and airline companies, will shrink. This can already be seen by the fact many airlines – desperate to negate collapsing incomes – have decided to cull their consulting spend. While this mainstream consulting will be partially offset by a growth in restructuring work, revenues from the sector will still likely take a 29% hit. Relating to this – as travel restraints will see less need to buy fuel – demand in the energy and resources sector is also likely to drop dramatically. Lower oil prices will be a key factor, with consultants in the sector seeing revenues fall by a quarter as a result.

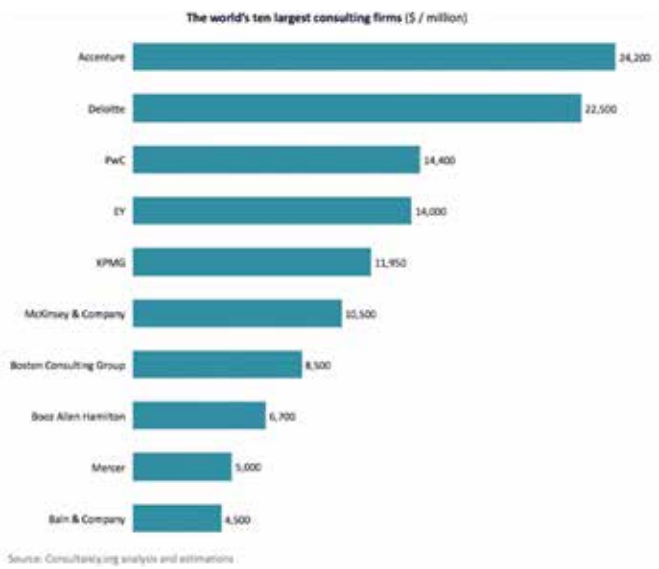
Oddly enough, amid the strain the Covid-19 crisis is placing on public healthcare, consulting in health is likely to see a precipitous drop in demand. While consultants have repeatedly trumpeted their importance in the sector when it comes to saving resources, improving patient experience and doing more with less, when push comes to shove most healthcare clients will not see value in allocating resources to consultants at this time.

The more urgent matters of treating the virus will see a big drop in revenues here, and whether they recover depends on whether the sudden strain placed on underfunded healthcare systems prompts governments to row back on their policy of privatising such systems. If there is such a change, then adequately resourced health systems may have less demand for consultants to help them scrimp and save. If the world does see a return to business as usual, however, consultants will undoubtedly be called in to help hospitals address the severe lack of capacity exposed by Covid-19.

The prospects for public sector consulting more broadly are likely to vary by country. Some firms are already reporting projects being put on hold as time and money is focused elsewhere, but others are continuing, especially where long-term technology projects are concerned.

Firm Types

The exposure of individual firms will vary based on the services they provide and industries they serve. At a time like this, diversity and the ability to adapt will be critical. As a result, multi-faceted firms which cater to various clients will undoubtedly come out of this crisis in the strongest position. However, for firms of all sizes, the key challenge will be how effectively they can rebuild their pipelines and convert sales during what are likely to be at least two very challenging quarters.



The hardest hit services will be those where the work involved involves time on clients' site and travel. Having been booming until very recently, then, change-related work and many aspects of operational improvement are suddenly suffering – particularly in Europe. On the other hand, as the work is often done in the consulting firm's office, strategy work will be less badly affected.

Another form of work to survive relatively unscathed will be long-term technology projects. Again, because so much of the work can be delivered remotely, this work can continue despite travel disruption. At the same time, as many of these long-term projects will have already begun, clients will be reluctant to shelve them at this point and lose the investment they've already made.

Again, this state of affairs will suit large firms best, as they tend to have the reputational clout to attract the biggest and longest projects, which clients are more reluctant to cancel. Brand recognition is a massive advantage at times like these; as was the case during the global financial crisis, clients will only invest in consulting during periods of economic upheaval if the work is delivered by a major firm. Meanwhile, smaller firms may further suffer as the market's largest competitors can afford to cut their rates, eating into the market share of the challengers who had so recently disrupted the market with their lower costs.

Coronavirus impact by region

For more information on the impact of the coronavirus on consulting have a look at Consultancy.org's more detailed analysis by region:

- US: coming soon
- Europe: Europe's consulting industry hardest hit by Coronavirus
- UK: UK consultants fear Coronavirus will spark a huge drop in fees
- Netherlands: Consultants vrezen inhuurstop en recessie door coronavirus
- Asia: coming soon
- Middle East: coming soon
- Africa: Africa's consulting market may drop by 14% due to Coronavirus
- Latin America: Latin America's consulting industry faces hit due to Coronavirus

CEAI NEWS

Webinar on Emerging Technologies in the Infrastructure Sector – AI/Ml, Lot, AR/VR

The infrastructure sector is the bedrock of human habitat. The emerging landscape of the 21st century is putting enormous pressure on the various aspects of everyday living for all sections of society. While professional consulting engineers are tasked with the challenges of developing solutions, a myriad of international bodies are together collaboratively developing a new lexicon to understand and communicate the scope of work envisioned and define the metrics for sustainability and liveability.

In our daily lives such changes are imperceptible. However, if we were to look back into the past decade or two, we can easily identify significant changes in the way we live and work. The telecom revolution has ensured that reliable internet connectivity is available at least in urban areas giving rise to multiple channels of communication and entertainment thus shunting the plain vanilla analogue telephony to become a relic of the distant past, in only a little over two decades period. With the upcoming 5G telecom networks and low orbit satellites, perhaps only 2 years away, far better bandwidth and internet access would be available in the remotest parts of the country, even in the Himalayan peaks, Rajasthan deserts and distant islands. Will that create a demographic shift from our crowded cities to tier 2 or tier 3 towns or further into the hinterland?

This is already happening even in the global context! A productivity App developer, Zoho, a Nasdaq listed company, that was based in the US has shifted its headquarters two years back to a village in Tamil Nadu on the outskirts of Chennai. The software development team as well as the technical support for global operations operate from a rural setting but with all the amenities of a modern technology company.

A clutch of technologies that have been under development independently over the past several decades have reached a price performance ratio that has made it abundantly accessible and affordable.

For instance, sensors have been in use in the hydrocarbon sector for decades. In the mid- 1980s the offshore fields of ONGC at Bombay High were being managed remotely from their workstations in Mumbai by collecting operational data using Digital Equipment Corporation's DEC/VAX computers and microwave telecommunications connectivity. Moreover, all refineries and petrochemicals had advanced systems collecting process data and being managed from the control room.

Today a wide range of digital sensors are available at a fraction of the cost and requiring very low energy for operations and data transmission, for being able to provide services and form the backbone of Internet of Things (IoT). Prof. Vincenzo Piuri, a Full Professor in Computer Engineering at the University of Milan, works in the area of environment management and pollution control. He has developed low cost and flexible wireless devices that can be installed on the windows of houses and buildings; by using Artificial Intelligence (AI) techniques to measure and monitor the data, predictive analysis could be made for the next few days. Thus, artificial intelligence tools would need to work with large volumes of data, which is termed as Big Data.

Devices and sensors that generate, communicate, and share data via the internet is increasing rapidly. By analysing their Big Data, organizations can make better decisions and improve their own performance.

However, this analysis creates its own challenges with the volume of data and the shortage of the skills needed to perform the analysis. Data scientists are in

high demand, but there is a significant shortage in the industry. To overcome this bottleneck governments and large corporates need the use of Machine Learning (ML) systems. These have the potential to replace, or at least boost the productivity of the hard-to-find skilled data scientists.

The world today is faced with innumerable pressing problems that are inter-related. They affect the livelihood of the growing billions in countries rich, middle-income or poor. The problems are related to Climate Change, rapid urbanisation, unbearable levels of pollution, increasing demands for energy, clean potable water, managing urban waste, mobility and transportation and demand for non-renewable natural resources. The list goes on ...

There is a complete re-think of the model of industrialisation that we have followed upto the end of the 20th century. There is a growing realisation for a sustainable and carbon neutral economy based on more efficient usage of energy and resources and moving towards a circular economy. These are backed by emerging concepts that we need to learn and new terminologies that we need to apply,

UNEP has a publication titled *'The ABC for Sustainable Cities - A glossary for policy makers'* in the context of the agenda 2030 for sustainable development making cities inclusive, safe, resilient and sustainable.

The World Green Building Council has come with its recommendation for net zero infrastructure for meeting the sustainable development goals. *"... in the race to curb global greenhouse gas emissions so that the global temperature RISE remains below 2 degree Celsius and ideally below 1.5 degrees Celsius. To that effect all new buildings must operate at net zero carbon from 2030 and 100% of buildings must operate at net zero carbon by 2050."*

This throws many challenges to engineers and technologists to conceive, design, develop, plan and implement engineering solutions to the problems at hand. Fortunately, we are at a tipping point of convergence of technologies that provides us with a range of tools to help us transform the abstract to reality. Some of the more obvious emerging technologies in this respect are Artificial Intelligence (AI), Machine Learning (ML), Big Data, Data Analytics, Internet of Things (IoT). And all these technologies ride on high-speed telecommunication networks.

Such technologies are no longer arcane or futuristic. They are very much all around us and being implemented as a matter of routine project delivery. For instance, the municipal development authority GMDA has started installation of Red-Light Violation Detection (RLVD) cameras in Gurugram. In the 1st phase 1,200 cameras will be installed at 222 locations (more than 700 have already been installed) and 800 cameras will be installed at 136 locations in the 2nd phase. The cameras are installed with artificial intelligence software for detection of speed, helmet, and parking violations, pothole & garbage detection, water logging, and crowd and vehicle count among other things and are being monitored at the Integrated Command & Control Centre.

Similar initiatives are being undertaken in many other regions under the Smart City program.

This process of digitalisation requires a Digital Mindset in the workforce at all levels. The work environment has become fast-paced with the need to learn, understand and absorb new knowledge quickly by being truly agile.

> *"The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn."*
>
> ***Alvin Toffler***

Formidable visual interactive tools are available to help in the learning and work acceleration process. These are technologies like Virtual Reality (VR), Augmented Reality (AR) and Extended Reality.

At the CEAI webinar on the above topic, held on 16th October 2020, Ananth Kitappa, Founder Vector Solutions, presented a bird's eye view of the developments that have taken place in the past 3

decades in this field and how VRAR could be used today to provide a realistic view to the stakeholders of an engineering project from design to procurement to construction. This would assist in tracking quality of construction by using Mixed Reality headsets. He also explained how VRAR could be a useful tool for training and teaching purposes.

In the same webinar, Suhas Bhagwat, former Vice President Hydrocarbon Engineering Larsen & Toubro provided a consultant's perspective on VRAR in the Oil & Gas Sector. He opined that for a company adopting technology solutions it must be a strategic decision. One must examine by asking questions: Does the adoption of technology help your process? Does it help to improve your efficiency or profitability? By earlier or faster adoption of technology does it enable you to be ahead of the competition? He exemplified the advantage of using VRAR at a hydrocarbon installation site where a maintenance engineer could seek the advice of an expert, remotely located by communicating with the use of mixed reality glasses.

Somnath Mitra, a digital transformation advisor, covered aspects of Building Information Modelling (5D BIM), Digital Twins, Unmanned Aerial Vehicles (Drones), etc. He elucidated on the application of Construction 4.0 for Smart Cities, Mass Rapid Transport System, Airports, Malls, Campuses, Smart Utilities (Water, Sewage, Power Distribution) and Energy.

The first speaker Prof. Vincenzo Piuri, explained that technology adoption is taking place at a rapid pace and the future is going to be different. What lies ahead will be very different from now in the way of working and way of living. He talked about his work on developing infrastructure solutions for monitoring tracks of high-speed trains and using Biometrics with behaviour analysis for surveillance at airports.

The webinar was introduced by Mr. Amitabha Ghoshal, President CEAI and enthusiastically moderated by Pradeep Khanna, Executive Director Asia Pacific, VR AR Association.

The enablers in the accelerating pace of change are well enunciated in a blog by Frank Diana. He said "*The convergence of multiple forces are driving this very fast future and as these intersections occur, that pathway to a very different future opens wide.*" There are seven forces that in effect accelerate the current acceleration dynamic:

- Saved Time
- Availability of Capital
- Genius
- Longer Lives
- Demonitization
- Communications Abundance
- New Business Models

In the Proceedings of ASCE Summit, June 2006, The Vision for Civil Engineering in 2025 was discussed and debated. The conclusions drawn at that time of the scenario looking ahead by 20 years are as follows:

> "In 2025, the civil engineering enterprise is focused on fast-track development and deployment of technologies using highly integrated planning and construction tools. Intelligent infrastructure, such as, embedded sensors and real time onboard diagnostics have led to this transformation of rapidly advancing and adapting high value technologies. Real time monitoring, sensing, data acquisition, storage, and modelling have greatly enhanced prediction time leading to informed decisions. Intelligent sensors have put productivity at an all-time high. Smart chip technologies enhance materials tracking, speed construction, and reduce costs. Wearable computing devices facilitate communication among onsite engineers, workers, and inspectors and provide access to remote documents and resources across global divides."

The Strategic Plan of CEAI that was released last year for the six-year period from 2019 to 2024 has also emphasised on Technology Frontiers as Enablers for Change.

"We are at the cusp of change that will impact us dramatically at work, at public spaces and at home. If we were to prognosticate, it is very likely to alter the way we work and play in the six-year period of this Strategic Business Plan of CEAI. Therefore, it is imperative that we factor in the drivers of change and be aware of the skillsets, new learnings and application of that knowledge."

Conclusion

In his concluding remarks, the CEAI President, Mr. Amitabha Ghoshal said that this has been a learning experience. He thanked the panellists, the moderator and the attendees. In this Diamond Jubilee year CEAI has planned many such events throughout the year, including more such webinars on emerging technologies. He ended with his words that we must work together to jointly transform India.

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Meida Reports are given in the below links:

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https://dwarkaparichay.com/blog/engineers-urged-to-adopt-emerging-new-technologies-to-increase-business-prospects/

Webinar On "Dam Safety & Instrumentation"

November 6, 2020

Programme

3:00 *Opening Remarks* - ***Dr. Ajay Pradhan****, VP, CEAI. Moderator of the webinar*

3:05 *Welcome* – **Amitabha Ghoshal**, President, CEAI

3:10 *Dam Safety in India – Status and Issues*, **Mr. Masood Hussain**, Former Chairman, Central Water Commission, Ministry of Jal Shakti, Government of India

3.55 *Design, Construction and Operation Aspects of Dam Safety- A Case of Tehri Dam Project*, **Mr. Rajiv Vishnoi**, Director, Technical, THDC Ltd.

4.30 *Experiences of Interstate River Velley Projects and Dam Safety and Instrumentation – A case of multi-stakeholder operation and management*, **Dr. Mukesh K Sinha**, Executive Member, Narmada Control Authority, Government of India.

4.45 Consideration Design Aspects of Dam Safety and Instrumentation – **Mr. Satish Sharma**, CEO, RODIC

5.00 *Discussions and Q&A*

5.20 *Vote of Thanks & End* - **President, CEAI**

Summary and Take-Aways

Dr. Ajay Pradhan, Vice President, CEAI provided an overview of the institutional and regulatory framework for Dam Safety in India. He underscored the prominent role dams have played in the rapid and sustained economic and agricultural growth in India, with 5,264 large dams completed and 437 under construction as of 2018. Budget constraints on maintenance and repair, combined with aging of significant dams and capacity gaps mean dam safety is becoming an increasingly important issue. Dams and Reservoirs are temples of Modern India as rightly told by our first Prime Minister Jawaharlal Nehru during the laying of the foundation stone of the Bhakra Nangal Dam. India is the third largest country in term of number of dams. India has over 5700 dams and has invested a huge amount in building these infrastructures which are continuing to fulfill the demand of water for irrigation, flood control, drinking water supply, energy, food production and overall mitigating climate change.

Recent dam incidents and failures have underscored the need to strengthen institutional frameworks for dam safety, reinforce risk management and dam safety practices, and enhance emergency preparedness strategies. Like any major infrastructure, hydropower infrastructure can often succumb to a costly and inefficient build-decay-rebuild cycle. It is possible to mitigate this pattern through proper management, efficient maintenance, and rigorous maintenance. Failures can be triggered by extreme events (earthquakes, floods, etc.) and by incremental processes (cracks, instability, etc.) crucial to the structural integrity of assets. The likelihood of an event undermining the safety of a dam can be reduced through careful risk assessment, project design, construction, operation and maintenance, inspections and monitoring, and regular dam safety review. This webinar covered institutional aspects of dam safety, issues and status, multi-stakeholder projects, instrumentation, design, construction and operations aspects from operator and designer perspectives.

Mr. Amitabha Ghoshal, President CEAI welcomed the participants and informed that the current webinar is under the Diamond Jubilee Webinar Series of CEAI. He highlighted the role of CEAI and importance of Dam Safety and Instrumentation in India.

Mr. Masood Hussain, outlined the status of Dam Safety and Institutional Framework in India and the issues related to Dam Safety and Practices. He added that India has a very robust organizational framework for dam safety with a National Committee on Dam Safety at the apex level. He also spoke about the necessary for creating National and State level dam safety organizations including bringing in the Dam Safety Bill 2019.

Mr. Rajeev Vishnoi, Director (Technical). THDC Ltd. made a very detailed presentation on Dam Safety and Instrumentation including monitoring of Tehri Dam, which is the largest rock and earth fill dam in Asia located in the most vulnerable seismic region in the Himalayas. He highlighted the approach and the monitoring system of the various components of the Dam Structures in a very conservative manner. He informed that THDC Ltd. has created a detailed Training Manual and Dam Safety Audit through national and international panel of experts and agencies like US Bureau of Reclamation, USA and National Committee of Dam Safety.

Dr. Mukesh Sinha, Executive Member Narmada Control Authority, Government of India which is an Interstate River Valley project, highlighted the challenges of multi state and multi stake holder project including operation and management taking the case of the Sardar Sarovar Dam, the largest and terminal dam on the Narmada River. He also presented the work in progress of instrumentation and operations of dams including inflow and flood forecasting using telemetry.

In his presentation, Mr. Satish Sharma, CEO RODIC Consultants brought in several Dam Safety and Monitoring aspects from design point of view. He highlighted Risk Management during construction including monitoring during and after construction of the dam. Thereafter regular monitoring and training during operation of large structures like dam. He also talked of Emergency Action Plan during high inflow and contingency in case there is a failure of a dam.

Mr. Amitabha Ghoshal, President CEAI gave the concluding remark and thanked all speakers and participants who were over 365. That indicated the attention that of the one of the most challenging aspects of engineering structures deserves. He briefly mentioned about CEAI activities and the 60 years celebration with future programs and invited participants to become members of CEAI and add to its strength.

Webinar on Asset Management- Need of the Hour

As a part of a series of events celebrating the Diamond Jubilee Year, CEAI's Eastern & North-Eastern Zone organized the fourth webinar in the series on the theme ***"Asset Management- Need of the Hour"*** on 19th November 2020.

The event was most informative on a subject that is usually neglected by the owners of public and even private assets. The topics covered by the speakers, leading experts from academia, industry and infrastructure included Importance of Asset Management and ISO 55000; Engineering Asset Management Systems; Integrity Management Issues and Digital Technologies; and Highway Asset Management.

The webinar was introduced by Mr. Amitabha Ghoshal, President CEAI and ably moderated by Dr. Harshavardhan Subbarao, CMD of Construma Consultancy Pvt. Ltd, Mumbai; he is also Member of the Governing Council and the Chairman CEAI Western Region Centre.

The first speaker was Dr. Nevil Shetty, Director, Fellow & Technical Chair for Asset Management in Institute of Asset Management (IAM) and leads Atkins/SNC-L's Centre of Excellence in Asset Management & Operations with over 25 years in professional field. He serves on the ISO TC251 Committee on Asset Management and has played a leading role in the development of ISO 55000. In his presentation, Dr. Shetty defined asset management and its principles, concepts and standards with particular stress on why it was the need of the hour for India. He touched upon Digital Asset Management including the concept of digital twins. He advocated pursuing Asset Management as a profession after training from IAM.

The second speaker was Prof. Pradip Kumar Ray, Dean, Vinod Gupta School of Management, IIT Kharagpur. He did his PhD in Productivity Engineering and Management of Manufacturing and Service Functions and has 38 years of experience in academics as well as in the industry globally. His topic of presentation was "Engineering Asset Management System: Implementation Challenges". Prof. Ray enlightened the

audience on the importance of establishing systematic and coordinated activities and practices through which an organization optimally manages its assets and their associated performance, risks and expenditures over their lifecycle for the purpose of delivering the organization's business objectives.

The third speaker in the programme was Mr. Subrata Mitra, JMD (Retd.), M. N. Dastur & Co (Pvt.) Ltd. having worked extensively in conceptualization, planning and seeing through implementation of many steel plant projects in India and abroad. He made a presentation on "Integrity Management Issues & Digital Technologies" which is a rarely discussed subject. Mr. Mitra stressed on the need to inculcate the culture of integrity and accuracy in all aspects of asset development such as in design & engineering, manufacturing, operation, maintenance and in interactive functioning. He extolled the scope of digital technologies in achieving asset integrity.

The fourth and final speaker was Mr. Partha Pratim Choudhury, Sr. Vice President with Bharat Road Net Work Limited (a part of SREI Group) who over two decades of rich experience in the field of large sized highway/ roads/ expressway development in PPP /EPC mode. His topic was "Management of Highway Assets- Present & Future". Mr. Choudhury, while giving an overview of the highway sector in the country, drew attention to the factors that influence the management of highway assets, which have been developed extensively in the last two decades. In consonance with the underlying theme of the webinar series, the role of technology in efficient asset management of highways and road structures was highlighted by the speaker.

The deliberations were aptly summed up by panelist Mr. Kishore Kumar, whole-time Director of a multi-sectoral infrastructure consultancy organization, M/s Aarvee Associates, Hyderabad, with 22 years of experience in design, supervision, O&M in BOT and non-BOT projects across the country and abroad. He was quite emphatic in his views about the present trend of asset creation and management. He also stressed on the need for constructing as per the designs and drawings of the consulting engineers.

The webinar was captivating; lasting close to 3 hours with the attendees participating enthusiastically.

In his concluding remarks, President Amitabha Ghoshal thanked the speakers, the panelist, the moderator and the attendees for their participation. He informed that in this Diamond Jubilee year, in spite of the pandemic disruption, CEAI was planning to organize many more engagements on topics of transformative nature.

Webinar on Digitalisation in Engineering

The fifth webinar in the series of Diamond Jubilee Celebrations was held on ***'Digitalisation in Engineering'*** on 18th December 2020.

Dr. Rajashekhar Malur, Chairperson, Southern Regional Chapter and Member, Governing Council, CEAI introduced the theme on digitalisation in engineering which cuts across domains and industries. He highlighted the importance of domain expertise vis-à-vis technology and wondered whether it is physics or data that would govern the future. Engineering community that is known for domain expertise should reinvent themselves in this fast-changing world. As India approaches its 75th year of Independence, the country is embracing digital and engineering consultants must be involved in enabling the same.

Mr. Amitabha Ghoshal, Immediate Past President CEAI welcomed the participants and informed that the current webinar is under the Diamond Jubilee Webinar Series of CEAI. He highlighted the role of CEAI and the importance of Digitalisation in Engineering.

Mr. Amit Sharma, Managing Director and CEO – Tata Consulting Engineers (TCE), delivered his keynote on *"Engineering Digitalisation and Innovation Driving Industry 4.0"*. He brought out the key drivers for going digital with reduction in capex spending, VUCA in global economy; and discussed the prevalent digital technologies and their uses. He demonstrated digital initiatives in TCE and further presented enterprise level case studies and point solutions across power, hydrocarbons and metals industries. He also proposed a digital maturity model.

Mr. Sudheesh Narayanan, CEO – Knowledge Lens, highlighted the evolution of Industry 4.0 and talked about integration of operating technologies and information technology. Mr Sudheesh brought out the importance of data analytics, big data, machine learning and artificial intelligence.

Mr. Alok Nanda, CTO – GE South Asia and CEO – GE India Technology Centre, discussed case studies across aviation, power and healthcare industries. He mentioned the importance of technologies such as visual analytics, artificial intelligence and machine learning in optimizing component life in an aircraft engine or a gas turbine and further, the role of digital in ensuring quality healthcare at affordable costs reaches the needy.

Following that, in a panel discussion that covered questions from the audience, the speakers were of one opinion that technology and domain expertise; physics and data go hand in hand in solving challenges and one can never replace the other.

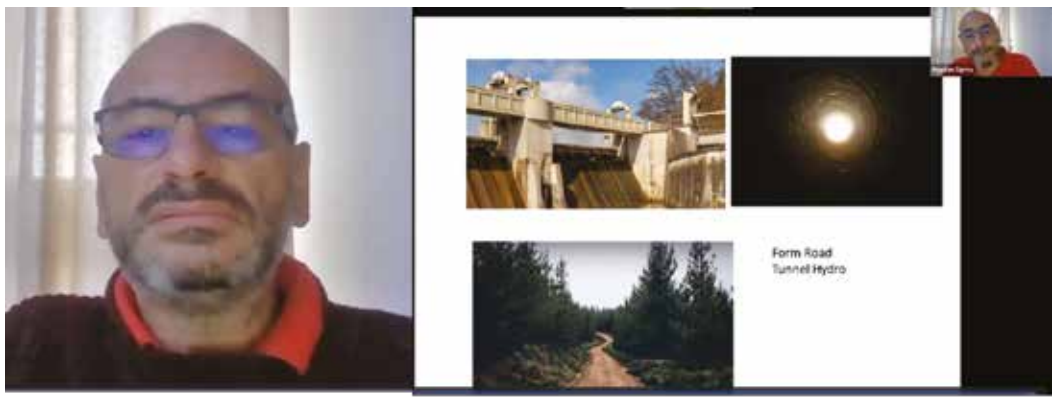
Fidic Training Program

CEAI organised its first ever online FIDIC Training Program on 20-21 and 27-28 November 2020. The training was held on ***"Management of Claims & Dispute Resolution"***. The course was organised for the employees of National High-Speed Rail Corporation Ltd (NHSRCL). The feedback received from the participants was very encouraging.

The scope of the training was to explain and illustrate how to use the FIDIC 1999 Conditions of Contract.

Mr. Bogdan Oprea, FIDC Accredited Trainer from Romania, conducted the training.

Mr. Bogdan Oprea – Training Course in progress



CEAI Governing Council Election

The election process for the Governing Council 2020-2022 has been concluded on 27th November 2020. The results were declared on 28 November 2020.

Election was held only for the Member (Individual) category. The following were declared elected:

1. Dr Ajay Pradhan
2. Mr. K K Kapila
3. Dr Samarjit Chatterjee
4. Mr Sudhir Dhawan
5. Mr Sunil Srivastava

For the 14 vacancies in the Member (Organisation) category, 14 nominations were received. All the 14 nominations were treated as elected.

S. No	MEMBER ORGANISATION	Represented by
1	Aarvee Associates Architects, Engineers & Consultants Pvt Ltd	Dr Dhaval M Parikh
2	Balaji Railroad Systems Ltd	Mr. Navin Kumar Jha
3	B&S Engineering Consultants Pvt Ltd	Mr. Alok Bhowmick
4	Construma Consultancy Pvt Ltd	Dr. Harshavardhan Subbarao
5	Design Forum India Pvt Ltd	Mr. C J Ragunathan
6	Holtec Consulting Pvt Ltd	Mr. P K Mittal
7	Intercontinental Consultants & Technocrats Pvt Ltd	Mr. Prashant Kapila
8	Mantec Consultants Pvt Ltd	Mr. Arvinder S Brara
9	Mott MacDonald Pvt Ltd	Mr. Amit Kumar
10	PEMS Engineering Consultants Pvt Ltd	Mr. M R Moorthy
11	R C Bysack	Mr. Gautam K Bysack
12	Saviram Engineering Consultants Pvt Ltd	Mr. Girish Mishra
13	Tata Consulting Engineers Limited	Ms. Sayona Philip
14	Theme Engineering Services Pvt Ltd	Mr. Tarun Rawat

Mr. B R Jain, Advisor of Engineering Council of India, was the Returning Officer for the Election.

New President of CEAI

During the first meeting of the newly elected Governing Council Members for the tenure 2021-2022, held on 5th December 2020, Dr Ajay Pradhan was unanimously elected as the President of CEAI for 2021-2022. Dr Ajay Pradhan is the President & CEO of C2S2 Consulting Engineers Pvt. Ltd. and has over three decades of experience in planning, designing and implementing infrastructure projects. He has been a consultant to the Planning Commission, and a scientist in Designing and Modeling Group of National Informatics Centre, Government of India. Prior to this he worked in (CH2MHill and Halcrow) JACBOS India as Managing Director, Founder Director and Managing Director for DHI (A Danish International Water & Environment Institute) in India. His key practice and research areas include technology intervention in irrigation management, mathematical modeling of sediment management, ports and harbors, river engineering, hydro power projects, sustainable integrated water resources management (IWRM), water and wastewater, waste to energy, climate resilience in hydropower, integrated flood management, policy and governance in irrigation, and water management with focus on transboundary issues. Dr. Pradhan also holds various other positions, such as the Chairman of the Institution of Water & Environment

India (IWE India), a policy and advisory think tank, Managing Trustee of Water Alliance India, Member Board of Management, KIIT University, and Academic Council Member of Central University of Jharkhand. He holds a masters and Ph.D. in Water Resources Management & Engineering.

Co-Opted Members

As per Memorandum and Rules of the Association, the following members were co-opted to the Governing Council

1. Mr. V N Heggade
2. Mr. R S Sharma
3. Mr. Sourav Daspatnaik

Regional Centre Representatives

1. Mr. Vishwas Jain
2. Dr. Rajashekhar R Malur
3. Mr. Samiran Sen
4. Mr. A P Mull
5. Mr. K P Singh

Permanent Invitees

1. Mr. Umesh Srivastava
2. Mr. Somenath Ghosh
3. Mr. Vijay Nadkar
4. Mr. Sitaram Aggarwal

Annual General Meeting

The 24th Annual General Meeting of the Members of the Consulting Engineers Association of India was held on Saturday, 5th December 2020, to transact the following business:

1. Confirmed the Minutes of the 23rd Annual General Meeting held on 7th December 2019
2. Adopted Annual Report of the Association for the year ended 31st March 2020.
3. Passed audited accounts of the Association for the year ended 31 March 2020.
4. Appointed Auditors for the financial year 2020-2021.
5. Updated members on the initiative taken by CEAI to create ENGINEERS GO SOCIAL for future image of CEAI.

Engineers Go Social
CEAI Foundation

ENGINEERS GO SOCIAL
An initiative of CEAI Foundation

CEAI has been helping the society towards better infrastructure facilities such as water supply, waste management and has decided to take up this activity in a broader way involving the professionals all over India. In order to streamline this activity in a structured manner, CEAI will set up a vertical – ***CEAI Foundation*** – which will promote social initiatives.

The new entity will be named ***"Engineers Go Social"***.

In spite of Government investing large amount in the development of infrastructure many areas in India still do not have proper infrastructure. It is proposed that the CEAI Foundation would supplement the effort of the Government bodies in providing appropriate engineering solutions for the community.

The Foundation would work from the CEAI office in Delhi and the Regional Centre offices in Kolkata, Mumbai, Jaipur and Bengaluru and also through City Chapters where CEAI members will take initiatives in their respective areas.

The Foundation would be set up as an independent non-profit organization with seed money from CEAI and later on additional funds would be obtained from other organisations. Once the Foundation is well established, CEAI would explore possibility of associating with other associations.

It will be a purely voluntary effort and CEAI seeks to involve all its Members in this effort. Please do send suggestions which CEAI would be happy to consider in the programmes.

CEAI Interventions
Reduction in Performance Guarantee for Consultants

CEAI is pleased to share with the Members a very heartening development from the Ministry of Finance, Govt. of India. Our persistent efforts have borne fruits with the Performance Security amount having been reduced from current 10% and 5% to **3%**. This reduced rate will be applicable on all running contracts and the new Contracts until 31st December 2021. CEAI will continue in its efforts to push for more relief for the fraternity.

The circular dated 12th November 2020 issued by Ministry of Finance is reproduced here.

No. F.9/4/2020-PPD
Government of India
Ministry of Finance
Department of Expenditure
Procurement Policy Division

512, Lok Nayak Bhawan, New Delhi
Dated the 12th November 2020

OFFICE MEMORANDUM

Subject: Performance Security.

As per Rule 171 of General Financial Rules (GFRs) 2017, Performance Security is to be obtained from the successful bidder awarded the contract for an amount of five to ten percent of the value of the contract to ensure due performance of the contract. Similar provisions also exist in the Manual for Procurement of Works 2019 and Manual for Procurement of Consultancy & other Services 2017 issued by this Department.

2. The Government is in receipt of many representations that on account of slowdown in economy due to the pandemic, there is acute financial crunch among many commercial entities and contractors, which in turn is affecting timely execution of the contracts. It has also been represented that this may affect the ability of contractors to bid in tenders and hence reduce competition. Requests are being received for reduction in quantum of Security Deposits in the Government contracts.

3. In view of all above, it is decided to reduce **Performance Security from existing 5-10% to 3% of the value of the contract** for all existing contracts. However, the benefit of the reduced Performance Security will not be given in the contracts under dispute wherein arbitration/ court proceedings have been already started or are contemplated.

4. Further, all tenders/ contracts issued/ concluded till 31.12.2021 should also have the provision of reduced Performance Security.

5. In all contracts where Performance Security has been reduced to 3% in view of above stipulations, the reduced percentage of Performance Security shall continue for the entire duration of the contract and there should be no subsequent increase of Performance Security even beyond 31.12.2021.

Similarly, in all contracts entered into with the reduced percentage of Performance Security of 3%, there will be no subsequent increase in Performance Security even beyond 31.12.2021.

6. Wherever, there is compelling circumstances to ask for Performance Security in excess of three percent as stipulated above, the same should be done only with the approval of the next higher authority to the authority competent to finalise the particular tender, or the Secretary of the Ministry/ Department, whichever is lower. Specific reasons justifying the exception shall be recorded.

7. These instructions will be applicable for all kinds of procurements viz. Goods, Consultancy, Works, non-consulting Services etc and are issued under Rule 6(1) of the GFRs 2017.

(Kotluru Narayana Reddy)
Deputy Secretary to the Govt. of India
Tel: 24621305
Email: kn.reddy@gov.in

MoRTH & NHAI Circulars

Subsequent to the Circular of Ministry of Finance issued on 12th November 2020 regarding revision of Performance Security rates from 5-10% to 3%, MoRTH/ NHAI have also issued circulars to follow the MoF directions.

CEAI had also written to all Chief Secretaries of States to issue instructions in their respective states on reduction of Performance Guarantee in line with the Ministry of Finance Circular.

Ease of doing Business in the Service Sector

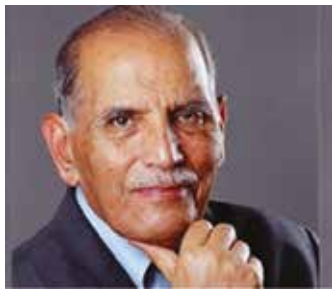
CEAI sent a representation to Prime Minister on 17th November 2020, intimating that though the consultants pay taxes as conscientious Professionals and Firms, they feel utterly frustrated with the present system.

Both Goods & Services Tax (GST) and Income Tax Deducted at source (TDS) have to be deposited on Accrual & Due basis. The Goods & Services Tax has to be deposited within 30 days of raising of Invoice and not on receipt of the dues from the Customer/ Client.

CEAI requested the Prime Minister to direct the Finance Ministry not to initiate prosecution proceedings against such law-abiding firms/ professionals, unless malafide intentions are blatantly visible.

Also, requested to direct the Finance Ministry to permit the firms in the Service Sector to deposit GST and Income Tax Deducted at Source on Cash Receipt Basis. This correction would indeed help to achieve the PM's vision and motto of "Ease of Doing Business" in the country.

OBITUARY



Faqir Chand Kohli, founder and first CEO of Tata Consultancy Services, the country's largest IT services company and acknowledged as the father of India's software industry, left for his heavenly abode at the age of 96 on 26th November 2020. He was awarded India's third-highest civilian honour Padma Bhushan in 2002 for his contributions to the Indian software industry.

He was born in Peshawar and got his Bachelor's degree in Electrical Engineering from Queen's University in Canada and later a Master's degree from Massachusetts Institute of Technology, USA.

He trained in power system operations in USA before returning to India in 1951 where he joined the Tata Electric Company and helped set up a load dispatching system to manage systems operations. He later worked for Tata Consulting Engineers in 1966, before returning to become the director of Tata Electric Company. During that time, he introduced the use of digital computers for power system design and control including the use of the CDC 3600 mainframe computer at Tata Institute of Fundamental Research. He is also known for the introduction of advanced engineering and management techniques for power system operations.

In 1969, he helped set up the Tata Consultancy Services, at the request of J. R. D. Tata, the Group Chairman, after Tata Electric company installed a computer system to control the power lines between Mumbai and Pune, making it the third utility company in the world to install such a system. Even when TCS was well established he pushed for newer frontiers in technology, engaging with educational institutions and associations right in to his ripe old age. He never let age be a barrier.

MEDIA REPORT

CONSULTING ENGINEERS ASSOCIATION OF INDIA

Creating Value Ethically for Engineers

CEAI Media Report

September - December, 2020

DEFINITION OF AN INDIAN COMPANY CEAI MEDIA REPORT – September - December 2020

PNi PRESS NET WORK OF INDIA

Govt needs to redefine an Indian company to safeguard interests of domestic MSMEs

Posted on September 18, 2020 by PNI Admin

By K.K Kapila Chairman, CEAI

The Consulting Engineers Association of India (CEAI), the apex body of consulting engineering professionals in the country has drawn the attention of Mr Nitin Gadkari, Union Minister for Micro, Small and Medium Enterprises (MSME) and Ministry of Road Transport and Highways (MoRTH) towards flouting of the MSME tendering norms by the powerful foreign companies recently set up by the Ministry and enjoying the benefits meant for the Indian companies. (Presently any company registered in India and paying tax is considered Indian)

The union government had recently changed the tendering system to benefit the small and medium enterprises in the country by limiting tenders below Rs 200 crore for Indian companies only. But the provisions are being flouted by powerful foreign companies wherein they set up business operations in India by incorporating a company under Companies Act 2013 either as Joint Ventures or Wholly owned subsidiaries or a Liaison/Representative Office. These entities operate as an Indian Company, duly complying with the provisions of the Indian Company Law and Indian Tax Laws. The current definition allows such companies to enjoy all benefits provided to Indian companies, especially the MSME's

At present for all practical purposes, these foreign companies become Indian company under the ACT, do their business and after paying due taxes, accrue the profits after tax to their parent company abroad, there by depleting the country of precious Forex reserves. The parent company in turn assists these with low interest funds in comparison to a home-grown Indian Company which borrows from banks for their operations at relatively higher rates of interest. This is clearly not a case of providing equitable and fair opportunities to the Indian Companies whose contribution, besides to the country's economy is also towards developing skilled workforce, and providing employment.

Therefore, in line with the philosophy of growth of the rightful stakeholders, the evolving global scenario during COVID 19 when every country is focussed on promoting their own business community and economic growth, there is an urgent need to address the country of origin to be eligible to bid for the Government Tenders. Taking a leaf out of practices in the West and Middle-East, the definition of the Indian company must take into account the Nationality of the stakeholder

Consulting engineers have also urged the government also to Provide funds at a lower rate of Interest (6% or so) to MSME companies to purchase equipment and software and early processing of Income Tax refunds due to the MSME companies

INVC

Redefine an Indian company for availing benefits under msme as a company with ownership of over 51% by indian nationals

Updated on 8 Sep, 2020 12:00 PM IST | Editor

Total Read - 361 Comments - 0

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"At present for all practical purposes, these foreign companies become Indian company under the ACT, do their business and after paying due taxes, accrue the profits after tax to their parent company abroad, there by depleting the country of precious Forex reserves. The parent company in turn assists these with low interest funds in comparison to a home-grown Indian Company which borrows from banks for their operations at relatively higher rates of interest. This is clearly not a case of providing equitable and fair opportunities to the Indian Companies whose contribution, besides to the country's economy is also towards developing skilled workforce, and providing employment" said Mr K.K. Kapila, Chairman, Infrastructure Committee, CEAI.

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KNN

Consulting Engineers Association allege foreign companies defying MSME tendering norms

New Delhi, Sep 8 (KNN)

The Consulting Engineers Association of India (CEAI) in a letter to Union Minister of Micro, Small and Medium Enterprises (MSME) Nitin Gadkari has drawn the attention towards flouting of the MSME tendering norms by the powerful foreign companies.

CEAI alleged that these foreign companies are enjoying the benefits meant for the Indian companies.

Avishkha Ghosal, President, CEAI, said that the union government had recently changed the tendering system to benefit the small and medium enterprises in the country by limiting tenders below Rs.200 crore for Indian companies only. But the provisions are being flouted by powerful foreign companies wherein they set up business operations in India by incorporating a company under Companies Act 2013 either as Joint Ventures or Wholly owned subsidiaries or a Liaison/Representative Office.

"These entities operate as an Indian company, duly complying with the provisions of the Indian Company Law and Indian Tax Laws. The current definition allows such companies to enjoy all benefits provided to Indian companies, especially the MSME's," he added.

"The parent company in turn assists these with low interest funds in comparison to a home-grown Indian Company which borrows from banks for their operations at relatively higher rates of interest. This is clearly not a case of providing equitable and fair opportunities to the Indian Companies whose contribution, besides to the country's economy is also towards developing skilled workforce, and providing employment" Kapila asserted.

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DH DECCAN HERALD

Keeping people safe on India's killer roads

Foreign firms flouting MSME tendering norms: CEAI to Nitin Gadkari

Union Minister for Road Transport and Highways Nitin Gadkari An engineering professionals body has written to Union Minister Nitin Gadkari alleging that foreign companies are flouting the MSME tendering norms.

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Foreign firms flouting MSME tendering norms

BANS◎INDIA

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DEFINITION OF AN INDIAN COMPANY **CEAI MEDIA REPORT – September - December 2020**

ET Auto.com
From The Economic Times

Foreign firms flouting MSME tendering norms: CEAI to Gadkari

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IANS October 07, 2020, 08:23 IST
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Foreign firms flouting MSME tendering norms: CEAI to Gadkari

October 6, 2020136

Nitin Gadkari. Source: IANS

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GST and TDS collection regime *CEAI MEDIA REPORT – September - December 2020*

Deshbandhu November 20,2020

जीएसटी व टीडीएस प्रणाली पर दोबारा विचार करे केंद्र सरकार : सीइएआई

सीइएआई ने पत्र लिख प्रधानमंत्री व निर्मला सीतारमण से किया आग्रह

नई दिल्ली, 19 नवम्बर (एजेंसियां)। देश में परामर्शदाता इंजीनियरों की शीर्ष संस्था कंसल्टिंग इंजीनियर्स एसोसिएशन ऑफ इंडिया (सीइएआई) ने प्रधानमंत्री नरेंद्र मोदी और केंद्रीय वित्त मंत्री निर्मला सीतारमण से सलाहकार एवं सेवा समुदाय के लिए वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कर कटौती (टीडीएस) संग्रह की व्यवस्था पर दोबारा विचार करने का अनुरोध किया है। संस्था ने गुरुवार को लिखे पत्र दोनों से अनुरोध किया कि इस क्षेत्र को ग्राहकों से भुगतान मिलने के बाद ही जीएसटी तथा टीडीएस जमा करने की सुविधा दी जाए। सीईएआई अध्यक्ष अमिताभ घोषाल ने कहा, इस समय सलाहकार अथवा कंसल्टेंट ईमानदार पेशेवरों और फर्मों की तरह अपने कर जमा करते हैं, किंतु जीएसटी तथा टीडीएस जमा करते समय काफी दिक्कतों का सामना करना पड़ता है क्योंकि इसे अक्रुअल एंड ड्यू आधार पर यानी खर्च करते ही जमा कर देना पड़ता है। जीएसटी को बिल बनने के 30 दिन के भीतर जमा कर देना होता है, ग्राहकों से भुगतान मिलने के बाद नहीं।

घोषाल ने कहा, कंसल्टिंग इंजीनियरिंग कंपनियां सेवा क्षेत्र से जुड़ी हैं और उनका अस्तित्व ग्राहकों से समय पर भुगतान मिलने पर ही टिका है। बैंक पेशेवरों को अग्रिम ऋण देने के लिए तैयार नहीं होते और जीएसटी तथा आयकर चुकाने या जमा करने के लिए कर्ज नहीं देते। ग्राहकों से भुगतान मिलने में देर हो तो हमारी वित्तीय स्थिति पर गलत प्रभाव पड़ता है, जिससे जीएसटी जमा करने में देर होती है और ब्याज भी जुड़ जाता है। सीईएआई की बुनियादी ढांचा समिति के चेयरमैन के.के.कपिला ने कहा,जीएसटी जमा करने में देर होने पर जीएसटी पंजीकरण रद्द होने या मुकदमा होने का खतरा रहता है, जबकि हम नकदी की किल्लत होने के बावजूद जीसटी में देर होने पर ब्याज भी जमा करते हैं। इसी तरह टीडीएस को भी अगले महीने की सात तारीख तक जमा करना होता है चाहे पेशेवर या फर्म को अपने ग्राहक से समय पर भुगतान मिले या नहीं मिले। आर्थिक तंगी के कारण कभी-कभी टीडीएस जमा करने में देर हो जाती है। उस स्थिति में भी ब्याज के साथ टीडीएस जमा करने के बावजूद हमें आयकर विभाग से मुकदमे का नोटिस भेज दिया जाता है। कपिला ने कहा,कंसल्टिंग इंजीनियरों ने प्रधानमंत्री से हस्तक्षेप करने और वित्त मंत्रालय को ऐसी कानून को मानने वाली फर्मों और पेशेवरों के खिलाफ तब तक मुकदमा नहीं करने का निर्देश देने का आग्रह किया है, जब तक उनकी मंशा स्पष्ट रूप से गलत नहीं दिख रही हो। सभी सेवा प्रदाताओं और उनकी कारोबारी जरूरतों को एक ही चश्मे से देखना सही नहीं है।

Suryakal Ahmedabad(21.11.20)

કંસલ્ટિંગ એન્જીનિયરોએ પ્રધાનમંત્રી નરેન્દ્ર મોદી અને કેંદ્રિય નાણામંત્રીને પત્ર લખી જીએસટી ટેક્સ તથા ટીડીએસની પ્રણાલી પર પુનઃ વિચાર કરવા વિનંતી કરી

નવી દિલ્હી, શનિવાર

દેશમાં સલાહકાર અર્થાત કંસલ્ટિંગ એન્જનિયરોની દેશની કંસલ્ટિંગ એન્જનિયર્સ એસોસિએશન ઓફ ઈન્ડિયા (સીઈએઆઈ)એ પ્રધાનમંત્રી નરેન્દ્ર મોદી અને કેંદ્રિય નાણા મંત્રી નિર્મલા સિતારમણને પત્ર લખી સલાહકાર તથા સમુદાય માટે જીએસટી તથા ટીડીએસ સંગ્રહની વ્યવસ્થા પર પુનઃ વિચાર કરવાની વિનંતી કરી છે. સંસ્થાએ તેમને વિનંતી કરી છે કે આ સેક્ટને ગ્રાહકો પાસેથી ચુકવણી મળ્યા બાદ જ જીએસટી તથા ટીડીએસ જમા કરવાની પરવાનગી આપવામાં આવે.

કંસલ્ટિંગ એન્જનિયર્સ એસોસિએશન ઓફ ઈન્ડિયા (સીઈએઆઈ)ના અધ્યક્ષ શ્રી અમિતાભ ઘોષાલે જણાવ્યું, આ સમયે સલાહકાર કે કંસલ્ટેંટ વ્યવસાયિકો અને કંપની જેમ પોતાના કર જમા કરે છે. પરંતુ જીએસટી તથા ટીડીએસ જમા કરતા સમયે તેમને ખૂબ જ સમસ્યા થાય છે, કારણ કે તેને અક્રુઅલ બેસ તથા ડ્યુ આધાર પર ખર્ચ કરતા જ જમા કરી દેવો પડે છે. જીએસટીને બિલ બનવાના 30 દિવસની અંદર જમા કરાવી દેવો પડે છે, ગ્રાહકો પાસેથી ચુકવણી મળ્યા બાદ નહીં.

તેમણે કહ્યું, કંસલ્ટિંગ એન્જનિયરિંગ કંપનીઓ સેવા ક્ષેત્ર સાથે જોડાયેલી છે અને તેનું અસ્તિત્વ ગ્રાહકો પાસેથી સમય પર ચુકવણી મળવા પર જ ટકેલી છે. બૈંક વ્યવસાયિકોને એડવાંસ લોન આપવા માટે તૈયાર થતી નથી અને જીએસટી તથા આવક વેરા ચુકવવા કે જમા કરવા માટે લોન આપતા નથી. ગ્રાહકો પાસેથી ચુકવણી મળવામાં મોટુ અંતર તો અમારી આર્થિક સ્થિતિ પર ખરાબ અસર પડે છે, જેથી જીએસટી જમા કરવામાં મોટુ અંતર છે અને વ્યાજ પણ જોડાઈ જાય છે.

સીઈએઆઈની મુખ્યકાર્ય અધિકારી વેરોનિક સી કે કપિલાએ જણાવ્યું, જીએસટી જમા કરવામાં મોટુ અંતર પડે જીએસટી રજીસ્ટ્રેશન રદ થવાનું અથવા કેસ થવાનું જોખમ રહેલું છે, જ્યારે અમે રીકવરી સમસ્યા ઓછા છતાં પણ જીએસટીમાં મોટુ અંતર પડે વ્યાજ પણ જમા કરાવીએ છીએ. આ પ્રમાણે ટીડીએસને પણ આવાની પરિસ્થિતી છે તારીખ સુધી જમા કરવાનો હોય છે, ભલે વ્યવસાયો કે કંપનીને પોતા ગ્રાહકો પાસેથી સમય પર ચુકવણી મળે કે ન મળે. આર્થિક તંગીના કારણે ક્યારેક-ક્યારેક ટીડીએસ જમા કરવામાં મોટુ થઈ જાય છે. આ સિચ્યુએશનમાં પણ વ્યાજની સાથે ટીડીએસ જમા કરવામાં છતાં અમને આવક વેરા વિભાગ તરફથી કેમની નોટિસ મોકલી દેવામાં આવે છે.

તેમણે કહ્યું, કંસલ્ટિંગ એન્જનિયરોએ માનનીય પ્રધાનમંત્રીને હસ્તક્ષેપ કરવા અને નાણા મંત્રાલયને આવી કાયદો માનનારી કંપની અને વ્યાવસાયિકો વિરુદ્ધ ત્યાં સુધી કેસ નહીં કરવાનો નિર્દેશ આપવાનું કહ્યું છે.

Western Times ahm(20.11.2020)

CEAI writi to PM and FM to have a relook at its GST and TDS collection regime

New Delhi

The Consulting Engineers Association of India (CEAI), an apex body of Consulting Engineers in the country in a letter to Mr Narnedra Modi, Prime Minister of India have urged him to have a re-look at its Goods and Services tax (GST) and Tax Deduction at Source (TDS) collection regime for Consulting and services Community and urged him to allow the sector to deposit GST and TDS after receipt of payments from the Clients.

"At present Consultants pay their taxes as conscientious Professionals and Firms and feel utterly frustrated as both Goods & Services Tax (GST) and Income Tax Deducted at source (TDS) as they have to be deposited on accrual and Due basis. Goods & Services Tax (GST) has to be deposited within 30 days of raising of Invoice and not on receipt of our dues from the Customer/Client. "said Mr Amitabha Ghosal, President, Consulting Engineers Association of India (CEAI).

"The Consulting engineering companies are engaged in the Service Sector and are totally dependent for our survival on timely receipt of dues from the clients. Banks are reluctant to advance finance to Professionals, and in any case are averse to funding payment / deposit of GST and Income Tax. Delays in receipt of dues from clients adversely affect our financial situation, leading to delays in deposit of GST along with interest" said Mr Ghoshal.

"Any delay in deposit of GST leads to threats of Cancellation of GST Registration and/or Prosecution, etc. This is in spite of the fact that we pay interest on delayed deposit of GST despite our tight Liquidity situation. Similarly, the Tax Deduction at Source (TDS) has to be deposited by the 7th of the subsequent month irrespective of non-receipt of dues by a Professional Firm from its clients, on time. Due to financial limitations, there arises situations of delayed deposit of TDS. Here again, in spite of depositing TDS along with interest, we are subject to receipt of Prosecution Notices from the Income Tax department" said Mr K K Kapila, Chairman, CEAI, Infrastructure Committee. "The Consulting Engineers have urged the Hon'ble Prime Minister to intervene and to direct the Finance Ministry not to initiate prosecution proceedings against such law-abiding firms/professionals, unless malafide intentions are blatantly visible. Equating all Service Providers and their business requirements to be similar is a very myopic approach. For instance, an Infrastructure Consultant, who as part of the Service Sector, contributes immensely to the development of the country as well as earns valuable forex reserves, are required to pay GST within 30 days of raising invoice, months ahead of realising the actual payment from the Client. A Shopkeeper, who is also part of the Service Sector network, realises immediate payments as soon as a sale is done and therefore, it is possible for him to pay the GST in the 30 day cycle."said Mr Kapila. "Consulting Engineers have requested the Prime Minister to help the consulting community by facilitating a more customised and positive approach to various stakeholders of the Service Sector network, so that the ultimate objective of revenue generation is achieved, without distress to anyone. An urgent correction is needed to save the Consultancy Sector which is on the verge of collapse. The consulting firms in the service sector should be permitted to deposit GST and Tax Deducted at Source on payment receipt Basis."Mr Kapila added.

"The above suggestions will help the Consulting Companies to tide over the problems of payment of GST/TDS to the Government and relieve their financial burden. It will also help the Government to collect tax revenues effectively." Mr Kapila said.

GST and TDS collection regime

CEAI MEDIA REPORT – September - December 2020

प्रेस विज्ञप्ति

कंसल्टिंग इंजीनियरों ने प्रधानमंत्री नरेंद्र मोदी और केंद्रीय वित्त मंत्री को पत्र लिखकर वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कर कटौती (टीडीएस) की प्रणाली पर दोबारा विचार करने का अनुरोध किया

प्रधानमंत्री और वित्त मंत्री से कारोबारी सुगमता के तहत सेवा एवं परामर्श क्षेत्रों के लिए भुगतान मिलने पर ही जीएसटी एवं टीडीएस जमा करने की अनुमति देने का किया अनुरोध

नई दिल्ली, **19** नवंबर, २०२०: देश में सलाहकार यानी कंसल्टिंग इंजीनियरों की शीर्ष संस्था कंसल्टिंग इंजीनियर्स एसोसिएशन ऑफ इंडिया (सीईएआई) ने प्रधानमंत्री नरेंद्र मोदी और केंद्रीय वित्त मंत्री निर्मला सीतारमण को पत्र लिखकर सलाहकार एवं सेवा समुदाय के लिए वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कर कटौती (टीडीएस) संग्रह की व्यवस्था पर दोबारा विचार करने का अनुरोध किया है। संस्था ने उनसे अनुरोध किया है कि इस क्षेत्र को ग्राहकों से भुगतान मिलने के बाद ही जीएसटी तथा टीडीस जमा करने की इजाजत दी जाए।

कंसल्टिंग इंजीनियर्स एसोसिएशन ऑफ इंडिया (सीईएआई) के अध्यक्ष श्री अमिताभ घोषाल ने कहा, "इस समय सलाहकार या कंसल्टेंट ईमानदार पेशेवरों और फर्मों की तरह अपने कर जमा करते हैं। मगर वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कटा आयकर (टीडीएस) जमा करते समय उन्हें बहुत परेशानी होती है क्योंकि इसे अक्रुअल एंड ड्यू आधार पर यानी खर्च करते ही जमा कर देना पड़ता है। जीएसटी को बिल बनने के ३० दिन के भीतर जमा कर देना होता है, ग्राहकों से भुगतान मिलने के बाद नहीं।"

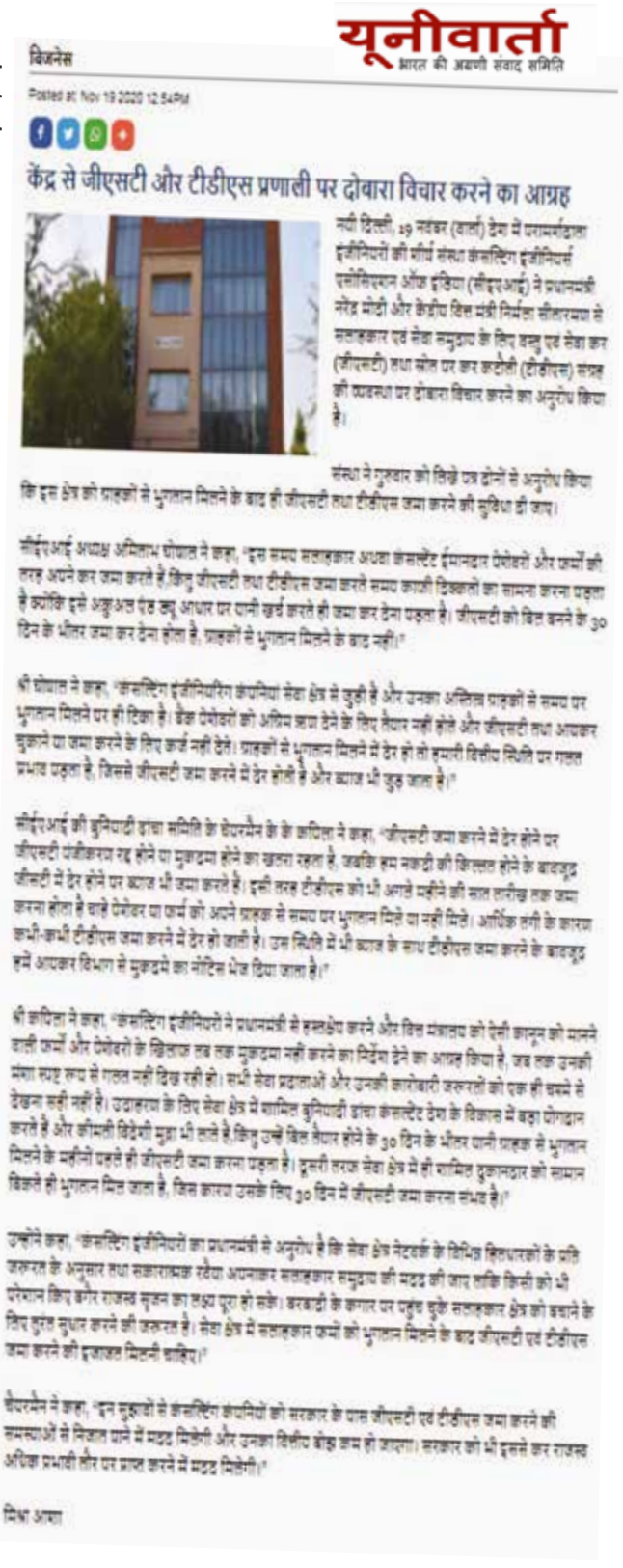
उन्होंने कहा, "कंसल्टिंग इंजीनियरिंग कंपनियां सेवा क्षेत्र से जुड़ी हैं और उनका अस्तित्व ग्राहकों से समय पर भुगतान मिलने पर ही टिका है। बैंक पेशेवरों को अग्रिम ऋण देने के लिए तैयार नहीं होते और जीएसटी तथा आयकर चुकाने या जमा करने के लिए कर्ज नहीं देते। ग्राहकों से भुगतान मिलने में देर हो तो हमारी वित्तीय स्थिति पर गलत प्रभाव पड़ता है, जिससे जीएसटी जमा करने में देर होती है और ब्याज भी जुड़ जाता है।"

सीईएआई की बुनियादी ढांचा समिति के चेयरमैन श्री केके कपिला ने कहा, "जीएसटी जमा करने में देर होने पर जीएसटी पंजीकरण रद्द होने या मुकदमा होने का खतरा रहता है, जबकि हम नकदी की किल्लत होने के बावजूद जीसटी में देर होने पर ब्याज भी जमा करते हैं। इसी तरह टीडीस को भी अगले महीने की ७ तारीख तक जमा करना होता है चाहे पेशेवर या फर्म को अपने ग्राहक से समय पर भुगतान मिले या नहीं मिले। आर्थिक तंगी के कारण कभी-कभी टीडीएस जमा करने में देर हो जाती है। उस सूरत में भी ब्याज के साथ टीडीएस जमा करने के बावजूद हमें आयकर विभाग से मुकदमे का नोटिस भेज दिया जाता है।"

उन्होंने कहा, "कंसल्टिंग इंजीनियरों ने माननीय प्रधानमंत्री से हस्तक्षेप करने और वित्त मंत्रालय को ऐसी कानून को मानने वाली फर्मों और पेशेवरों के खिलाफ तब तक मुकदमा नहीं करने का निर्देश देने को कहा है, जब तक उनकी मंशा स्पष्ट रूप से गलत नहीं दिख रही हो। सभी सेवा प्रदाताओं और उनकी कारोबारी जरूरतों को एक ही चश्मे से देखना सही नहीं है। उदाहरण के लिए सेवा क्षेत्र में शामिल बुनियादी ढांचा कंसल्टेंट देश के विकास में भारी योगदान करते हैं और कीमती विदेशी मुद्रा भी लाते हैं। मगर उन्हें बिल तैयार होने के ३० दिन के भीतर यानी ग्राहक से भुगतान मिलने के महीनों पहले ही जीएसटी जमा करना पड़ता है। दूसरी तरफ सेवा क्षेत्र में ही शामिल दुकानदार को सामान बिकते ही भुगतान मिल जाता है, जिस कारण उसके लिए ३० दिन में जीएसटी जमा करना संभव है।"

श्री कपिला ने कहा, " कंसल्टिंग इंजीनियरों ने प्रधानमंत्री से अनुरोध किया है कि सेवा क्षेत्र नेटवर्क के विभिन्न हितधारकों के प्रति जरूरत के अनुसार तथा सकारात्मक रवैया अपनाकर सलाहकार समुदाय की मदद की जाए ताकि किसी को भी परेशान किए बगैर राजस्व सृजन का लक्ष्य पूरा हो सके। बरबादी के कगार पर पहुंच चुके सलाहकार क्षेत्र को बचाने के लिए तुरंत सुधार करने की जरूरत है। सेवा क्षेत्र में सलाहकार फर्मों को भुगतान मिलने के बाद जीएसटी एवं टीडीएस जमा करने की इजाजत मिलनी चाहिए।"

उन्होंने कहा, "इन सुझावों से कंसल्टिंग कंपनियों को सरकार के पास जीएसटी एवं टीडीएस जमा करने की समस्याओं से निजात पाने में मदद मिलेगी और उनका वित्तीय बोझ कम हो जाएगा। सरकार को भी इससे कर राजस्व अधिक प्रभावी तौर पर प्राप्त करने में मदद मिलेगी।"



यूनीवार्ता
भारत की अग्रणी संवाद समिति

बिजनेस

Posted at: Nov 19 2020 12:54PM

केंद्र से जीएसटी और टीडीएस प्रणाली पर दोबारा विचार करने का आग्रह

नई दिल्ली, १९ नवंबर (वार्ता) देश में परामर्शदाता इंजीनियरों की शीर्ष संस्था कंसल्टिंग इंजीनियर्स एसोसिएशन ऑफ इंडिया (सीईएआई) ने प्रधानमंत्री नरेंद्र मोदी और केंद्रीय वित्त मंत्री निर्मला सीतारमण से सलाहकार एवं सेवा समुदाय के लिए वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कर कटौती (टीडीएस) संग्रह की व्यवस्था पर दोबारा विचार करने का अनुरोध किया है।

संस्था ने गुरुवार को लिखे पत्र द्वारा से अनुरोध किया कि इस क्षेत्र को ग्राहकों से भुगतान मिलने के बाद ही जीएसटी तथा टीडीएस जमा करने की सुविधा दी जाए।

सीईएआई अध्यक्ष अमिताभ घोषाल ने कहा, "इस समय सलाहकार अथवा कंसल्टेंट ईमानदार पेशेवरों और फर्मों की तरह अपने कर जमा कराते हैं किंतु जीएसटी तथा टीडीएस जमा कराते समय काफी दिक्कतों का सामना करना पड़ता है क्योंकि इसे अक्रुअल एंड ड्यू आधार पर यानी खर्च कराते ही जमा कर देना पड़ता है। जीएसटी को बिल बनने के 30 दिन के भीतर जमा कर देना होता है, ग्राहकों से भुगतान मिलने के बाद नहीं।"

श्री घोषाल ने कहा, "कंसल्टिंग इंजीनियरिंग कंपनियां सेवा क्षेत्र से जुड़ी हैं और उनका अस्तित्व ग्राहकों से समय पर भुगतान मिलने पर ही टिका है। बैंक पेशेवरों को अग्रिम ऋण देने के लिए तैयार नहीं होते और जीएसटी तथा आयकर चुकाने या जमा करने के लिए कर्ज नहीं देते। ग्राहकों से भुगतान मिलने में देर हो तो हमारी वित्तीय स्थिति पर गलत प्रभाव पड़ता है, जिससे जीएसटी जमा करने में देर होती है और ब्याज भी जुड़ जाता है।"

सीईएआई की बुनियादी ढांचा समिति के चेयरमैन श्री के.के. कपिला ने कहा, "जीएसटी जमा कराने में देर होने पर जीएसटी पंजीकरण रद्द होने या मुकदमा होने का खतरा रहता है, जबकि हम नकदी की किल्लत होने के बावजूद जीसटी में देर होने पर ब्याज भी जमा कराते हैं। इसी तरह टीडीएस को भी अगले महीने की ७ तारीख तक जमा करना होता है चाहे पेशेवर या फर्म को अपने ग्राहक से समय पर भुगतान मिले या नहीं मिले। आर्थिक तंगी के कारण कभी-कभी टीडीएस जमा कराने में देर हो जाती है। उस स्थिति में भी ब्याज के साथ टीडीएस जमा कराने के बावजूद हमें आयकर विभाग से मुकदमे का नोटिस भेज दिया जाता है।"

श्री कपिला ने कहा, "कंसल्टिंग इंजीनियरों ने प्रधानमंत्री से हस्तक्षेप करने और वित्त मंत्रालय को ऐसी कानून को मानने वाली फर्मों और पेशेवरों के खिलाफ तब तक मुकदमा नहीं करने का निर्देश देने का आग्रह किया है, जब तक उनकी मंशा स्पष्ट रूप से गलत नहीं दिख रही हो। सभी सेवा प्रदाताओं और उनकी कारोबारी जरूरतों को एक ही चश्मे से देखना सही नहीं है। उदाहरण के लिए सेवा क्षेत्र में शामिल बुनियादी ढांचा कंसल्टेंट देश के विकास में बड़ा योगदान करते हैं और कीमती विदेशी मुद्रा भी लाते हैं,किंतु उन्हें बिल तैयार होने के 30 दिन के भीतर यानी ग्राहक से भुगतान मिलने के महीनों पहले ही जीएसटी जमा कराना पड़ता है। दूसरी तरफ सेवा क्षेत्र में ही शामिल दुकानदार को सामान बिकते ही भुगतान मिल जाता है, जिस कारण उसके लिए 30 दिन में जीएसटी जमा कराना संभव है।"

उन्होंने कहा, "कंसल्टिंग इंजीनियरों का प्रधानमंत्री से अनुरोध है कि सेवा क्षेत्र नेटवर्क के विभिन्न हितधारकों के प्रति जरूरत के अनुसार तथा सकारात्मक रवैया अपनाकर सलाहकार समुदाय की मदद की जाए ताकि किसी को भी परेशान किए बगैर राजस्व सृजन का लक्ष्य पूरा हो सके। बरबादी के कगार पर पहुंच चुके सलाहकार क्षेत्र को बचाने के लिए तुरंत सुधार करने की जरूरत है। सेवा क्षेत्र में सलाहकार फर्मों को भुगतान मिलने के बाद जीएसटी एवं टीडीएस जमा करने की इजाजत मिलनी चाहिए।"

चेयरमैन ने कहा, "इन सुझावों से कंसल्टिंग कंपनियों को सरकार के पास जीएसटी एवं टीडीएस जमा करने की समस्याओं से निजात पाने में मदद मिलेगी और उनका वित्तीय बोझ कम हो जाएगा। सरकार को भी इससे कर राजस्व अधिक प्रभावी तौर पर प्राप्त करने में मदद मिलेगी।"

मिथा आचा

GST and TDS collection regime

CEAI MEDIA REPORT – September - December 2020

जीएसटी और टीडीएस प्रणाली पर दोबारा विचार करने का आग्रह, पंजीकरण रद्द होने पर मुकदमा

सीईएआई ने वित्त मंत्री से जीएसटी और टीडीएस प्रणाली पर दोबारा विचार करने का अनुरोध किया है

सीईएआई अमिताभ धोपाल का बयान

'कंसल्टिंग इंजीनियरिंग कंपनियां'

पंजीकरण रद्द होने पर मुकदमा

सेवा क्षेत्र में शामिल बुनियादी ढांचा

प्रधानमंत्री से अनुरोध

समस्याओं से निजात

Herald Young leader (21.11.2020)

कंसल्टिंग इंजीनियरों ने जीएसटी तथा टीडीएस की प्रणाली पर विचार करने का अनुरोध किया

नई दिल्ली, देश में सलाहकार यानी कंसल्टिंग इंजीनियरों की शीर्ष संस्था कंसल्टिंग इंजीनियर्स एसोसिएशन ऑफ इंडिया (सीईएआई) ने प्रधानमंत्री नरेंद्र मोदी और केंद्रीय वित्त मंत्री निर्मला सीतारमण को पत्र लिखकर सलाहकार एवं सेवा समुदाय के लिए वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कर कटौती (टीडीएस) संग्रह की व्यवस्था पर दोबारा विचार करने का अनुरोध किया है। संस्था ने उनसे अनुरोध किया है कि इस क्षेत्र को ग्राहकों से भुगतान मिलने के बाद ही जीएसटी तथा टीडीएस जमा करने की इजाजत दी जाए।

कंसल्टिंग इंजीनियर्स एसोसिएशन ऑफ इंडिया (सीईएआई) के अध्यक्ष श्री अमिताभ धोपाल ने कहा, इस समय सलाहकार या कंसल्टेंट ईमानदार पेशेवरों और फर्मों की तरह अपने कर जमा करते हैं। मगर वस्तु एवं सेवा कर (जीएसटी) तथा स्रोत पर कटा आयकर (टीडीएस) जमा करते समय उन्हें बहुत परेशानी होती है क्योंकि इसे अकरुअल एंड ड्यू आधार पर यानी खर्च करते ही जमा कर देना पड़ता है। जीएसटी को बिल बनने के 30 दिन के भीतर जमा कर देना होता है, ग्राहकों से भुगतान मिलने के बाद नहीं। उन्होंने कहा, कंसल्टिंग इंजीनियरिंग कंपनियां सेवा क्षेत्र से जुड़ी हैं और उनका अस्तित्व ग्राहकों से समय पर भुगतान मिलने पर ही टिका है। बैंक पेशेवरों को अग्रिम ऋण देने के लिए तैयार नहीं होते और जीएसटी तथा आयकर चुकाने या जमा करने के लिए कर्ज नहीं देते। ग्राहकों से भुगतान मिलने में देर हो तो हमारी वित्तीय स्थिति पर गलत प्रभाव पड़ता है, जिससे जीएसटी जमा करने में देर होती है और ब्याज भी जुड़ जाता है।

सीईएआई की बुनियादी ढांचा समिति के चेयरमैन श्री केके कपिला ने कहा, जीएसटी जमा करने में देर होने पर जीएसटी पंजीकरण रद्द होने या मुकदमा होने का खतरा रहता है, जबकि हम नकदी की किल्लत होने के बावजूद जीसटी में देर होने पर ब्याज भी जमा करते हैं। इसी तरह टीडीएस को भी अगले महीने की 7 तारीख तक जमा करना होता है चाहे पेशेवर या फर्म को अपने ग्राहक से समय पर भुगतान मिले या नहीं मिले। आर्थिक तंगी के कारण कभी-कभी टीडीएस जमा करने में देर हो जाती है। उस सूरत में भी ब्याज के साथ टीडीएस जमा करने के बावजूद हमें आयकर विभाग से मुकदमे का नोटिस भेज दिया जाता है।

Nirmal Metro Ahm(20.11.2020)

કંસલ્ટિંગ એન્જીનિયરોએ પ્રધાનમંત્રી નરેન્દ્ર મોદી અને કેન્દ્રિય નાણા મંત્રીને પત્ર લખી ગુડ્સ એન્ડ સર્વિસ ટેક્સ (જીએસટી) તથા ટીડીએસની પ્રણાલી પર પુનઃ વિચાર કરવા માટે વિનંતી કરી

પ્રધાનમંત્રી અને નાણા મંત્રીને વ્યાપારી સુગમતા અંતર્ગત સેવા તથા સલાહ ક્ષેત્રો માટે ચૂકવણી મળવા પર જ જીએસટી તથા ટીડીએસ જમા કરવાની પરવાનગી આપવા વિનંતી

GST and TDS collection regime

CEAI MEDIA REPORT – September - December 2020

SOCIALNEWS.XYZ
The Millennial Media

CEAI urges PM to allow deposition of GST, TDS on payment receipt basis

Posted By: Gopi November 19, 2020

New Delhi, Nov 19 (SocialNews.XYZ) The Consulting Engineers Association of India (CEAI) have written to Prime Minister Narendra Modi urging him to give a re-look at the Goods and Services tax (GST) and Tax Deduction at Source (TDS) collection regimes and allow the sector to deposit taxes after receipt of payments from the Clients.

At present Consultants pay their taxes as conscientious on accrual and Due basis. GST has to be deposited within 30 days of raising of Invoice and not on receipt of dues from the Customers and Clients. Similarly, the TDS has to be deposited by the 7th of the subsequent month irrespective of non-receipt of dues.

"The Consulting engineering companies are engaged in the Service Sector and are totally dependent for our survival on timely receipt of dues from the clients. Banks are reluctant to advance finance to Professionals, and in any case are averse to funding payment/deposit of GST and Income Tax. Delays in receipt of dues from clients adversely affect our financial situation, leading to delays in deposit of GST along with interest," said Amitabha Ghosal, President, Consulting Engineers Association of India (CEAI).

"Any delay in deposit of GST leads to threats of Cancellation of GST Registration and/or Prosecution, etc. This is in spite of the fact that we pay interest on delayed deposit of GST despite our tight Liquidity situation. Similarly, the Tax Deduction at Source (TDS) has to be deposited by the 7th of the subsequent month irrespective of non-receipt of dues by a Professional Firm from its clients, on time. Due to financial limitations, there arises situations of delayed deposit of TDS. Here again, in spite of depositing TDS along with interest, we are subject to receipt of Prosecution Notices from the Income Tax department," said K.K. Kapila, Chairman, CEAI, Infrastructure Committee.

In the letter to PM, the Consulting Engineers have urged him to intervene and to direct the Finance Ministry not to initiate prosecution proceedings against such law-abiding firms/professionals, unless malafide intentions are blatantly visible. Equating all Service Providers and their business requirements to be similar is a very myopic approach. For instance, an Infrastructure Consultant, who as part of the Service Sector, contributes immensely to the development of the country as well as earns valuable forex reserves, are required to pay GST within 30 days of raising invoice, months ahead of realising the actual payment from the Client, the association said.

"An urgent correction is needed to save the Consultancy Sector which is on the verge of collapse. The consulting firms in the service sector should be permitted to deposit GST and Tax Deducted at Source on payment receipt Basis," Kapila added.

Nav Gujrat Ahm. (21.11.2020)

સીઈએઆઈએ જીએસટીમાં સુધારાની રજૂઆત કરી

નવી દિલ્હી: કંસલ્ટિંગ એન્જીનિયર્સ એસોસિએશન ઓફ ઈન્ડિયા (સીઈએઆઈ)એ પ્રધાનમંત્રી નેરેન્દ્ર મોદી અને કેન્દ્રિય નાણા મંત્રી નિર્મલા સિતારમણને પત્ર લખી સલાહકાર તથા સમુદાય માટે જીએસટી તથા ટીડીએસ સંગ્રહની વ્યવસ્થા પર પુનઃ વિચાર કરનાવાની વિનંતી કરી છે. સંસ્થાએ તેમને વિનંતી કરી છે કે આ ક્ષેત્રને ગ્રાહકો પાસેથી ચૂકવણી મળ્યા બાદ જ જીએસટી તથા ટીડીએસ જમા કરવાની પરવાનગી આપવામાં આવે એમ અધ્યક્ષ અમિતાભ ઘોષાલે જણાવ્યું હતું.

CEAI Webinar on 'Digitalisation in Engineering' on 18th December 2020

DwarkaParichay.com December 15, 2020 Business News, Business Promotion, News-Events, Update

Consulting engineers Association of Indi (CEAI) , the apex body of consulting engineers in the country is organising a webinar on 'Digitalisationof engineering on December 18, 2020 as part of its 60 years of service .

"In today's world digital revolution and digital engineering are making engineering tasks easier and influencing the requirements profiles for engineers. When we discuss digitalisation we're talking about a series of tools that can offer benefits at every level of the industry. These can include sensor networks, field automation, artificial intelligence, robotics, block chain and virtual reality. "said Mr Amitabha Ghosal President, Consulting engineers Association of India .

"Until this point, major engineering companies have been less reliant on upcoming technologies as other sectors. Embracing digitalisation not only requires investment in the technologies themselves, but in training and new talent. A fully digitalised change will significantly shift the skillsets required in workers. "said Mr Ghosal .

"The initial shift into these areas can take up a significant portion of total maintenance budgets, which is one of the reasons digitalisation has taken so long to be implemented. But with tools such as predictive modelling already demonstrating huge value to companies that have implemented it, it's not surprising to see companies, experts and engineers ready to embrace the change.

Many industry experts are already seeing the impact that these developments are having on the operating models and market supply chains "said Mr K.K.Kapila, Chairman, Infra Committee of CEAI.

"At present Core IT skills are more important than having a particular specialisation. When establishing the must-have qualifications for working in a digitalised mechanical engineering sector, IT skills always come top of the list. The basic set of requirements is growing in scope and digital know-how is therefore becoming a basic prerequisite. Employees who can demonstrate appropriate training or hands-on experience have a clear-cut advantage. "Mr Kapila said .

The topics that will be discussed at the webinar will include 'Engineering Digitalisation and Innovation Driving Industry, by Amit Sharma, ,MD, Tata consultancy engineering Limited, 'Role of Artificial Intelligence, Niche learning for successful industry 'by Sudheesh Narayanan, CEO, Knowledge Lens company and GE Digital experience by Alok Nanda, CEO GE, India Technology Centre.

The link for registration is:
https://us02web.zoom.us/webinar/register/WN_k5cd4nlGQlyBWcU0akSpa

APN NEWS

Digitalisation of Engineering Central To Engineering Profession Firms Survival –Experts

Published on December 21, 2020

New Delhi: Consulting engineers Association of Indi (CEAI) , the apex body of consulting engineers in the country is organising a webinar on 'Digitalisation of engineering on December 18, 2020 as part of its 60 years of service .

"Automation and digitalisation, both of production and of business processes, can no longer be regarded as 'nice to have' innovations, they will be central to many firms' survival. Digitalisation is at the heart of all these strategies as it will make the impossible affordable and ensure the prosperity and future of the Indian manufacturing and consequently the country's economy." Said Mr Amit Sharma, ,MD, Tata consultancy engineering Limited while speaking at the webinar.

"With digitalisation taking grip of the engineering sector, today's engineers need to be all-rounders. They are expected to meet customer requirements that are changing all the time and must be able to quickly and accurately interpret third-party designs. Mechanics, electronics and software are becoming more closely interconnected in general. What's more, new job opportunities are opening up for IT specialists who can develop new 3D engineering software solutions. Engineers will have to take on additional coordination tasks in the future and thus assume a project management role in certain areas." Said Mr Sharma.

"Tata consultancy engineering with the help of digital advance technologies including drones, 3D laser scans, and advanced computer applications has been able to finish major projects worldwide before time and below the estimated cost" said Mr Sharma.

"digitalisation in engineering changes the way we undertake the process of design.Engineers are changing their tools from analogue to digital. They are using new technologies to provide services with greater even accuracy and scope to innovate." Said Mr Alok Nanda, CEO GE, India Technology Centre.

"But more than using high-tech gadgets and tools, digital engineering means working in a safer environment. With the help of drones and other smart tech gadgets, engineers can avoid going to potentially dangerous and risky situations. Observations can be gathered, time spent in potentially high-risk environments is minimised and safety in design solutions created to protect workforces delivering projects.´said Mr Amitabha Ghosal President, Consulting engineers Association of India .

"At present Core IT skills are more important than having a particular specialisation. When establishing the must-have qualifications for working in a digitalised engineering sector , IT skills always come top of the list. The basic set of requirements is growing in scope and digital know-how is therefore becoming a basic prerequisite. Employees who can demonstrate appropriate training or hands-on experience have a clear-cut advantage. "MrSudheesh Narayanan , CEO Knowledge lens.

The topics that were discussed at the webinar included 'Engineering Digitalisation and Innovation Driving Industry 'Role of Artificial Intelligence, Niche learning for successful industry and GE Digital experience

MEMBER NEWS

Webinar on 'The Story of Morandi Bridge Collapse, Italy'

IAStructE organised a webinar on ***"The Story of the collapse of Polcevera Viaduct (also known as Morandi Bridge), Italy"*** on 15th October 2020.

The story was presented by Mr Alok Bhowmick, Governing Council Member of CEAI. The webinar was moderated by Prof Mahesh Tandon.

Report on Prof. Mazumder's talk on "Sediment Problems in Rivers and Reservoirs" at ISWEE-2020

Prof. S. K. Mazumder was invited to talk on ***"Sediment Problems in Rivers and Reservoirs"*** in a webinar held during 6th to 8th December 2020, at the International Symposium on Water, Ecology and Environment (ISWEE-2020) organized by Jiatong University, Beijing, China. He was the only speaker from India. Prof. Mazumder's Audio-Video talk was presented on 8th December 2020 in session-5 on "Hydrology & Water Resources".

Prof. Mazumder brought out that at the current rate of sedimentation, 50% of world's storage capacity is going to be filled up with sediments intercepted by dams by the years 2100. It would have serious consequences not only for water availability but also other problems like aggradation upstream and degradation downstream of dams & barrages (Figure-1).

Figure-1 Aggradation Due to Landslides in 2013 Flood in Uttarakhand

Other hydraulic works on rivers e.g. bridges, hydro power, navigation, irrigation, municipal and industrial uses, etc. will also be affected. Increased landslides (Figure-2) due to GLOF etc. and tectonic activities would result in change in the landscape. He also cautioned that the life of fish, flora and fauna would be affected causing ecological and environmental changes.

(a) Before GLOF (b) After GLOF

Figure 2 Devastation of Kedarnath Town

He used Lane's theory and Schum's diagram to explain the change in the river regime and the meandering and braiding process in rivers, outflanking of hydraulic works and flow avulsion with figures and photographs – the tendency that has been observed in Kosi and Farakka barrages in India. He explained the phenomenon of delta formation at the foot hill after the mountainous journey of a river by means of H. A. Einstein's bed load equation for sediment transport.

Prof. Mazumder also presented a few slides to illustrate reservoir sedimentation behind dams, meandering upstream and downstream of a few hydraulic works e.g. barrages and bridges in India. He explained the use of Boreland-Milar curve to estimate life of reservoir and sediment distribution within reservoirs. Different methods of sediment removal from reservoir and soil conservation in the watershed area were also discussed. The talk was very well received.

OTHER NEWS, VIEWS & NOTES

VIEW POINT

The theme for the ViewPoint of March 2021 is "Export of Consultancy Services".

Indian Consulting Organisations and Professionals are doing yeoman services in many developing countries in Africa, Central Asia, South East Asia – the ASEAN countries, and South America. They are providing appropriate solutions which are affordable for developing countries and for that they adapt from or modify the more expensive ones which may not be the right fit. Articles could discuss the qualifying requirements, the sources of assistance for funding for the consulting engineers, the major sectors where opportunities are available, etc. Consulting Engineers are requested to share their experiences – the trials and tribulations, they encountered in the bargain but doggedly pursued their aim and ultimately achieved it. Apart from direct project involvements there are others who are involved with arrangements such as the offshore design services for foreign Consulting Engineering organisations or even foreign Owners directly. Consulting Engineers could also be involved with training etc. Articles are invited on all aspects from CEAI Members and various stakeholders on the subject considering their experience.

Authors are urged to share their knowledge and experience by providing case studies of the works executed or in execution, first-hand accounts of the challenges faced, practical issues experienced and the solutions to those, etc. Photographs, charts, diagrams, drawings, etc. would benefit readers for better appreciation of the issues encountered and the manner in which they were addressed.

The articles for an issue need to reach CEAI at least 6 weeks prior to the end of the month of the View Point issue.

Articles need to be in Times New Roman 12 with single line spacing with before and after 6 pt and normal margin, on A4 size. A recent clear and bright passport size photograph of the author(s) is to be sent along with the article.

Advertisement in View Point

VIEW POINT is circulated to all CEAI Members, FIDIC, Ministries of the Government of India, Public and Private Sector Undertakings, Construction Firms, Contractors, Consultants, Foreign Missions and Funding Institutions in India and other organisations related to or dealing with the engineering profession.

Advertising in the VIEW POINT gives the advertiser wide exposure and visibility.

Support from CEAI Members and stakeholders are sought in increasing the number of advertisements, such that View Point gains in its stature as an unique Technical Publication.

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***Inside Front Cover booked till June 2021*

Tech Quiz

1. Who designed the Difference Engine?
   a) Joseph Jacquard
   b) George Marshal
   c) Ada Byron
   d) Charles Babbage
   e) Polly
2. What was the main component of the first digital electronic computers?
   a) Relays
   b) Vacuum Tubes
   c) Switches
   d) Transistors
   e) Chips
3. For which computer was BASIC developed?
   a) GE
   b) Apple
   c) IBM
   d) HP
   e) MITS
4. Who invented the mouse?
   a) Bill Gates
   b) J G Kemeny
   c) D Rockmore
   d) T E Kurtz
   f) D Engelbart
5. Where was the first computer developed in India?
   a) ISI, Calcutta
   b) IISc Bangalore
   c) University of Roorkee
   d) TIFR, Mumbai
   e) IIT Bombay
6. The field of interaction between computers and human language is known as
   a) Artificial Intelligence
   b) Machine Learning
   c) Natural Language Processing
   d) Human Machine Interface
   e) Linguistic Computing
7. Edge Computing means
   a) Computation close to the location where it is needed
   b) Computation in the cloud
   c) Computation at the edge of the plant boundary
   d) Computations in a defined boundary
   e) Edging out the computations through other means
8. Blockchain technology
   a) Securely blocks chains of information
   b) Is a security protocol to avoid information leakage
   c) Stores transactional records
   d) Is cryptocurrency
   e) Relates to data in highspeed rails
9. Digitalisation means
   a) Digitization
   b) Process of changing from analog to digital form
   c) Creating digital forms of physical things such as documents and photographs
   d) Is the use of digital technologies to optimize business processes
   e) Avoiding digitization
10. Command and Control Centre
    a) Is the residence of High Command in Delhi of a political party
    b) Is the Police Headquarters in the State Capital
    c) Is the office of the Chief of Defence Staff (CDOS)
    d) Is a room that provides Centralised Monitoring, Control and Command of a situation
    e) Is a place where one can Command and Control the Centre

Contributed by A P Mull & Dr. Rajashekhar R Malur

The first person who mails the correct answers to CEAI *info@ceai.org.in* will get a congratulatory mail and will be acknowledged by publishing the persons photograph in the next issue.

Contributed by

Answers to Tech Quiz September 2020 issue1(d), 2(b), 3(c), 4(a), 5(a), 6(b), 7(c), 8(d), 9(d), 10(b)

Prof Mainak Ghosal,
Consultant is the winner of the Tech Quiz with full/ maximum marks.

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- INDIA 5000 Best MSME Awards – 2017
- India Small Giants, MSME's of India – 2013-2014
- BOI India SME 100 SME Award – 2012
- EPC World Award, Best Railway Consultant - 2010

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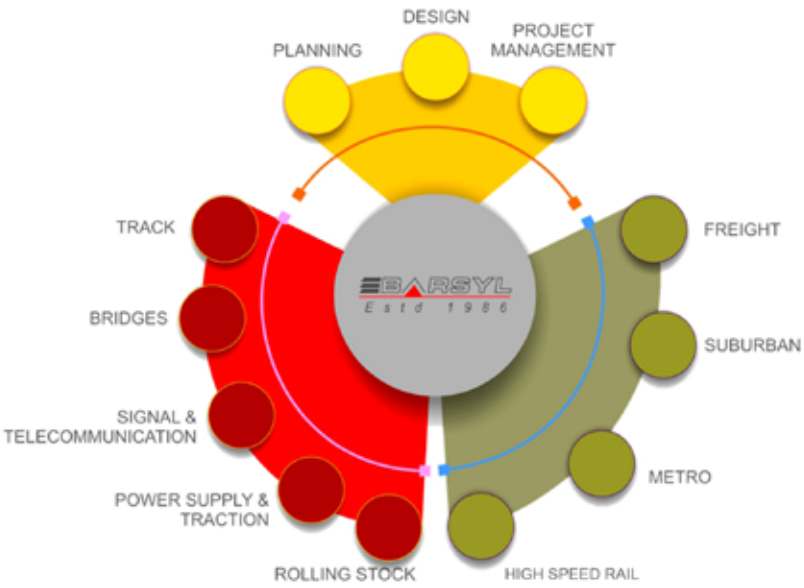

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01


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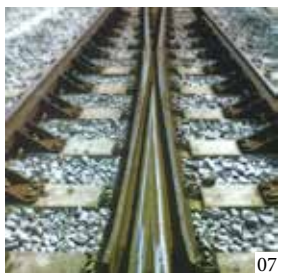
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