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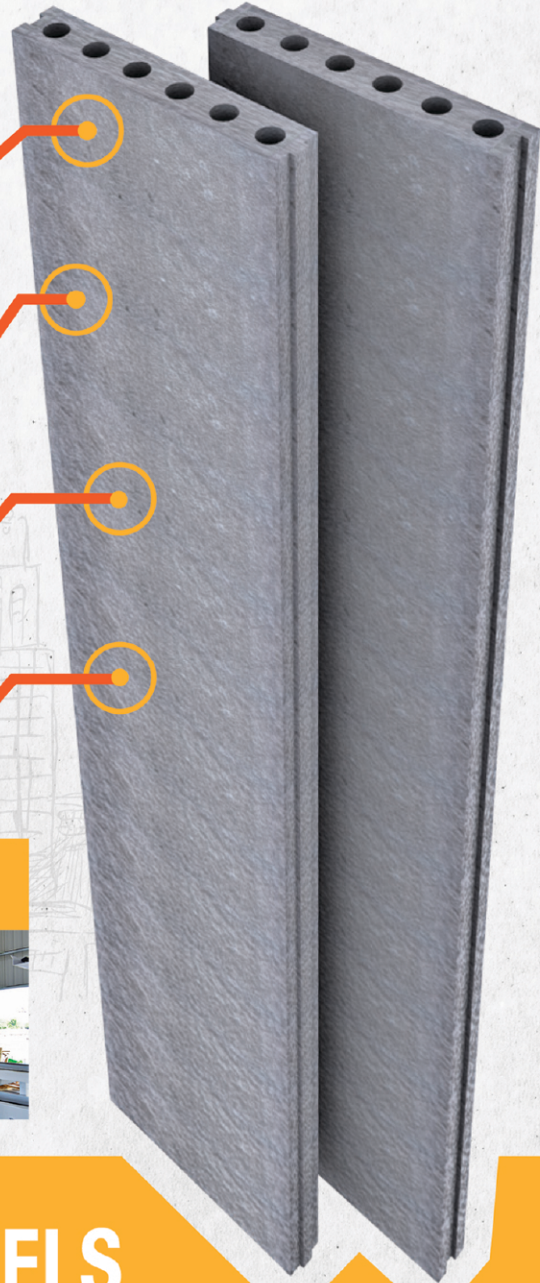
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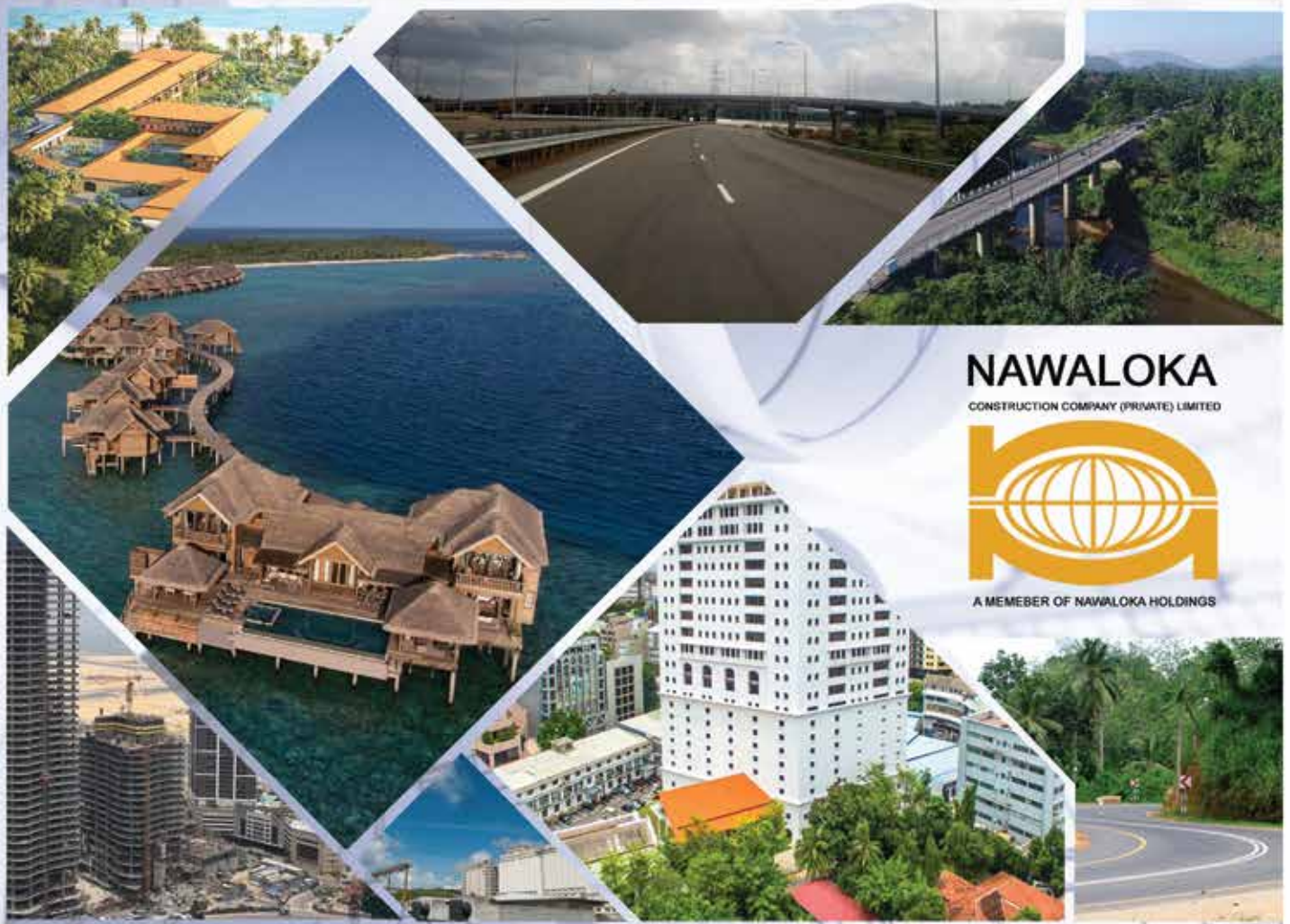
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* COVID 19 PREVENTIVE MEASURES APPLIED.

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Editor's Note

“The Next Normal” is a term based on the assumption that there is a before and after; the period before COVID-19 and the new normal that will emerge in the post-viral era: the next normal.

McKinsey & Company a global management consulting firm that serves leading businesses, governments, non-governmental organizations, and not-for-profits invented the term.

Before COVID-19, organizations were undergoing digital transformation, some at varying paces. As we enter into the next normal, digital transformation is no longer a process or future end goal. It is actually a need that will define how organizations will continue to survive in today's new era.

In order to come back stronger, companies or business entities will have to reimagine their business models by focusing on four strategic areas: Recovering revenue, Rebuilding operations, Rethinking the organization & Accelerating the adoption of digital solutions.

In addition, organizations will need to reinvent their digital strategy. Digital strategy means the strategic implementation of new digital capabilities and software systems, allowing for scaled maximization of the business operations and goals. It calls for applying new technologies to existing business activities as a way of enhancing supply

chain efficiency, product fulfillment, customer experience, relationship nurturing and internal alignment and management.

Companies will have to do more with less. Having a well-developed plan of how they will implement new digital capabilities and software systems to maximize and scale their business goals is essential.

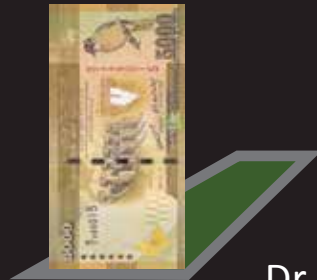
The Next Normal impact the workforce to remote work that companies need to have the right technology in place to ensure their employees can effectively work from home and that their customers will be supported and satisfied. Entering into the next normal, remote work will become common practice.

The need to reskill or teach employees new skills for a different job function within the organization and upskill by learning new skills within the same job function will rise as organizations change and restructure.

Customers of all different ages and backgrounds need to be able to confidently and easily navigate a company's website or Apps to make purchases or complete tasks.

We all want things to go back to normal quickly but what most of us have probably realized is that things will not go back to normal after a few weeks, or even in a few months. Some things never will.

Money printing, Inflation and Construction Industry

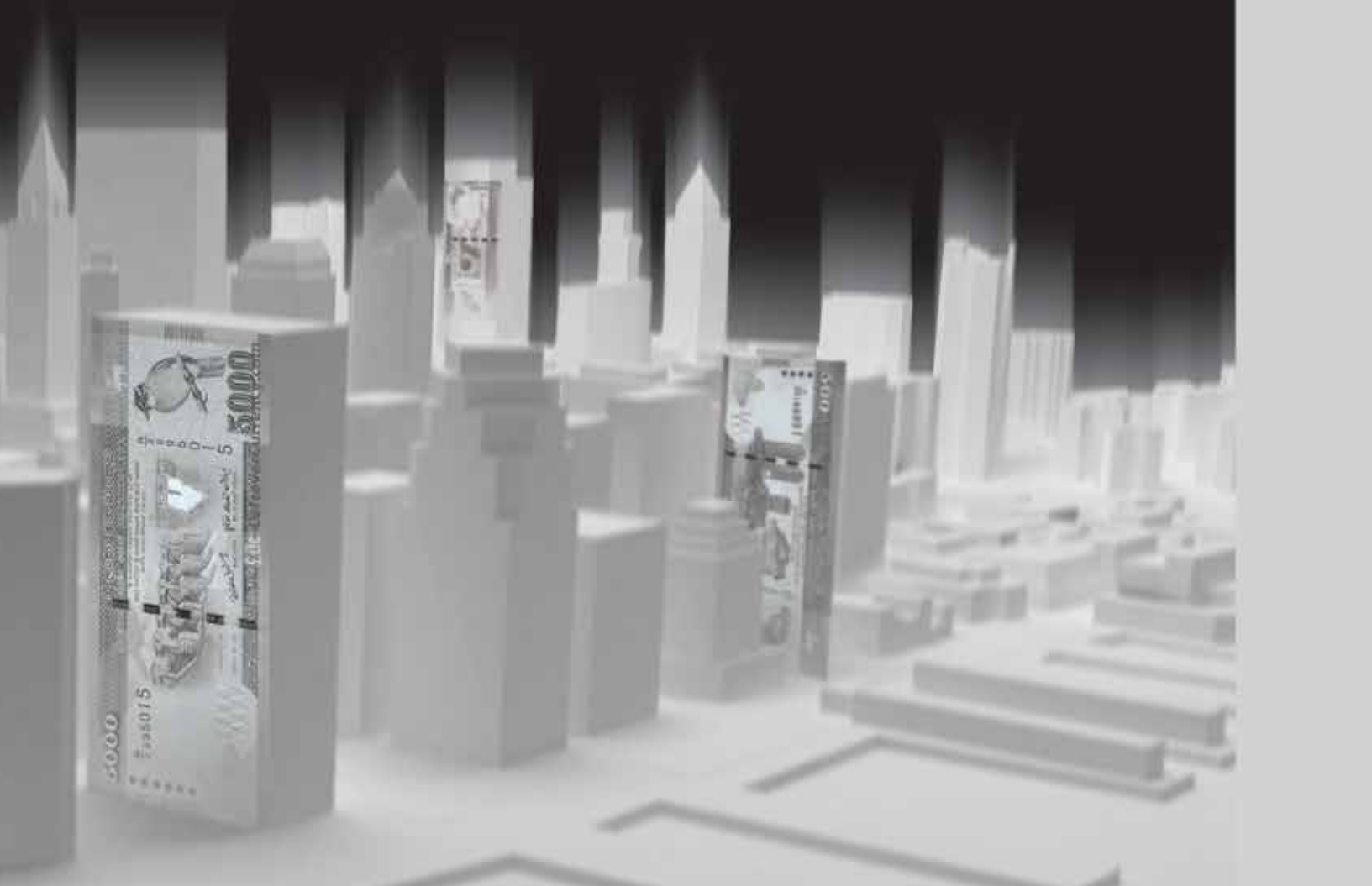


Dr Rohan Karunaratne
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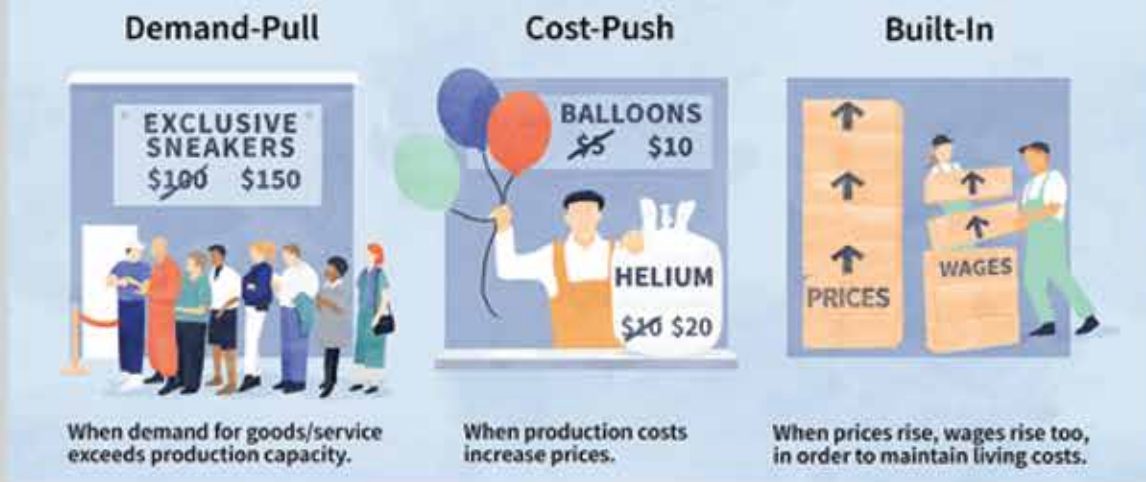


In Sri Lanka, the money printing authority is given to the Central Bank of Sri Lanka by Monetary Law Act No.58 of 1949. Treasury bills are issued by the Government of Sri Lanka to the CB and Banks for the receipt of monetary funds.



How Does Inflation Work?

Inflation represents the rate at which the cost of goods and services increase over a period of time.



The government requires increased money stock- (the total amount of money available in a particular economy at a particular point in time) to provide more goods and services for Sri Lankans and settle debts to Sectors like Construction, Agriculture, Fertilisers and so on. When this Government came to power, creditors were over 300b for the Construction Industry. By now much of this has been settled, however, during 2015-2020 local contractors suffered immensely with some having to sell their homes and their assets taken over by banks, none of which would not have happened if this money had been paid on time.

However, if the increase in money printing is not supported by economic growth as measured by gross domestic product (GDP), the result can lead to high inflation. (Hyperinflation).

During inflation the price level of an economy rises over time, purchasing power declines and the average price level of goods and services increase. Therefore, a unit of currency effectively buys less than it did in prior periods.

As the economy deteriorates further, companies charge more, consumers pay more, and the central bank prints more money leading to a vicious cycle of hyperinflation.

Subsequently if inflation falls to a negative, the economy would reach deflation (a general decline in prices for goods and services, typically associated with a contraction in the supply of money and credit in the economy. Purchasing power of currency rises.) In this case the producer will lose as constructions are not done because products are not brought. Extreme deflation can harm borrowers, who can be bound to pay their debts in money that is worth more than the money they borrowed, as well as any financial market participants who invest or speculate on the prospect of rising prices. In Sri Lanka, from 60-70yrs ago to now, the economy had grown by 310% and money stocks increased by 700%. In 1980, a car purchased for Rs. 50, 000 would now cost Rs.5 m (100x more in 40 yrs). 50 cents canteen money would now be Rs250. (500x increase). Land prices, then Rs.1000 per perch are now Rs.3m a perch. Similarly, a Rs.100,000 house then, would now

be priced at 10 m. This is the pattern of Sri Lanka's inflation-driven property.

The Construction Industry can help reduce this inflation by contributing to the GDP of Sri Lanka by providing the necessary public infrastructure and private physical structures for many productive activities such as services, commerce, utilities and other industries, by producing road networks, water supply, electricity, maintenance etc and supporting the micro and macro economy of the people directly or indirectly employed by construction. However, for this to be solved, money printing has to be balanced against the value of overall transactions in the economy, revenues should increase, and bank borrowings reduced- avoiding unhealthy levels of inflation or deflation.

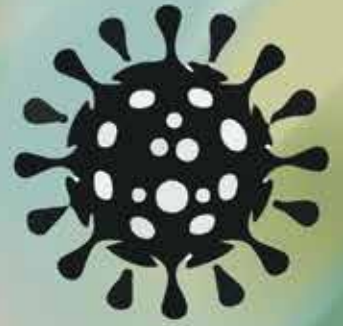
Conclusion

Although money printing has helped the construction industry by increasing developments and settling much of its owed debts, excess money printing can raise inflation to unhealthy levels. Goods and services produced by the Industry would increase in price, while buying power reduces.

At the same time, British economist John Maynard Keynes believed that some inflation was useful. When the economy is not running at capacity, meaning there is unused labor or resources, inflation theoretically helps increase production. More dollars translates to more spending, which equates to more aggregated demand. More demand, in turn, triggers more production to meet that demand. Therefore, this shows that a bit of healthy inflation is good, mainly for the construction industry.

However, if inflation increases to unhealthy levels the country faces economic deterioration. Similarly, under certain circumstances rapid deflation can be associated with a short-term contraction of economic activity.

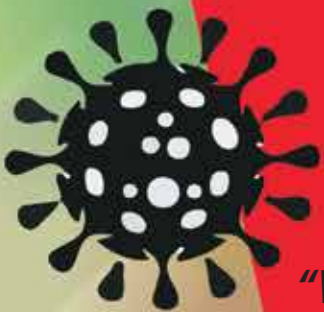
To put this in context in the year 2020 the government of Sri Lanka has borrowed 2000b (approx.) and the government has lost 600b in reducing tax revenues. Also, the government and public corporation has borrowed 800b more. To control the inflation, the government should reduce borrowings and increase revenues.



Kids & Constructions Fun ideas to do with you kids during this lock down period

A research article by
Shanika Gamage

*“When we make play the foundation of learning,
we teach the whole child” – Vince Gowmon*



With the COVID 19 new normal living, our main concern is our children. Unlike the old days, their social interactions have reduced, and they are basically stuck inside the houses with us. Parents and elders are a likely worried about the physical

and mental development of their kids. Social activities that encouraged children's personality development has become minimal. In a situation like that, here are some fun activities you can do with your child by staying safely at home.

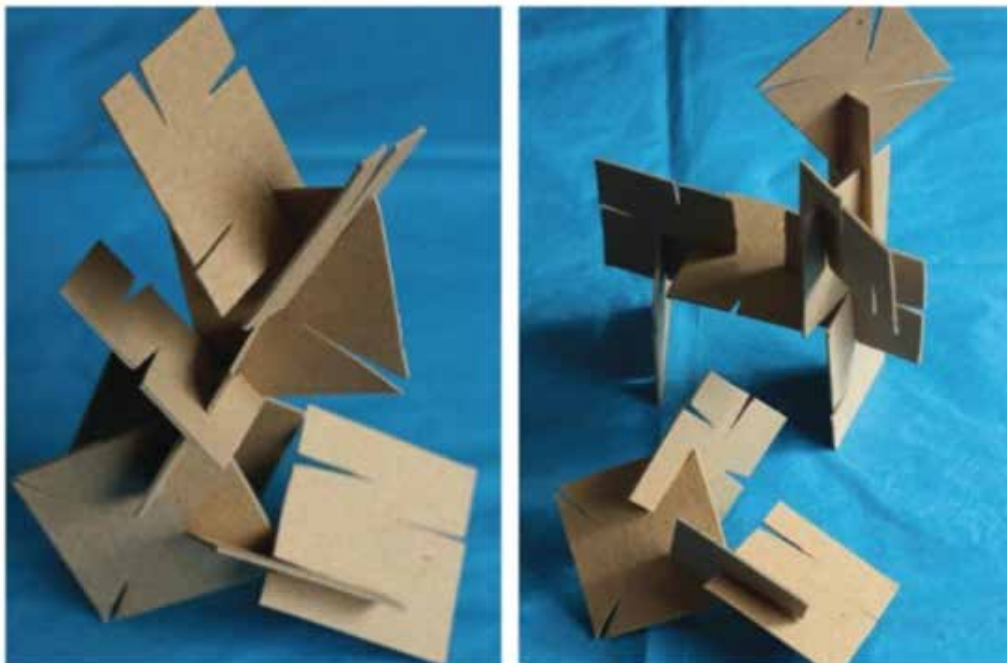
Construction coloring & activity books.



Who doesn't love coloring?

Inside the lines, outside the lines, purple clouds, there's no wrong answer! You can find lot of free materials online.

Cardboard construction Kits



Got any extra cardboard lying around the house?

You've got your next activity! Cut your cardboard into squares, then add very narrow slits into the sides. And that's all the prep you need to do for it! Slide the pieces together to see how many different creations you can make.

Build a fort



Gather up blankets, sheets, pillows, cardboard, whatever you can find.
Build a fort and turn it into a new hotel, restaurant, or school.
The possibilities are endless!

Paint your dream home



What does your kid's dream house look like?
Three stories tall with a water slide from their bedroom to the backyard?
Dinosaurs in the basement?

Have them paint you a floor plan, then you paint one your own dream house and compare notes.

Pack a Lunch and Eat Outside at the "Job Site"



If your construction adventure takes you to the backyard,
why not stay there for when food is ready?

Pack a lunch and eat out on the job site.
Building is hard work and you deserve a break!

How to emerge stronger amidst **COVID 19**

“Success isn't always about greatness. It's about consistency. Consistent hard work leads to success. Greatness will come”

- Dwayne Johnson

The **COVID-19** pandemic is a global problem

Engineering, construction, and building materials have a vital role to play in a post-pandemic recovery of our communities and economies. Seven actions can help companies prepare for the next normal.

COVID-19 has affected communities globally, with more than 2.5 million reported cases and numbers that are still rising. And while governments and companies globally are responding fast, much remains to be done.

In this difficult time, construction matters more than ever. From building hospitals in just a few days to donating lifesaving equipment, the industry has played a critical role in responding to the crisis and in the recovery. The industry represents 13 percent of global GDP and unlocking currently constrained labor availability could help drive recovery while addressing our most pressing construction-related needs.

But the industry has also suffered: construction sites in many countries have shut down. And most

sites that are open have faced disrupted supply chains and operational restrictions. Such disruption has been reflected in financial indexes: since February, public engineering, construction, and building materials companies have dropped significantly more than average.

Organizations must think through the moves they can make today to come out ahead later. A fast return to business as usual seems unlikely for the industry: leaders must first define and prepare for what the construction industry will look like after the crisis. Seven actions can help them anticipate and adapt to the next normal.

Beyond the short-term impact of an economic downturn on construction demand, the crisis is also expected to hit long-term supply and demand, resulting in lasting shifts in investment patterns. Although a high level of economic uncertainty persists our researches suggests that economic activity could be back on track by early 2022 - if the virus is contained within the next few months

and the right economic policies are enacted. However, longer-term lockdowns or other severe restrictions, even intermittent ones, could result in a severe and sustained economic downturn, with economic activity returning to 2019 levels by 2024 at the earliest.

Construction is typically much more volatile than the overall economy. Reduced economic activity results in less demand for new commercial or industrial facilities, and ambiguity further dampens investment. Loss of income and lack of consumer confidence negatively affect demand for housing construction or refurbishment. And as the value of buildings and infrastructure closely tracks GDP, the need for new construction activity is highly sensitive to GDP growth, even in longer-term models. A four-year slump, for example, could substantially reduce construction's share of GDP above and beyond the initial contraction.

On the upside, unprecedented public-relief packages could not only support a rapid recovery but also be followed by public-investment programs. The pandemic also represents a shock to supply. Both migrant and domestic construction workers may be unable to reach jobsites and will need to adhere to new on-site protocols that will reduce productivity for the foreseeable future. Some building-materials supply chains have also been interrupted, suspending production and distribution.

Indeed, recent years have signaled impending disruption. A combination of increasingly stringent sustainability requirements, rising cost pressure, labor scarcity, and new available materials, production approaches, and digital tools are forcing the industry to innovate. Preliminary indications are that many of the characteristics of the COVID-19 pandemic are inducing or increasing some disruptions. In addition to immediate trends, we expect longer-term ones to accelerate as new ways of living and working become standard:

Short term: Increased digitization. - Organizations across the industry are shifting to remote ways of working. For instance, designers and engineers are relying even more heavily on digital collaboration tools such as building-information modeling (BIM). Leading engineers and contractors are

using 4D and 5D simulation to replan projects and reoptimize schedules. Integrated digital-twin solutions are being developed to be used end to end, from project concept to commissioning. And contractors are looking to online channels for monitoring their employees' well-being through apps, ordering construction materials, managing scarce resources more accurately, and maintaining cash flow.

Short term: Rebalanced supply chains toward resilience (versus efficiency) - Contractors are building inventory, securing critical materials and long-lead items, and identifying alternative suppliers.

Long term: Augmented consolidation - Players are looking to consolidate to establish economies of scale and support investment in IT, talent, R&D, and technology. Furthermore, companies and investors will increasingly look to consolidation for much-needed resilience in their balance sheets.

Long term: Vertical integration - Industry players are already starting to vertically integrate to increase efficiency and as a route to standardization and control of design and execution. In a post-crisis world, vertical integration (which may include a return to greater reliance on direct labor) is a potential route to greater resilience. This is the case in industrial asset classes, where equipment manufacturers are experimenting with integrating forward in the value chain and often moving from building to assembling industrial plants. And in real estate, many vertically integrated players are emerging with new business models.

Long term: Further investments in technology or digitization and innovation of building systems - The industry faced a shortage of skilled labor before the crisis. With the prospect of rolling physical-distancing measures and restrictions on cross-border movement of labor, skilled labor shortages will become even more acute. The case for digital tools that are proven to increase productivity, such as 4D simulation, digital workflow management, real-time progress tracking, and advanced schedule optimization, will become even stronger. For similar reasons, we see an increase in R&D spending to develop new standardized building systems to speed up and automate elements of design and construction. We also expect to see more players investing in automation of on-site and back-office processes.

Long term: Increase in off-site construction - Building in controlled environments makes even more sense in a world that requires close management of the movement and interaction of workforces. Such rationale further strengthens the case for off-site construction, beyond the existing quality and speed benefits. In fact, we expect to see contractors gradually push fabrication off-site and manufacturers expand their range of prefabricated subassemblies.

Long term: Acceleration toward sustainability, including designs for healthier living - Governments may stimulate the economy by encouraging measures to meet carbon reduction targets - for example, by retrofitting housing stock to improve energy efficiency. Such incentives might come in the shape of a combination of policy changes and direct public investments. We expect to see a parallel shift in demand toward more sustainable buildings and communities that promote healthier lifestyles (such as access to local amenities and outdoor space, higher standards on air quality, and recycled and sustainable materials).

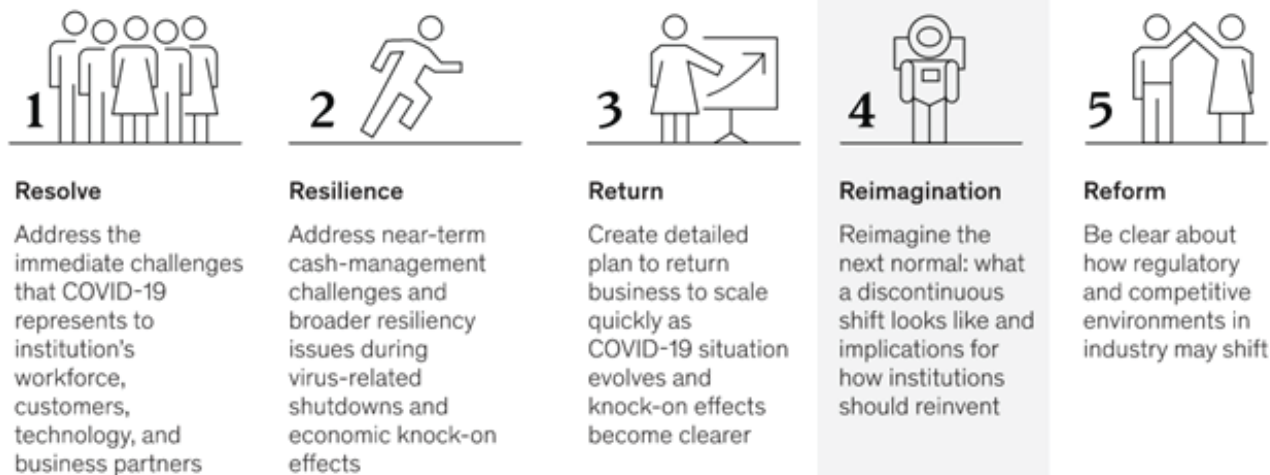
the crisis, construction companies focused on the first two steps: resolving the immediate issues and building resilience for the coming months. Currently most construction projects are ongoing. This process demands a delicate balance: protecting the health of workers, demonstrating compliance with local regulations, and managing client and supplier relationships and contracts - all while trying to achieve some level of productivity and financial stability.

The majority of construction companies are by no means out of danger - and won't be for some months -but now is the time to start reimagining our industry and how organizations can emerge in the next normal from a position of strength.

We all are already taking steps to move beyond the current crisis. Many executive teams are reshaping their strategies and operating procedures, launching ambitious initiatives to come out stronger and spur positive change on the heels of the pandemic. Leaders must proactively reshape their agendas to improve their odds of future success.

Engineering, construction, and building materials leaders are now focusing on reimagining the next normal.

The five horizons



Across all types of business, it is becoming clear that the world will look different as we move beyond the COVID-19 crisis to the next normal. As industry leaders consider navigating this crisis and surviving and thriving in the next normal, we propose a call to action across five stages: resolve, resilience, return, reimagination, and reform. In particular, reimagination can help construction leaders look beyond the immediate crisis and start to plan for the next normal. In the first weeks of

The following seven actions can help leaders prepare for the next normal:

Accelerate rollout and adoption of digitization.

There is no time to experiment with the perfect road map. Organizations must instead enable well-proven remote use cases. For contractors, this may mean scaling up remote collaboration at the production stages using a digital model or urging for minimal manning at site offices. Distributors may need to rethink their entire fulfillment model

with minimal physical interactions, especially with e-commerce models for which sales teams could work and handle customer contracts, sales, or ordering remotely with digital tools. Engineering consultants might strengthen their BIM capability and other collaboration tools. Finally, building materials manufacturers may need to ensure updated BIM, market access through e-commerce, as well as effective, digitally enabled remote sales.

Invest in the culture and skills needed to operate in the next normal.

Balancing performance and health are critical at any point in time—and it's that much more important in these turbulent times. Industry players must invest proportionately in culture to erode not only risks related to remote work but also apprehension across the workforce regarding job security and productivity. Moreover, there is no better time to upskill the entire workforce and require training on new tools and technologies (such as BIM) and operating procedures. Many of these activities can benefit employees by encouraging greater engagement among one another.

Build a control tower across the portfolio.

In a world in which construction prices may come under pressure, companies should use their total size to avoid getting squeezed. Resource allocation will pose a significant challenge for construction in the coming months. It will involve making trade-offs between projects and assets and will rely on accurate progress data across the portfolio. Therefore, companies should establish a central monitoring function that can rapidly identify and respond to resource-allocation needs across the portfolio. In addition to systematic assessment of the parts of the portfolio that may be affected by COVID-19, these capabilities can include real-time transparency on project process, material inventory, subcontractors, services, and costs. Players that have increased transparency across portfolios are much better equipped to optimize sourcing, among other needs.

Bolster supply-chain resilience.

Most leading players have already reviewed their supply chains for vulnerabilities due to the pandemic; they must now look at options for fortification - such as building inventory, identifying backup distribution channels, and recruiting direct labor to replace subcontractors. These could lead to greater consolidation and vertical integration of the value chain not only to minimize

risk but also drive future productivity. Indeed, today's fragmented and multilevel contracting practices often hinder large-scale changes in ways of working, rollout of digital tools, general investments, and R&D.

Redeploy capital and resources.

To sustain a post-crisis revival, construction leaders must strategize their business priorities. In many cases, responding to COVID-19 could present opportunities to make long-overdue moves. And while aspects will differ across the value chain, they will also likely each contain choices of where to deploy capital, resources, and capabilities (and where not to) in the most economical manner. Examples include reinforcing future high-growth segments by increasing funding and reallocating competencies or sharpening core business focuses by selectively exiting business areas. Given the breadth of such options, an effective execution should consider both organic and inorganic levers.

Identify opportunities to shift work off-site.

Suppliers and subcontractors should identify elements and subsystems that can be preassembled in a controlled environment. Longer term, players can look for more significant elements of construction to modularize or build off-site (for example, frames and volumetric modules). Such shifts could help building-materials manufacturers collaborate on designing new product features that could facilitate building-site activities. Furthermore, off-site construction could contribute to sustainability goals by reducing materials waste, noise, and air dust as well as enabling circular building systems.

Get closer to customers. Customer preferences are undergoing a step change—toward online retail, remote working, and more sustainable communities, to name just a few examples. It is not yet clear what other shifts might emerge, but we can assume many of those will likely become engrained and normalized in customer preferences, permanently. Therefore, it's more important than ever to stay close to current (and future) customers.

A healthy and productive construction industry is vital for an immediate crisis response—and to overall economic recovery. However, that industry will look far different from the current setup. Now is the time for construction companies to prepare for their role in a more productive and resilient industry.

A research article by
Shanika Gamage

Building maintainability for realizing sustainable built-environments



By Dr. Ashan Senel Asmone

Building defects have traditionally been known to be repeated in the construction industry resulting in time and cost overruns. Many such defects are only observed during operations stages of the building project due to the latent nature of defects. Such defects have a significant impact on the operations and maintenance of asset intensive buildings; where maintenance shares a significant portion of its operational cost. While the process of decay is inevitable in buildings, and design for a maintenance-free perfectly durable building is economically and technologically impractical; minimizing and mitigating such defects carries a strong motivation for all parties involved in the building delivery process. Hence, an increased awareness on maintenance requirements add value to buildings. Building maintenance is defined as activities carried out to sustain building performance, usage and value by keeping, repairing, retrofitting, or upgrading building's elements, services, and grounds, to an up-to-date standard

[1]. British Standards define building maintenance in BS3811, as 'a combination of any actions carried out to retain an item in, or restore it to, an acceptable condition.' Building maintenance transcends to green maintenance by incorporating sustainable development strategies. Creating a maintenance regime which has lesser negative environmental impacts and improved health, safety, and welfare for maintenance personnel.

Maintenance, on the other hand, is identified as the resultant of "maintainability." While, maintainability of a building is its ability to perform optimally throughout the lifespan within the minimum lifecycle cost

[2]. Maintainability is, therefore, a measure of the ease and ability to which building maintenance can be fulfilled. It is achieved with detailed design, proper construction and a comprehensive maintenance regime. This requires lifecycle cost approach to be integrated with building performance from project outset, as well as a wealth of knowledge on building maintenance (i.e. maintenance feedback) to be used

in designing buildings that are more effectively and efficiently maintained. However, it is most influenced during the design phase, and therefore, maintainability considerations at the design phases are of paramount importance to the future performance (i.e., defect occurrence) and expenditures (i.e., maintenance cost) of facilities.

An emphasis on good design strategies, quality construction, and comprehensive maintenance can pave way for the reduction and possible elimination of building defects

[3]. Projects should aspire to get it right the first time, in order to tackle the defects that may otherwise be only visible at the end of the construction. Yet, design for maintainability is one of the most challenging management principles related to the construction and facilities management industries, due to its indiscernible impact on the facility lifecycle. This has resulted in a lack of industry adoption

of this concept. This is further attributed to a lack of available standards and protocols on maintainability. Traditionally, maintainability was involved in selecting building technologies and materials which require minimal maintenance, viz. cleaning, repair, and replacement

[4]. These maintenance priorities can be used to express the maintainability of a building as an expression of various physical and functional parameters. Such strategies can create buildings with desirable maintenance phase performance by using maintenance feedback data from existing buildings. Maintainability has gained some long needed mainstream recognition in recent years. ISO 21929-1 defines maintainability as ‘the indicator that measures the quality of design of a building and its structures and surfaces and the quality of maintenance plan that has a potential impact on the maintainability in terms of the comfort of the users and in the ability of the building to function.’ It is further identified as an indicator of sustainability. Essentially, a building needs to maintain optimum operational conditions to be sustainable

[5]. This shows that maintainability has a direct impact on building function, its users, and the environment. To serve this purpose, building design teams are expected to bring forth a strong knowledge of the operations and maintenance activities to the drawing table, to plan for maintainability implementation to acquire the required performance over the lifetime of building systems.

General principles of maintainability as reduced lifecycle maintenance costs, reduced maintenance work (in terms of amount, frequency or complexity), elimination of a need for maintenance, reduced repair time, preventive maintenance management, reduced requirements of supply chain support, provisions for interchangeability and modular replacement

[6]. Newer, green buildings need to be operated and maintained in a higher standard to observe whole life sustainability benefits from them. Yet, a lack of maintainability considerations during building design can create a critical barrier in operationalizing this. Therefore, maintainability of state-of-the-art building technologies must be considered to better integrate principles of facilities management (FM) during i

ts design and construction stages, to reap benefits of the operations and maintenance stages. To this end, the designers and owners must determine the principles having priority related to their conditions. Sustainable building design and construction is an integrated and holistic process with the aim more than the sum of the individual components. Much more important than agonizing over the significance of each strategy is the process of creating environmentally conscious and healthy spaces that provide human contact to the natural environment, supporting the local economy and culture.

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Ten most haunted

Construction sites in the world

"Monsters are real, ghosts are real too. They live inside us and sometimes, they win." – Stephen King



We have always been so fascinated by ghost stories. Scary they might be we always love to hear a good ghost story. While researching and writing articles for the current issue of "Construction Today", I was thinking about researching about haunted construction sites. Viola, here you go. If you are a weak heart, do not proceed.

DO NOT!

Beware! Proceed at your own risk!

Information curtesy the world wide web – **Shanika Gamage**

1.

Poinsett Bridge, Greenville, South Carolina, USA



This is the oldest bridge in South Carolina and is said to be haunted by a number of ghosts. A legend states that a mason died here while it was under construction and has been buried inside ever since. Construction is said to have taken longer than expected due to workers being brought into hospital from injury. In the 1950s a man died there in a car accident and his ghost is still said to haunt the site. People who now go and visit the site to look for evidence have identified disturbances such as unexplained voices, shadows and intense lights.

2.

Abandoned UFO village, Sanzhi, Taiwan



This totally abandoned village is recognized as one of the most haunted places in Taiwan.

After construction for a seaside holiday resort began in 1978, strange things such as car accidents and even a suicide occurred.

One day work was abandoned and the people just up and left, with different theories about why this happened.

The series of mysterious deaths that took place during construction is a popular belief.

There are claims that it's the site of a burial ground for over 70,000 Dutch soldiers, with some construction workers claiming that they were haunted by ghosts when work took place.



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How can



Dr Rohan Karunaratne
President
Ceylon Institute of Builders

the Port City benefit Sri Lankan Construction Industry?

The Sri Lankan Construction Industry still operates on outdated and redundant methods and procedures. Our building technologies, bidding documents and legal frameworks are outdated. Similarly, our considerations of the sustainability and environmental impacts of construction are antiquated and require substantial improvement.

Therefore, although we try to heal the industry by small ventures, (One such example being, Modular Construction which has been attempted many times.

Yet, architects and consultants don't approve of it and clients are fearful because there is no guarantee.

As such, no one is ready to accept new technologies) the Port City, being a novel and large-scale venture, is the best place to change all of this- reboot the Industry with new and improved ways of working and revive the people's resolve to better Sri Lankan Construction.

From the beginning, CIOB has urged the SL government to involve Local Contractors, Engineers, Architects, Quantity Surveyors and Consultants in the Port City at a minimum percentage of 25% of 40%. Given the afore-mentioned reasons, we hope this request will be fulfilled.

Contract Documents

Ideally, in the Port City, we can start with the agreements, documentation and legal frameworks. FIDIC is generally recommended for such a situation, however this is the ideal platform to make documentation improvements, equitable to both client and contractor, such as using revised versions of JCT contracts which include: Consultant agreements, Sub-contracts, Sub-sub-contracts, Design agreements between an employer and a specialist designer, Forms of tender, Forms of contract for the supply of goods, Forms of bond and Collateral warranties.

Sustainable Construction & New Technology

Then design stages could be developed for Green, Lean, BIM designing (expected to be the only technology necessary in future construction), drone technology, modular etc. Subsequently in the construction stage, new technology, new methodologies and new materials should be developed. None of the contractors are ready to do this. But the Port City provides the opportunity to change these minds.

Moreover it is a good place to start thinking about the environment, via, sustainable, green and environmentally friendly building, 0 energy buildings and 0 carbon emissions to build an efficient, self-sufficient green city. CIOB has proposed that it will give all necessary 'green guidelines' and issue the 'CIOB Green Mark Certification' for all buildings. Further, sustainable/green materials should be given prominence and the recommended negative list for material importation should be carefully considered.

Technology Transfer & Training

Afterwards hopefully, using the Port City as an example, technology transfer and training etc. can be applied to projects outside the Port City, to the rest of the country. A good example is our Road Sector Contractors who are evidence of the importance of such training. A few years back, Sri Lankan contractors didn't have the strength to compete with foreign contractors to do roads. However, after gaining experience from working with foreign contractors (via sub-contracts/JV's) and self-training, our contractors have now proven their capacity as the most economical, technically-advanced and efficient contractors in the road sector in Sri Lanka.

Bearing these in mind, we can think of someday being a carbon neutral city. If not, everybody will continue their usual course aimed at personal financial gain and we as a nation can't do that for long. So we need to take action now, considering the Port City a rare opportunity to change our course as an industry and as a nation, so we don't reach that point where we cannot continue any further. If done properly, this holds the possibility of changing the Sri Lankan Construction Industry as well as being a globally-appreciated model city.



How Much Do You Know About Construction ?

1

Drone use in the building industry has increased by 239 percent in the last year.

6

Women make around 10.3% of the overall US construction workforce

2

Construction rentals account for 47% of the industry's income.

7

By 2024, the global construction industry is expected to be \$11,093.7 billion.

3

In 2020, the total value of construction in the United States is expected to be \$1.36 trillion.

8

The required construction rate between 2020 and 2050 is 13,000 buildings per day.

4

In 2021, 1 million single-family homes are projected to be under construction.

9

Global construction spending may reach \$17.5 trillion by year-end 2030.

5

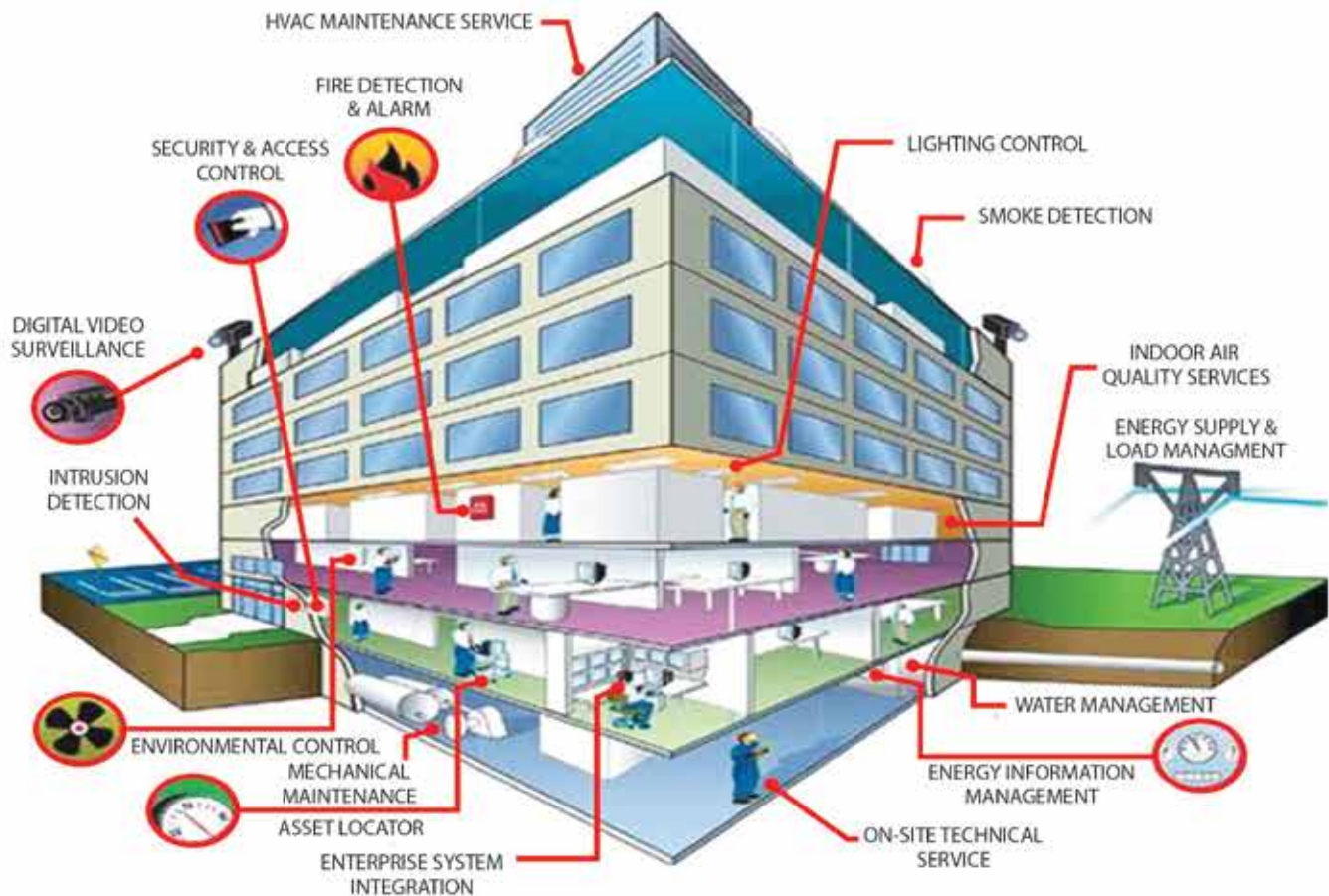
The construction industry in the United States invests an average of \$1,231 billion a year.

10

The construction industry in the United States employs approximately 7.9 million people.

What is a SMART BUILDING ?

- By: Tom Bell -



We are reaching a new age when it comes to building construction.

No longer is it simply enough for offices to provide a space for us to come sit down at one set desk and work.

Today, thanks to the evolution of technology, it's possible for a building to not only deliver all the services that occupants need, but for this to be done whilst making the building as efficient as possible, minimizing costs, and increasing energy savings over the life of the building.

This is a balance that will be key to businesses going forward. The age of the smart building is here.

What is a smart building?

A smart building is one that uses technology to enable efficient and economical use of resources, while creating a safe and comfortable environment for occupants. Smart buildings may use a wide range of existing technologies and are designed or retrofitted in a way that allows for the integration of future technological developments. Internet of Things (IoT) sensors, building management systems, artificial intelligence (AI), and augmented reality are amongst some of the mechanisms and robotics that may be used in a smart building to control and optimize its performance.

Ways of utilizing smart building technology For automation

The most fundamental feature of a smart building is that the core systems within it are linked. Connecting smart technology, such as real-time IoT occupancy sensors and building management systems together, means you can share information that can be used to automate various processes, including, but not limited to, heating, ventilation, lighting, air conditioning, and security. This is what makes a building “smart” - the ability of the systems within it to talk to one another.

To integrate with different building systems

Sharing and integrating data between building systems enables the value of the combined smart building to be greater than the sum of its parts.

For example, integrating IoT occupancy sensor data into a desk or room booking system means that you can enable efficient management processes and provide a smart environment for your employees with assets that know when they are free, booked or occupied.

For space optimization

Buildings and real estate are often the second-highest cost for a business (behind wages and

employees), so ensuring that the space you have available is used optimally is essential.

Here sensors are an integral part of smart buildings and play an important role in collecting data to inform decisions about where to allocate resources. So, for example, occupancy sensors may be integrated into the building to provide information that will help you understand whether your facilities have the right types of spaces to meet your staff’s requirements. Occupancy analytics can help you identify:

- whether you have the right size or amount of meeting rooms
- which communal areas are the most popular or unpopular
- whether the working spaces provided are sufficient

For preventative maintenance

Using AI can help you identify if an asset needs maintenance, because it can learn abnormal usage patterns and alert you when detected. By collecting accurate data from devices such as people sensors, you can get a more realistic picture of how often a facility within your building is used, enabling you to take a more proactive approach to managing wear and tear, cleaning and restocking, helping to prolong the life of equipment, furnishings and appliances.

Smart building examples

To show how smart building features can be utilized in the real world, the National Grid demonstrates how people counting sensors were used to provide reports on occupancy levels. This allowed for usage and capacity measurements throughout the building and helped support a smarter workspace strategy.

The University of Technology, Sydney, utilized automated smart building technology within the education sector to synchronize control of the air-conditioning with a room booking platform. This helped to save significant business costs as the air con only had to be activated when the room was in use.

The benefits of smart building analytics

Smart buildings generate a large volume of valuable building data about how they are being utilized. Analyzing this data can give you insight regarding usage patterns and trends, so that you can make informed decisions on how to optimize your building, bringing the following advantages:

Increased productivity

Delivering a space that facilitates good indoor air quality, physical comfort, security, sanitation, lighting, efficient processes, and the room that staff need at an optimum level will enable them to perform well.

Therefore, identifying and understanding how people make use of and move around your building, is integral to improving the physical layout towards the optimization of frequented space while minimizing waste. Increasing the size of a cramped high-footfall area might be a practical example of this.

Smart buildings can no longer just focus on reducing costs and energy. They need to operate smartly for your staff. Putting in smart operations such as meeting room and desk booking will help reduce wasted staff time and make your space smart.

Reduce energy consumption

Smart buildings allow you to improve your energy efficiency, and, in turn, energy costs.

By connecting IoT sensors that monitor occupancy with your building management system, you can automatically turn off lights or HVAC systems in unoccupied rooms or spaces to reduce the need for unnecessary consumption of energy these aspects emit.

Reduce operating costs

Building overheads are a significant cost for any building owner/user. However, while these are a necessary business expense, the level of spend is often wasteful because it's not intelligently applied. By identifying patterns around underutilized spaces, you can reduce real estate to cut costs.

There are many benefits to implementing smart systems within a building, from cost efficiency to improving the environmentally friendly credentials of the construction. Smart buildings are relatively new today but, given the wide range of benefits that they offer, they will soon become the norm.

How to make your building smart with data

The key to successfully transforming your building into a smart and efficient premise is understanding that only accurate and reliable data can facilitate this. Fundamentally, data that identifies the usage of the facility underpins the operation of smart building systems.

Implementing smart building solutions such as occupancy sensors that record utilization information is the first step to obtaining and analyzing this data. Once you have this information, you can identify where improvements can be made either through integration with other smart technologies and building systems that enable automation or by facilitating strategic decisions to be made.

Courtesy : Internet



Chief Guest Address 9th World Construction Symposium Inauguration 9th July 2021

Prof. Ananda Jayawardane
Senior Professor in Civil Engineering
Former Vice-Chancellor University of Moratuwa.

- /// President CIOB – Dr. Rohan Karunaratne and other officials of the CIOB
- /// Conference Chair – Prof. Chithra Weddikkara
- /// Dr. Suranga Jayasena, Head, Department of Building Economics, UOM
- /// Dr. Yasangika Sandanayake - Head of BEMRU, UOM
- /// Keynote speakers
- /// Editor in Chief BEPAM – Prof. Mohan Kumaraswamy
- /// All paper presenters and participants connecting virtually
- /// Ladies and gentlemen

I am very pleased and honored to have been invited as the Chief Guest at the inauguration of the 9th World Construction Symposium this afternoon and would like to extend my appreciation to the conference organizers for this kind invitation.

As a person who has been supporting this symposium since its launch in 2012, It is heartening to note that the symposium has gained reputation as the largest and the most prestigious construction symposium in Sri Lanka conducted by the CIOB in partnership with Building Economics and Management Research Unit of the University of Moratuwa and in collaboration with several other strategic international universities, professional bodies, and publishers.

At a time when the entire world is grappling with the Covid Pandemic, with construction industry greatly affected, the theme chosen 'Reshaping construction: Strategic, Structural & Cultural Transformations towards the Next Normal' is clearly a very appropriate theme to be discoursed during this symposium. I have noted that the symposium program consists of two important keynote addresses, 12 thematic sessions covering vital themes applicable to the construction industry culminated by a panel discussion providing an

excellent opportunity to cross fertilize ideas, disseminate knowledge, and share best practices for mutual benefit of participants.

I believe that these efforts should lead to three important purposes. First, the industry practitioners and academics who conduct industry-based research highlight the issues and challenges in the construction industry and bring them to the focus of relevant stakeholders and decision makers. These issues and challenges can be common or country specific depending on the development stage of the industry and the systemic, structural, and cultural characteristics. Second, to develop solutions to these challenges by putting our heads together evaluating industry-based research findings, sharing best practices, evolving knowledge to suit local situations and influence the decision makers and responsible implementers to embrace such solutions and recommendations. This is extremely important if we want to see immediate improvement of our industry performance. Third, to do cutting edge research to drive the industry to better sophistication with evolving technologies and tools such as vast strides in communication technologies, IOT, integrated data usage, robotics, advanced materials, rapid construction technologies such as modular and 3D printing, sustainable and resilient cities to raise the industry standard in terms of Key attributes of productivity, safety, quality, sustainability, reduction of cost and time.

This is where we need to understand many certain as well as uncertain developments taking place in the construction industry, identify changes in the external environment where a different set of opportunities and threats loom, review the impact on the performance of the construction industry players, study the various courses of actions taken by the policy makers and the government to mitigate the impact and promote future growth.

It is a well understood that almost every construction project is unique in its very nature in terms of all key parameters, such as location, players, cost, time, specifications, materials, environment, regulations and many more. This is feature we cannot change. Each player whether client, constructor, consultant, financier, project manager, material suppliers, regulators will have their own systems, interactions, and roles. Even if any one of them default or become inefficient, the entire project is affected despite all the other players do their best as in a nested production line. In such a situation, we as researchers should not only address the process improvements within each player but the wholistic system improvement of the network of players. Unless we address these mutual

responsibilities, it is very hard to improve the industry performance. The result is that no player tries hard to perform best if he knows his efforts are wasted due to lapses of other players. This is a challenge for development promoters of the industry such as CIOB.

In order to get the best out of the symposium, I believe that the CIOB intends to prepare a robust set of recommendations aiming at relevant stakeholders and decision makers considering multidisciplinary perspective, our industry structure and status to effect strategic, structural and cultural transformations for the new normal or next normal we are facing not only due to covid challenges but also due to all other challenges we face. I have no doubt that such efforts would have significant and far-reaching improvements in our practices and performance.

I hope and wish that this symposium would be a fertile ground for such discourse and action by understanding various perspectives presented by a multitude of researchers with the idea of sharing best practices and developing consensus on real actions to be taken to face the 'Next Normal'.

In conclusion, I wish the presenters all the very best, the symposium main partners CIOB and BEMRU of UOM to grow from strength to strength, all the participants a rewarding time and the 9th World construction Symposium a great success.

Thank you.

China starts operating



BAIHETAN Hydropower Station

China's second largest hydropower project



The Baihetan Dam opens to release water.

Southwest China's Baihetan Hydropower Station, one of the world's largest hydropower projects under construction, reached a milestone in end June 2021 with the official start of operations for the first group of unique 1 million kilowatt-generating units.

The Baihetan Hydropower Station is located downstream on the Jinsha River, an upper stretch of the Yangtze River, on the border of Southwest China's Sichuan and Yunnan provinces.

The dam broke a number of world records, including the largest underground caverns, the largest anti-seismic parameters of a 300-meter high dam, and the largest spillway caverns.

According to the calculations by engineers, a one million kilowatt generating unit can supply electricity in one hour to an ordinary Chinese family for more than 400 years.

The first batch of million-kilowatt generating units, with the largest single-unit capacity in the world begins operation

The Baihetan Hydropower Station is equipped with 16 generating units, with an expected output of 62 billion kilowatt-hours of electricity per year, or more than 5 times the energy produced by the Hoover Dam in the US. It can help reduce China's carbon emissions by more than 51 million tons per year. The station is expected to be China's second largest hydropower project after the Three Gorges project once it is completed.

The station will be in full operation by the end of 2022. The rest of the 14 generators are planned to start operations by July 2022.

Three Gorges Dam

In 2012, the Three Gorges Dam in China took over the number one spot of the largest hydroelectric dam (in electricity production), replacing the Itaipú hydroelectric power plant in Brazil and Paraguay.

The Three Gorges Dam has a generating capacity of 22,500 megawatts (MW) compared to 14,000 MW for the Itaipu Dam. But, over a year-long period, both dams can generate about the same amount of electricity because seasonal variations in water availability on the Yangtze River in China limit power generation at Three Gorges for a number of months during the year.

Three Gorges Dam is 2,335 metres (7,660 feet) long with a maximum height of 185 metres (607 feet); it incorporates 28 million cubic metres (37 million cubic yards) of concrete and 463,000 metric tons of steel into its design. When it became fully operational in 2012, the dam's hydroelectric power plant had the largest generating capacity in the world, 22,500 megawatts. The reservoir impounded by the dam extended back up the Yangtze River for more than 600 km (almost 400 miles).



Three Gorges Dam located in Yangtze River, , Hubei province, China



Aerial photo on a night view of the Three Gorges Dam



Photo taken on Jan. 1, 2021 shows the Three Gorges Dam in central China's Hubei Province.

Courtesy: Internet

WIRELESS Power Transmission



Courtesy : Internet

Wireless electricity sounds like science fiction, but the technology is already realized and primed for a utility-scale case study. And in this first-of-its-kind pilot program, New Zealand is testing Emrod technology beginning in 2021.

Electricity cannot be transmitted through the air, except in the form of electrically charged particles of **air** - as in a spark or lightning stroke. Magnetic fields **can** travel in **air**, so you **can** send **electricity** by **using** it to make a magnetic field and then **using** the magnetic field at the other end to make **electricity**. When sending electricity wirelessly **long**-range means typically **power** transmission of 100's of metres or across kilometres. **One** technique of **power** transmission is using antennas to **send** electromagnetic beams, like microwaves or lasers. Antenna arrays composed of numerous antenna elements **can** be used to **transmit electric power** from space to the ground in **microwave** form. **Microwaves** are a form of electromagnetic waves in a wavelength range often used for communications.

Advancements in radar and advanced materials technology have made energy transmission over long ranges possible. A company named Emrod has developed a unique technology that makes long distance energy transmission safe & reliable for commercial purposes.

Energy is transmitted through electromagnetic waves over long distances using Emrod's proprietary beam shaping, metamaterials and rectenna technology.

S a f e

- Emrod uses beams in the ISM (Industrial, Scientific, and Medical) band with frequencies commonly used in WiFi, Bluetooth, and RFID.
- Point-to-Point transmission means that power is beamed directly between two points. There is no radiation around the beam, as there is with high voltage wire transmission.
- Low power laser safety curtain ensures that the transmission beam immediately shuts down before any transient object (such as a bird or helicopter) can reach the main beam ensuring it never touches anything except clean air.
 - Reduces electrocution risk associated with wires

R e l i a b l e

- Fewer failure points. No wired lines reduce weather and other physical interference related outages.
 - The technology we use for power transmission is not affected by weather or atmospheric conditions such as rain, fog or dust.

L o n g D i s t a n c e

- Emrod's patented beam shaping and meta material technology creates columnated beams that safely transmit power over many kilometres

C o s t E f f i c i e n t

- Significantly lower infrastructure and maintenance costs.
 - No outage fees

E c o - F r i e n d l y

- Minimising environmental footprint and supporting sustainable energy uptake
- Replacing underwater cables and lines going through nature reserves reduces the human footprint and impact on our environment

By eliminating the need for long stretches of traditional copper wiring, Emrod says it can bring power to regions, which can't afford the kind of infrastructure that supports the power grid. There could be positive environmental ramifications to this, as well, since many sites that don't have access to electricity end up leaning on diesel generators for energy.

To wirelessly conduct energy, Emrod generates electricity in a tight and focused beam in the non-ionizing Industrial, Scientific, and Medical band of the electromagnetic spectrum - the portion of the radio band that corresponds to Wi - Fi and Bluetooth frequencies.

From there, a transmitting antenna sends the power through various relay points to a "rectenna" that can safely transport the waves in the same frequency range as the microwave oven in your home. Meanwhile, tiny lasers monitor the rectennas to sense any obstructions between relay points. That way, there is no outside radiation, and no birds are harmed in this transfer of power.

9th World Construction Symposium,

successfully completed by CIOB & University of Moratuwa



Prof. Ananda Jayawardena
Chief Guest



Dr. Rohan Karunaratne
President CIOB



Prof. Chitra Weddikkara
Chair WCS

Reshaping Construction: Strategic, Structural & Cultural Transformation towards the Next Normal

Over 50 research papers that were received from all over the world, were discussed, from which the best were selected and awarded certificates. Dr Rohan Karunaratne, the president of CIOB said that this symposium has become very popular among international academic and institutional communities and receive over 50 research papers each year, introducing new technologies to Sri Lanka's construction industry including: sustainability, energy management, procurement and integrated project delivery, multinational construction projects, construction practices, quality and productivity, new technologies, research law and dispute resolution in the development of sustainable construction, green and lean construction. He emphasised that these technologies are not largely avoided by the industry. Therefore, the government and institutions like CIDA should seriously consider leading the way to implement these new technologies to Sri Lankan Construction.

The panel discussion, was headed by:

Prof. Mike Kagioglou

Dean, School of Engineering Design and Built Environment/Pro VC International Europe and UK
Western Sydney University, Australia

Dr. Priyath Bandu Wickramama

Secretary, Ministry of Water Supply and Drainage / Member of the Colombo Port City Economic Commission

Prof. Andrew Ross

Emeritus Professor – Construction Project Management / Liverpool John Moores University, England UK

Eng. Nissanka Wijeratne

Secretary General/CEO of the Chamber of Construction Industry Sri Lanka

Topics discussed:

- Visualising the Next Normal in Construction
- How national policy makers visualize the Next Normal
- How the construction industry uses new technologies and knowledge to contribute to build a better world in the Next Normal.
- What was the capacity of the construction industry in recovering after a crisis?
- Take of public sector investments in running construction businesses. Other policies and strategies of the government would be there to support this.
- If a construction industry to thrive in the Next Normal, what are the recommendations for individuals, organizations, professional bodies, and governments?
- Areas requiring training and skill development.
- How should the construction industry strategize to make the full use of Opportunities that will be presented by the Next Normal?

Finally, Dr Rohan Karunaratne thanked all parties who supported the World Construction Symposium :

Hon. Prime Minister, Mr Mahinda Rajapakse, State Minister of Finance, Hon. Ajith Nivard Cabral, Prof. Ananda Jayawardena, Prof. Steve Rawlinson, Dr. Ioannis Brilakis, Prof. Chitra Weddikkara, Prof. Kumarassamy, Eng. Saliya Kaluwarachchi, Mr Kalana Alwis, Eng. Sagara Gunawardena, Prof. Yasangika Sandanayake, Dr. Sachie Gunatilake, Ch. QS. Dr. Anuradha Waidyasekara, Vice-presidents of CIOB Mr Ruwan De Silva & Eng. Jaikish Tudawe, Council members of CIOB, Nawaloka staff, CIOB staff and especially Mr Waruna Mallawarachchi of Lakehouse Newspapers.

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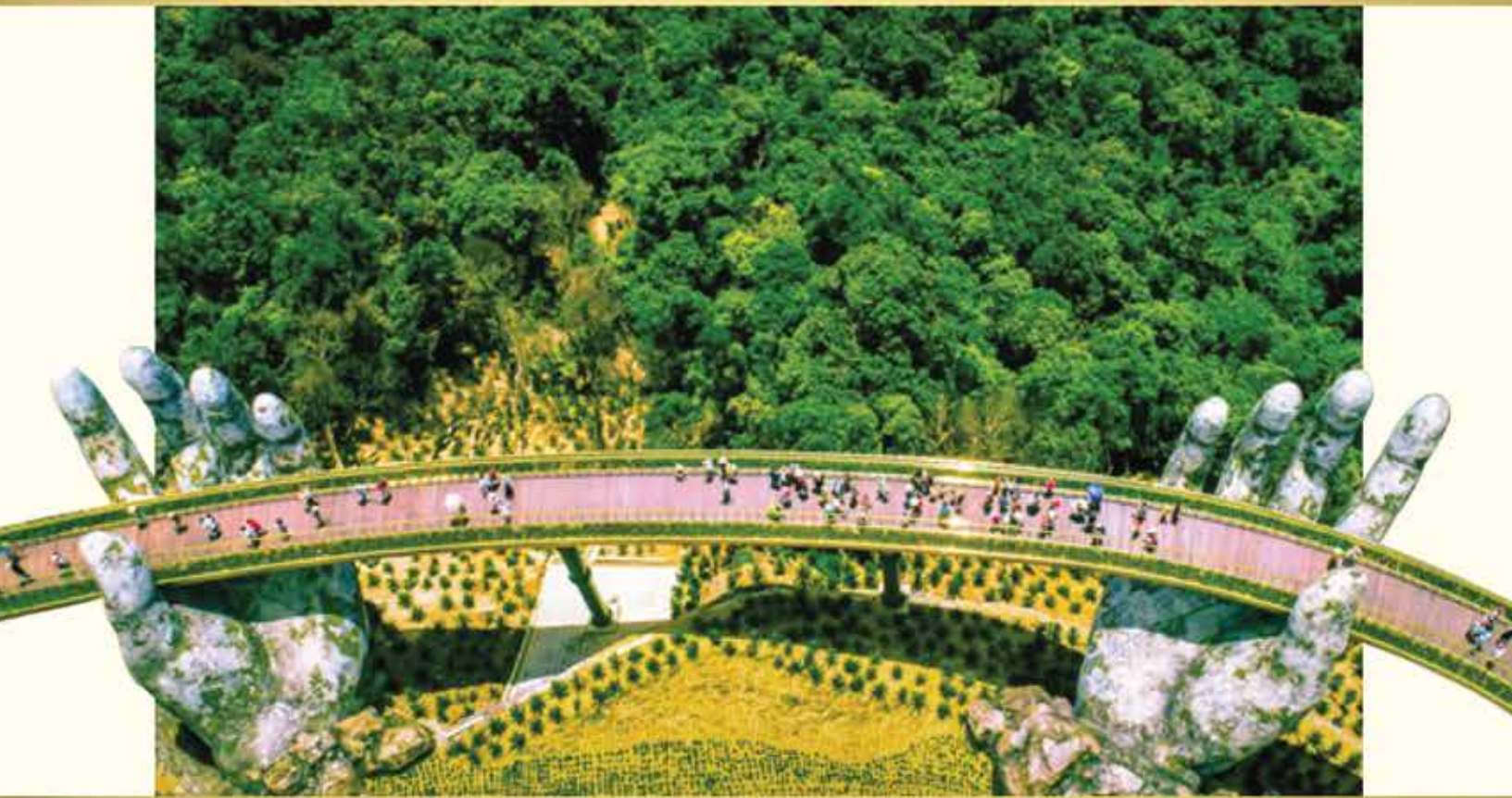


GOLDEN BRIDGE

VIETNAM

A golden ribbon in the sky





“The remarkable appearance of two huge hands looks like they drew the bridge out from the ground, adoring it as if it were a gift from nature.”
- TA Landscape Architecture

The first time most people lay eyes upon the enchanting Cầu Vàng, or ‘Golden Bridge’, they assume it’s CGI or perhaps even a leftover prop from Avatar or Lord of the Rings. But rest assured this breathtaking 150-metre long, 5-metre wide footbridge in the Ba Nàh hills of Vietnam is very real indeed. Amongst a stunning list of architectural awards, this seemingly made-for-Instagram (#CauVang) structure was voted as one of TIME Magazine’s ‘Greatest Places in the World’ in 2018 and continues to attract thousands of local and international visitors.

The design for the iconic footbridge was created by TA Landscape Architecture based in Ho Chi Minh City. Construction began in July 2017 and was completed less than a year later in April 2018. The bridge opened to the public in June 2018.

Inspired by the spectacular natural setting and the mythology of superhuman Gods, Cầu Vàng was designed to appear like a golden ribbon in the sky,

‘a path between heaven and earth’. The initial vision proposed by TA Landscape Architects was for an ambitious elevated pedestrian bridge joining the two ends of the cliff. However, height constraints saw the design team ultimately chose a more fluid and winding arc-shaped structure. Following the line of the adjoining mountainside, the final design comprised eight separate spans over the 150 metre length, with the longest span measuring 21.2 metres. Without question, the bridge’s most notable design features are the two giant ‘stone’ hands reaching out from the lush mountainside. While designed to look like weathered and mossy ruins, they’re actually constructed from state-of-the-art fibreglass and wire mesh. Although the hands appear to be lifting the entire bridge structure, they’re non-loadbearing. Timber decking and green bridge columns in the form of trees were specified to blend in with the surrounding forest and create the impression of a hovering structure, while the ethereal golden stainless steel handrails inspired the name, Cầu Vàng or ‘Golden Bridge’.

The bridge is part of the Sun World Bà Nà Hills amusement park, about 20 miles west of the city of Da Nang. Visitors take a cable car ride up the hill where they can walk the 500-foot pedestrian bridge at an impressive 3,280 feet above sea level. The amusement park features more than just the Golden Bridge. Visitors can also tour a medieval French village and a wax museum featuring cultural icons like Michael Jordan and Lady Gaga.

The Golden Bridge (Vietnamese: Cầu Vàng) was built as an investment to revitalize tourism

in the Da Nang area. Immediately after the bridge was unveiled, photos started going viral, drawing attention from travelers across the globe. Vu Viet Anh is astonished at the instant popularity of the bridge, “We’re proud that our product has been shared by people all over the world.”

The shimmering Golden Bridge has quickly become a favorite spot for wedding photos, social media influencers, and artists to capture the contrast of the imposing, human-made structure against the breathtaking, natural beauty of Vietnam’s landscape.



Courtesy : Internet



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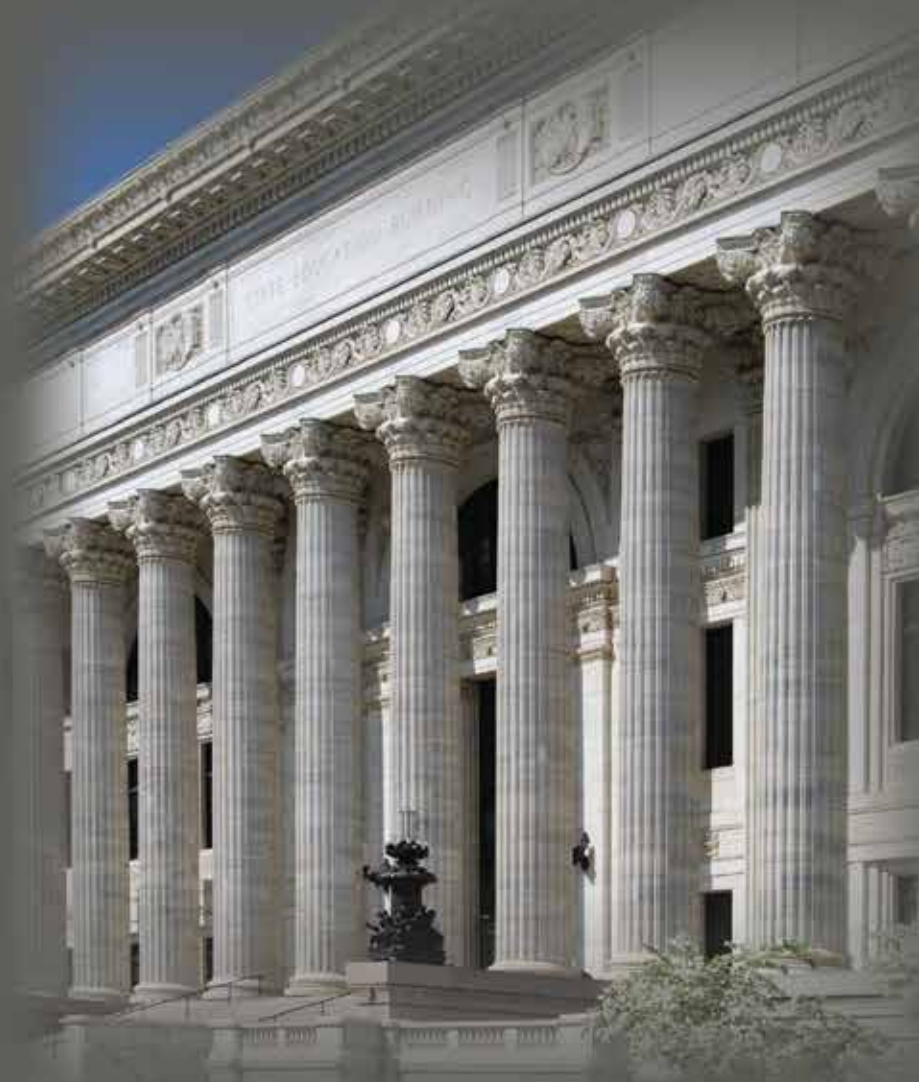
The Bullocks Wilshire Building, Wilshire Boulevard, Los Angeles, USA



This department store was built in the 1930's and is now part of the Southwest Law School. There are rumors going back to the time it was built that a young girl was killed when she was pushed down an elevator shaft. During renovation, construction workers did report secret passageways being discovered, leading from the late owner John G. Bullock's penthouse to other parts of the building. Other strange events include lights suddenly turning on and off and windows opening and closing by themselves. Several workers did choose to resign during construction. In the 1980s, the last scene of 'Ghostbusters' was shot at the top of this building.

4.

The New York state Education Building, Albany, New York, USA



In 1910, an Italian stonemason working on the construction of this building fell into the space where cement was being poured by stoneworkers. The foreman apparently said, "Keep pouring" and this has now become a famous phrase. Pouring kept on and the basement archive of the New York State Education Building is known by employees as 'the dungeon'. Known as 'Jason', the stonemason's ghost is now the most famous in Albany. Employees have reported an icy, unwelcome feeling as they enter the dungeon, as well as finding books strangely open or them on the page they were looking for.

5.

Woodchester Mansion, Nympsfield, UK



Built on the site of the much earlier Spring Park mansion leading back to the 1600s, the history of this mansion is believed to go back to the time of the ancient Romans. Soldiers have apparently been observed roaming the grounds. This building was never completed and during construction there are said to have been 7 deaths and 6 bad accidents that occurred, since work began in the 1850s. During World War Two 20 American soldiers stationed at the site were killed when a pontoon bridge collapsed on the lake. Army vehicles still remain in the lake to this day.



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Artificial Intelligence Future: Comprehensive Overview (2021)

Artificial Intelligence has gone from being a figment of fiction to reality in a matter of years. Machines that could think like humans were an excellent plot for a thrilling storyline. However, in recent times, it has transitioned from fiction to reality- we are living that Artificial Intelligence future. People are using AI technologies in their everyday lives, and somehow it has become an integral part of their daily rituals. From asking Alexa/Siri to tell you the time to get them to plan your next grocery delivery, you are carrying AI into your daily routine.

The evolution of Artificial Intelligence, however, is not as smooth and straightforward as it sounds.

Let's take you through the transitional journey of how AI was realised to be integrated into our daily lives. Let us first understand how it came into existence before taking note of its impact on the human race.



1. The Evolution of AI
2. The Impact of AI
3. The Impact of AI on Society
4. Artificial Intelligence for the Next Decade
5. Concerns Behind the Rise of AI
6. AI & the Future of Privacy
7. Preparing for the future

1) THE EVOLUTION OF AI

It all started with Alan Turing, creating the concept of machines that can think like humans. He was the creator of the Turing test that helped to understand if machines could think like humans. In the late 1950s, research on AI technologies began, and people started designing devices that could think and act like humans.

The technology gained momentum when we got introduced to the first series of computers. Earlier, they were giant machines that could compute faster. However, they updated the devices to store, retrieve, and analyse the data that could enable them to work better.

The goal was to ensure problem-solving and introduce the concept of interpretations.

There have been many scientists who have worked on this concept, from Stephen Hawking to innovators like Elon Musk. They have derived impressive machines and even ideas that could save the world from a potential doomsday.

The idea was to introduce devices that could use natural language processing and are self-recognised to enable better learning capabilities.

The technology was designed to enable machines to keep learning and updating themselves using the data available. These machines need to possess as much data as possible. If there is a fair amount of data, it amounts to useful information and better algorithm designs. But why is Artificial Intelligence important for society in general? Let us try to understand:

- The present state of AI has been defined to help businesses with smooth functioning and better management. It helps streamline significant functions essential for prosperity.
- Companies have started using growth management and productivity tools to accelerate their work and function properly.
- They have started using Big Data tools combined with analytics functions to build better insights and prepare the scaling blueprint. It helps them predict the future of AI. These tools are useful for setting proper pricing and even increasing sales.
- Customer service and other resource support have been improved owing to the AI functions.
- Current research and growing abilities of this technology have led to newer paths and better functioning. There is a use of this technology in almost all industries, as it helps with forecasts and fraud detections.

2) THE IMPACT OF AI

Artificial Intelligence is vital for the future and growth of society. However, before we look at the impact of AI on humanity, let's look at how it benefits you and why Artificial Intelligence is vital for businesses.

1. Automation Everywhere:

Whether you are an operating business or an individual, automation in mundane processes can help. From building your grocery list to checking on your inventory, AI can help you increase speed and agility. As a result, you will observe greater productivity and better management owing to advances in AI.

2. Impressive Experiences:

As a business owner, you are always worried about how your customers react to your business. You want to offer them luxury and better services. When you incorporate AI, you are also enabling your business to automate interactions. You don't invest in resources, and your AI bot is always available. This will lead to better engagement and growth.

3. Better Healthcare:

In a world where people are fighting for basic healthcare needs, AI will ease accessibility and improved awareness. Past data combined with medical advancements can help forecast better and enable faster cure. It also helps with continuous monitoring and immediate help, which you need at this point. Maintaining records and transfer of care has become hassle-free with this technology.

4. Problem Solving:

AI comes with problem-solving capabilities, which means you won't be stuck for long. The intelligence combines methods and past data to build algorithms that can detect frauds, identify cybercrimes, reduce transaction risks, create better experiences and keep multichannel exposures seamless.

Overall with AI, you can expect reduced risks and better management. You will notice greater efficiency as a result of this technology. Let's note some of the impacts this technology has had on society.

3) THE IMPACT OF AI ON SOCIETY

Artificial Intelligence is gradually transforming society. It is ensuring better ways to live together and improving the conveniences for the human race. There are some positive impacts it has had on the human race.

- AI is offering personalisation to users. As a customer, you may need a different solution than someone who is residing with you. Your needs are different, and so are your thought processes. This is when AI can help you. Understanding how you work, what kind of products you use, and how you conduct your daily lives, the intelligent machine can process a solution that works best for you and this makes life so much easier!

- The best example of how this has impacted the current society can be seen in the e-content viewership during the pandemic. For a while, when the theatres and all other forms of

outdoor entertainment remained shut, streaming platforms such as Netflix were on the rise. People subscribed to these platforms to keep themselves entertained. These platforms offer a host of choices of unseen content which is practically impossible for you to sit and search in entirety. However, Netflix managed to search through your past views and offer you recommendations. This helped you pick movies that matched your choices. After watching a lot of movies and series, the recommendation side increased. This led to better options and availability. Artificial Intelligence has impacted your preferences.

- When we talked about healthcare's benefits, we can see how positively AI technology has impacted the medical world today. We know a lot of improvements in the way in which healthcare is accessed and the people are monitored. Let's take a look at some of the cases.

- The electronic health record is one such sign of positive impact where your health data is recorded for easy access. However, what makes it intelligent is that the apps can tell you if you need to buy a new medicine, is time for your next appointment or, even send your details to the doctor when you record new data.

This way, the doctor can keep an eye on their patients and monitor their health.

- The doctors can offer their services through AI-based video conferencing and monitoring tools. These are some of the essential Artificial Intelligence goals that businesses need to align with your requirements.

- Artificial Intelligence has helped the administration take note of when cleaning is needed inside the hospital. For instance, the machines require periodic maintenance. The admin staff cannot remember the details of these services. The devices will tell whenever the next maintenance schedule is on through SMS or email. The admin staff can then call the concerned person and manage it.

- Similarly, smart bins and smart cleaners help the admin staff cater to maintaining hygiene. Whenever the container needs to be emptied, a message is sent, and the user responds immediately.

- Technology is on the rise to improve businesses and how they function. In the manufacturing industry, specifically, there are plenty of processes. It has become time and resource consuming for companies to operate in this condition

As a result, you need to incorporate machines that can communicate and save some time. Artificial Intelligence allows these companies to man the processes without investing in people.

- When it's time to move the things from assembly to the packaging line, the AI will inform these machines and immediately process the transfer.

- AI technology can help in billing and invoicing; there are devices for pre-generated invoices, so that the resources can focus on inventing and innovating.

- It automates inventory management and procurement to improve efficiency.

- There is a need for resources to connect and collaborate with the users. The businesses need to engage with anyone who comes to them for a question-answer round.

- The companies can offer immediate assistance and respond to customer queries through Artificial Intelligence. The chatbots can help overcome resource deficiency in the organisation.

- You can even train the bots to think like the user and answer based on their responses. This gives a human touch to the communication.

4) ARTIFICIAL INTELLIGENCE FOR THE NEXT DECADE

The future of Artificial Intelligence in the next decade looks quite promising and eventful. For one, you will notice a surge in the use of this technology in everyday life. Here are a few trends to incorporate in the coming ten years.

- When it comes to businesses, monitoring and reevaluation of the existing processes help build the future. The future scope of Artificial Intelligence has paved the way for smart monitoring, quicker feedback, and improved business lines. The robotic process automation will reduce the time taken to complete repetitive tasks, making the strategies less cumbersome and more effective.

- Getting a clear view of the customers' mind can build insights, and help you make real-time decisions to improve their experiences. The mobile apps and other mediums that are using AI will help you realise what the users want. Data-driven insights lead to personalised solutions and improve interactions.

- There will be more people behind AI solutions. As a result, the interactions will be in sync with the Artificial Intelligence machines.

The collaboration will lead to successful engagements and better exposure. The future devices will have more data to learn from, which will eventually help them garner better decisions.

- In the next few years, those businesses that have not shown interest in AI solutions yet will start consuming this technology. This showcases a chance for more competition and improved business processes.

Eventually, AI will help with content creation, increased solutions, and improve all industry aspects.

5) CONCERNS BEHIND THE RISE OF AI

We have discussed the advances of Artificial Intelligence, its numerous benefits, and its presence in all quarters of our world. However, it is also time to discuss how AI can be a possible threat to our society. Here are a few risks and concerns associated despite the growing future scope of Artificial Intelligence.

We can find a lot of opposition to this technology, and it is not without any cause. AI is cutting down jobs and the need for a few roles. Apart from this, you cannot ignore the risk associated with privacy and personal data intrusion.

- One of the biggest worries facing the people creating and safeguarding this technology happens to be controlling it. If you create technology or a machine, you should be able to handle it. If you lose control of the technological marvel you created the device can wreak havoc and chaos around you.

There is no ground or even guideline that can help create the technology to have control over it. It has become essential to have a boundary set for this technology.

- With Artificial Intelligence advances automation, few job roles will become obsolete. With no future for these roles, people will have to get new skills or training for new tasks. This will render a lot of people jobless, which can cause financial losses and economic issues. In the past, salesmen used to forecast the future figures using data analysis. It wasn't very accurate, though. With ML and AI, you can achieve greater accuracy. You can remove the study of the data from the salesperson's profile.

- With the addition of robots, many things that people used to do will be done by machines. For instance, you can give regular cleaning of the

house to the robots. The market is already flooded with robot cleaners. So, the maids who used to operate these jobs will now take a backseat.

- If a computer is better at doing a job done by the human till now, it will replace the human in future. As a result, human jobs will require more skills and adaptability as compared to machine jobs. It will require intensive training and constant upgradation to think with and beyond the machine intelligence. This will lead to a different style of hiring.

- If you are a company planning on incorporating Artificial Intelligence advances, you need people adept at the technology. Everyone is not well-versed in the advances in Artificial Intelligence. As a result, you will have to invest in machine learning training and deep learning skill adoption.

The transition will require people to get educated in new skills and abilities. If the people stay abreast and do not enter into their comfort zones, they can find new opportunities even with AI.

- We will observe a more prominent and broader socioeconomic divide if AI technology comes to play. The technology will take over tasks that are prone to repetition. The researchers are of a higher socioeconomic background, and people with intolerances are taking it over. In general, people have preferences, and the machines include these biases. It makes the divide more remarkable. Let's say the researcher is racist. The machine they have created can derive personality traits from the creator and we will have a racist machine. It can become a more substantial threat with time if you cannot control the devices.

- When we talk about humans working on something or taking over a job, we know how to define their rights. However, it becomes problematic when we are dealing with a robot. How do you determine the robots' rights, and what are the rules for rewards and aversions in this case?

The more you invest in training, the better rewards you can reap. You will notice a high-performing and highly engaging machine, which is not the case at the moment.

- AI can also cause military and arms issues by releasing intelligent weapons trained by smart minds. This could prove a threat to the world as controlling and even keeping these weapons in check can be dangerous. It could lead to wars with little or no scope of human intervention to make them stop.

6) AI & THE FUTURE OF PRIVACY

Let's talk about the ethical and privacy issues that are caused by Artificial Intelligence technology.

Advances in Artificial Intelligence can pose a threat to digital security. We have already discussed how this technology uses data that you have provided, including your name and age, to determine how to personalise the solutions for you. As a result, most companies have a lot of data regarding you.

If the researchers can create things for your comfort, they can even threaten you with solutions that can endanger your being. For instance, engineering weapons that pose a threat to you is a possibility. Training machines to hack into the data and create the data into an opportunity. A criminal's mind can rank anywhere from high-risk solutions to endangering solutions.

Despite being created for convenience, AI can wreak our lives by entering into places that are not meant for technology.

However, there is no way to get over this issue. You can master the art of securing your data, but you cannot overcome the dangerous species working continuously behind creating this technology. Artificial Intelligence can create social media personalities that seem real but are not. These personalities can influence your decisions or even manipulate your views. It is not just an intrusion into your life but also your thoughts and decisions. You will need to improve your security system to prevent hackers and pause cybercrime.

7) PREPARING FOR THE FUTURE

The systems working under AI technology are superficial. The learning is based on the availability of data. Though they solve the majority of the problems, the technology itself is in its infancy.

For instance, the technology that we are looking at is not well-versed with studying the patterns in-depth. They can learn the customs and even create cases that will enable the algorithm to think more like humans.

While implementing AI in your organisation, there are a few things that you need to consider. It will help you improve your usage and even keep up with the increasing needs of the machine and Artificial Intelligence future.

- Incorporate an open culture in your organisation. It has become increasingly prominent for businesses that have adopted AI that they have better revenues and profits. It is not enough to adopt the new technology; you also need to

prepare your organisation for the Artificial Intelligence future. Introduce cross-collaboration and discourage silos so that you can benefit from intelligence. You need to boost the performance of the employees. For this performance, you need to identify metrics that are more in sync with the new technology. AI will help you improve efficiency, thus leading to better monitoring and enhanced productivity

- If you plan on engaging with the Artificial Intelligence future, you need to get data from those who have pioneered this technology. Understand how they managed to achieve success and what did not work for them. It is not enough to have the technology; you should work with startups to offer agility and growth. It also helps innovate and bring better ideas to the table.

- You look at the future scope of AI before incorporating better insights and improved logic. The technology is excellent with numbers. However, it does not have the creativity or the intelligence to innovate. If you have freed up your resources from manual and mundane tasks, it is time to get them to innovate the core. It will help you succeed and engage the users better. When you solve their problems, you tend to understand them better. It helps you accumulate more users and build a loyal customer base. It also allows you to stay aware of the issues faced by your users, which is essential for growth.

CONCLUSION

Advances in Artificial Intelligence will reach the superintelligence stage in a couple of years. However, starting a new technology transition has begun, and most businesses are incorporating this unique fixture. It has not only helped with better sales and forecasts but also gives companies new growth opportunities.

AI comes with its own ethical and security issues. It causes privacy concerns to businesses, which needs to be mitigated if you want the user to stay within the company for a while. You will also need to work on job reallocation so that the people who have engaged with you for years can stay happy and engaged. The idea is to transform the future of AI without harming the goodwill of loyal people. It would help if you also introduced the overall culture and organisation-level changes to build a robust AI-induced enterprise. There is no doubt that the Artificial Intelligence future is exciting and extremely promising.

Courtesy : Jyotsna / Jigsaw

“The future is here today – it is just not evenly distributed” – William Gibson –



What's the



FUTURE

of the

construction industry?

A research article by **Shanika Gamage**

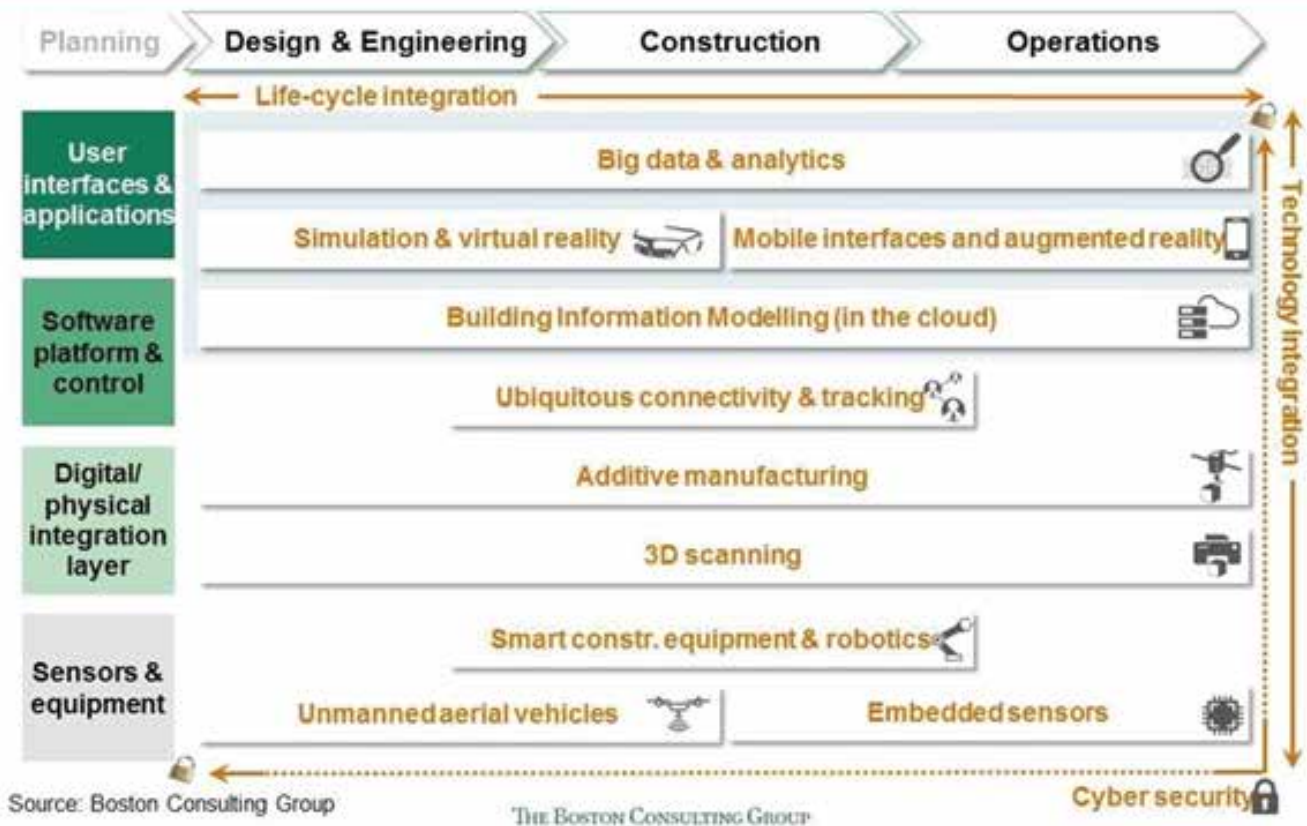
Unlike other industries, the Engineering and Construction sector has been slow to adopt new technologies and has certainly never undergone a major transformation. As a result, productivity has stagnated over the last 40 years, or in some cases, even declined. This unimpressive record looks set to change very soon, and very dramatically. In fact, profound changes are already taking place – though not yet on a sufficiently wide scale – in many aspects of the construction industry. The writer William Gibson’s famous phrase fits the industry perfectly: The future is here today – it is just not evenly distributed. The key is digitalization. More and more construction projects are incorporating systems of digital sensors, intelligent machines, mobile devices, and new software applications – increasingly

integrated with a central platform of Building Information Modelling (BIM). The challenge now is to achieve widespread adoption and proper traction. Wherever the new technologies have properly permeated this fragmented industry, the outlook is an almost 20% reduction in total life-cycle costs of a project, as well as substantial improvements in completion time, quality, and safety.

Construction reconstructed in all its phases

Technological advances are now revolutionizing almost all points in the life cycle of a built asset, from conceptualization to demolition. The chart below shows the relevance of digital technologies along the engineering and construction industry’s value chain.

Many digital technologies can be applied along the E&C value chain



Digitalization is transforming all three major life-cycle phases of construction projects. Consider the following scenario – no longer futuristic, but “here today”, though its building blocks are still distributed patchily over disparate projects.

During the Design & Engineering phase, BIM identifies potential design clashes and constructability issues, thereby averting costly corrective rework; and it improves the tendering process by making the information more transparent and accessible.

An interesting example is that of Crossrail – one of the world’s largest and most complex infrastructure projects, building a major new underground line across London in the year 2016: the designers and engineers used a centralized set of linked BIM databases to integrate about 1.7 million CAD files into a single information model.

During the actual Construction phase, drones surveyed and inspected the construction site. 3D printers prefabricate many of the building components. GPS and radio-frequency identification (RFID) were used for tracking the materials, equipment, and workers, in order to then optimize flows and inventory levels. Robots and autonomous vehicles did much of the actual building work. 3D laser scanning or aerial mapping was used for comparing work-in-progress against a virtual model, thereby enabling prompt course corrections, and minimizing corrective work.

Take the case of a Japanese equipment manufacturer that has developed fully autonomous bulldozers, led by drones that map the area in real-time to provide data on the workload.

During the Operations phase, embedded sensors continue to monitor any given part of an asset, checking for deterioration, facilitating predictive maintenance, and continually updating a central database. Augmented reality is used for guiding maintenance crews.

Big data – on traffic movements, electricity consumption, and so on – are collected digitally, and are subjected to advanced analytics, in order to optimize decision-making and generally boost operational efficiency.

By way of illustration, consider the approach taken by the Japanese building service provider NTT Facilities to the inspection, maintenance and repair of their R&D premises: by integrating the BIM model into the building’s facility- and asset-management system, and making intelligent use of this combined resource, the company was able to reduce the cost of operations and maintenance by an estimated 20%.

Gathering momentum

On average, uptake of these transformative technologies has been slow initially. They have faced some resistance to adoption, and some companies that do deploy them have struggled to capture all the potential benefits.

The obstacles are being overcome, however. More and more companies are now embracing the opportunities, with productivity starting to rise and promising to soar.

As per the current trends, within the next ten years full-scale digitalization will lead to huge annual global cost savings. For non-residential construction, those savings will be \$0.7 trillion to \$1.2 trillion (13% to 21%) in the Design & Engineering and Construction phases; and \$0.3 trillion to \$0.5 trillion (10% to 17%) in the Operations phase.

Note that the productivity gains will vary not only across the life-cycle phases but also across the sub-sectors: vertical, industrial, and infrastructure. The chart below, based on a study conducted by Philipp Gerbert, Santiago Castagnino, Christoph Rothballer, Andreas Renz, and Rainer Filitz in the year 2016 on construction projects from each of the sub-sectors, shows the variation in detail.

Overview case study findings: Estimated impact of digital E&C levers on total life-cycle cost and construction time

	I Office building	II Long-distance highway	III Power plant
			
Impact on total-life-cycle cost	-15%	-16%	-12%
• Design & Eng. cost	±0%	±0%	-5%
• Construction cost	-12%	-19%	-14%
• Operations cost	-18%	-10%	-10%
Impact on construction time	-30%	-23%	-15%

Source: Boston Consulting Group

THE BOSTON CONSULTING GROUP

The gap between digital leaders and laggards is widening – for construction companies themselves, for technology providers, and also for governments in their role as project owners and regulators. All these stakeholders need to master the dynamics, upgrade their competencies and investments, and adapt their processes and attitudes, or risk losing out competitively.



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Public - Private - Partnerships (PPP)

Dr.V.Mohan,
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Introduction

PPP's constitute a new and unique challenge for public procurement because they transcend traditional contracting assumptions, policies, and procedures predicated upon the existence of a buyer/seller relationship. As the name implies, PPPs place governments not in the position of buyers of goods and services from the private sector, but rather in the position of partners with private sector organizations, both for-profit as well as non-profit or third sector organizations. As such, c PPPs represent a form of coproduction.

**PUBLIC
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Balancing the needs of the public and private sectors to finance the nation's infrastructure



Although PPPs have many of the same characteristics as privatization and contracting it can be argued that PPPs represent a new species of governance tool suggest that PPPs are really a synthesis of the direct government service delivery mode and market-based approaches. PPPs attempt to combine the best aspects of both delivery approaches, while simultaneously minimizing the negative aspects. PPPs can reduce life-cycle costs, provide for better resource allocation, enable the faster implementation of public works and services, improve service quality, and provide additional revenue streams. The different types of actors (public, for-profit, and not-for-profit) involved in PPPs suggest different types of interactions between the partners. As the role of a public partner in a PPP is to “define and promote the achievement of the public purpose;” the role of a for-profit partner is to “produce goods and services” PPPs then do not require an abandonment or change in the raison d’être of sector partners, but rather involve the harnessing of their collective energies through cooperative interaction.

A typology of PPPs is then presented based on a dichotomy of infrastructure PPPs and functional PPPs; case studies provide examples of each type. Next, the funding of PPPs is considered. The characteristics of successful PPPs are then discussed. Some initial evaluation results of PPPs are presented. Finally, the challenges of PPPs for public procurement are identified and discussed.

PPPs in Historical and Modern Contexts

Throughout history, governments have frequently looked to the private sector for assistance, particularly in times of crisis. The principal difference between modern PPPs and those of the past is that the latter were essentially pragmatic responses to specific situations. Modern PPPs tend to be based on a priority government policy decision to work in partnership with the private sector as a preferred way of conducting the public’s business and addressing public policy goals. The modern world is much more complex, the pace of change is accelerating, and knowledge is no longer found exclusively (if it ever was) within the public sector. The renewed interest in PPPs today by governments around the world can be traced, at least partially, to the ideas of the “new public management” the “governance” paradigm and the “reinventing government” all of which stress involvement of the private sector and the harnessing of private sector expertise and resources to assist in the accomplishment of public policy goals.

What Are PPPs?

The concept of a “public–private partnership” might best be thought of as an “umbrella term” that encompasses a variety of approaches that have common features, but nevertheless vary significantly depending upon their focus, their construction, and their country of origin. Different governments in different countries utilize different types of PPPs to accomplish different public policy goals. Some countries (e.g., the United Kingdom) make extensive use of PPPs across a variety of policy areas, while other countries (e.g., Chile and Italy) make more targeted use of PPPs. Because of their scope and breadth, as well as their country differences, there is no single consensus definition of a PPP. Some of the more instructive attempts at definition are:

Common Characteristics of PPPs

Although obviously looking at the subject from different perspectives, the definitions highlighted in the previous section identify several characteristics that take PPPs out of the realm of traditional public procurement, competitive tendering, and government contracting:

- (1) sharing of skills and assets,
- (2) long-term flexible relations,
- (3) risk and reward sharing, and
- (4) joint decision making.

1. Sharing of Skills and Assets

The common thread in all PPPs is “... the public sectors efforts to take advantage of private-sector management skills, expertise, innovations, efficiencies ...”. The sharing of skills and assets means that some form of joint decision making and dispute resolution, above and beyond that of traditional contracting relationships, is required.

2. Long-Term Relationships

PPPs frequently cover long time periods; partnership terms of 10, 20, or even 30 years are not unusual. Some PPPs can have even longer time periods. Part of the rationale for the extended terms of PPPs is the need of private partners to recover and recapture their capital investments. The long-term nature of PPPs requires that they be flexible. It is doubtful that the PEST assumptions (e.g., political, economic, social, and technical) upon which any individual PPP is based will continue unchanged over a 10, 20, 30 years, or even longer time period. Thus, the idea of flexible PPPs flows logically from their long-term nature. The partners enter into PPPs with the understanding that the basic agreement will almost certainly need to change and evolve over time.

3. Risk and Reward Sharing

The entering into a PPP creates major risk exposure for both public and private partners. At least six major types of risk can be identified: construction risk, financial risk, performance risk, demand risk, residual value risk, and political risk. In managing the risk associated with PPPs, the general rule of thumb is that the risk should be assigned to the partner best positioned to manage it. Thus, a decision that confronts the public and private partners up front in the initial partnership understanding is which one will be assigned to manage each of the six types of risk. The political risk usually accrues to the public partner, while the financial risk is largely assigned to the private partner. The suggestion is made by some that the financial risk should be largely born by the private partner as an incentive to hold costs down during implementation.

4. Joint Decision Making

Most government contracts are predicated on the existence of a buyer/seller relationship. As such, “principal/agent” theory and traditional legal and contracting principles are generally deemed to apply. Under principal/agent theory, the government is the principal and the private sector contractor is the agent. It is the agent’s duty to do the principal’s bidding; the agent also has a fiduciary responsibility to make decisions which are in the best interest of the principal. Because of the risks involved, the longterm nature of the relationships as well as the need to share skills and assets, it is questionable that principal/agent theory provides a satisfactory foundation for creating and managing PPPs. Instead, joint decision making is seen as a virtual necessity. It is hard to imagine a private sector organization that would be willing to commit its skills and assets to a long-term relationship with major attendant risk exposure without desiring, if not demanding, some role in partnership decision making.

Major Drivers of PPPs

The major drivers of PPPs are essentially two- fold:

- (1) public infrastructure needs and
- (2) public budgetary constraints.

1. Public Infrastructure Needs

The most important driver of PPPs is the infrastructure needs of governments. Without this need, there would obviously be less interest worldwide in PPPs. Governments have significant

amounts of aging infrastructure, much badly in need of repair and replacement; additionally, governments have new unmet infrastructure needs. The use of PPPs, and in particular the private financing aspect, enables public infrastructure projects to be brought online much more expeditiously than via traditional public financing.

2. Public Budgetary Constraints

At the same time governments are facing increasing pressure to repair and replace old infrastructure as well as create new infrastructure, they also face budgetary constraints. PPPs represent a method by which governments can address infrastructure needs while circumventing government laws and regulations concerning public borrowing. The cost savings and cost deferrals to governments can be significant.

Types of PPPs

Just as there is no universally agreed upon definition, there is likewise no universally agreed upon taxonomy or classification system of PPPs. In general, PPPs are divided into two major classes:

- (1) infrastructure PPPs and
- (2) functional PPPs.

Within these two broad classes, typologies and nomenclatures can vary significantly.

1.) Infrastructure PPPs

Despite their differences, there is nevertheless considerable agreement among national and international organizations about the major types of infrastructure oriented PPPs. What can be called a “metaclassification system” arranges infrastructure PPPs on a continuum based on the extent of private sector involvement and risk sharing. The continuum ranges from the relatively simple and less risky PPP where the private sector operates and maintains a public facility or asset (e.g., convention center, park, museum, etc.) to the complex and extremely risky. build–own–operate (BOO) approach. Examples of the various types of PPPs are illustrated in the following sections.

2.) Operations and Maintenance

Operations and maintenance PPPs involve the public partner retaining ownership and management of a facility or asset, while the private partner oversees the day-to-day. Under the PPPs that were created, Lockheed agreed to repair, replace, and maintain the city’s parking meters.

Taxonomy of Infrastructure PPPs

Infrastructure	Approach
1. Operations and maintenance	Private partner operates and maintains a public facility or asset; the public sector partner owns the facility or asset
2. Design–build	Private partner designs and builds a facility or asset; the public partner provides the funding, owns and operates the facility or asset
3. Design–build–operate	Private partner designs, builds, and operates a facility or asset; the public partner provides the funding and owns the facility or asset
4. Design–build–finance–operate	Private partner finances, designs, builds, owns, and operates (for a period of time, e.g., 30 years) a facility or asset; the public partner provides funding during the life of the facility or asset
5. Design–build–operate–transfer	Private partner designs, builds, and operates facility or asset and transfers ownership to the public partner.
6. Build–transfer–operate	Private partner builds a facility or asset and transfers title to the public partner. The public partner leases the facility or asset back to the private sector partner under a long-term lease
7. Build–own–operate–transfer	Private partner builds, owns, and operates a facility or asset for a period of time at which point ownership is transferred free of charge to the public partner
8. Build–own–operate	Private partner builds, owns, and operates a facility or asset in perpetuity and assumes all the risk that would have been born by the public partner (similar to privatization)

2. Design–Build (DB)

A design–build (DB) PPP is created when one private partner designs and constructs a project, which both saves time and reduces conflict between separate design and build contractors. The public partner provides for the operations of the facility, while maintaining ownership.

3. Design–Build–Operate (DBO)

In a design–build–operate (DBO) PPP, the private partner designs, constructs, and operates the project. Having one private partner for all three phases expedites completion of the project because of

cycle time reductions created by overlapping design and build phases. When the operations phase is added, there is a better possibility of private financing of the project, as they can see returns on their investments through user fees. In one DBO public–private partnership, the private partner was tasked to design and build a facility.

4. Design–Build–Finance–Operate (DBFO)

In a design–build–finance–operate (DBFO) PPP, the private partner finances, designs, builds, and operates the facility or asset. Funding after construction is provided by the public partner and

the facility or asset is eventually transferred to the public partner after some specified amount of time. The consortium provides everything necessary for creation of the center from financing to operation.

5. Design–Build–Operate–Transfer(DBOT)

Design–build–operate–transfer (DBOT) PPPs take place when the private partner handles the design, construction, and operation of a facility or asset. The ownership is transferred to the public partner when construction is complete. The contract for this DBOT PPP is expected to last between 30 and 50 years and is heavily focused on technology.

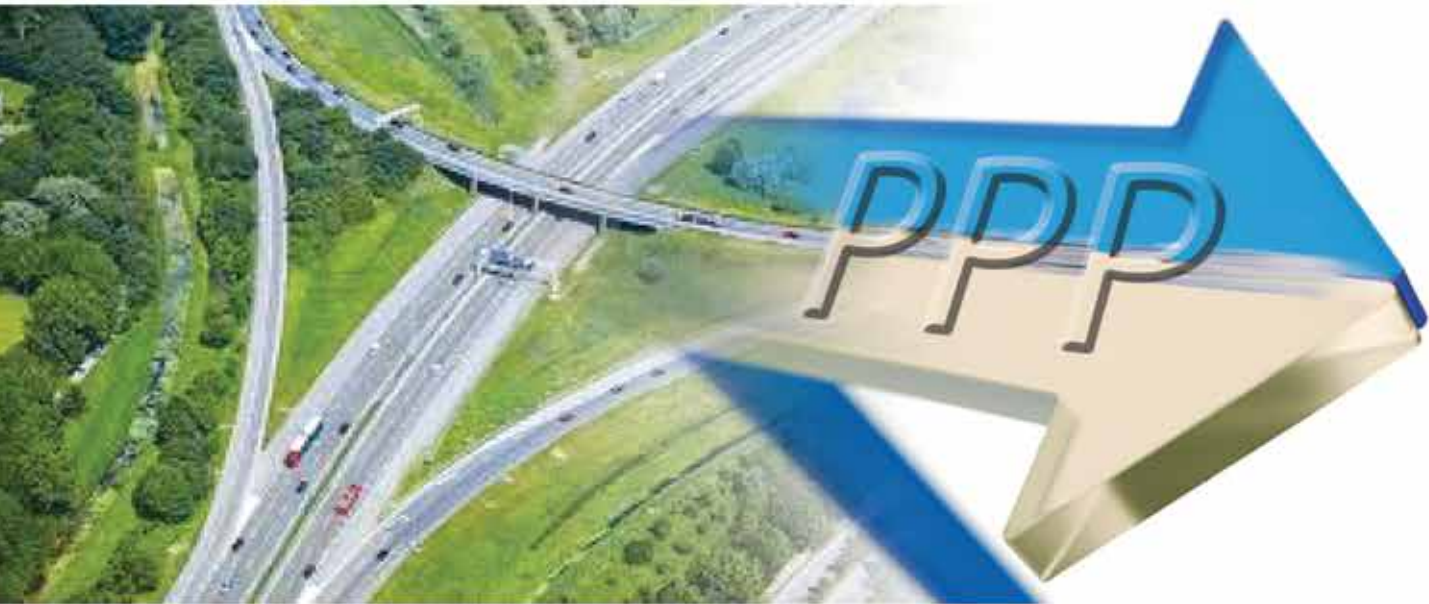
8. Build–Own–Operate (BOO)

In a BOO PPP, a private partner does exactly that. The private partner builds and operates a facility or asset, but does not transfer ownership to the public partner. This type of PPP does not require a purchase by the public partner and thus it might qualify for tax exempt status if all requirements are fulfilled. This type of PPP is based on the private partner assuming all of the project risk.

Financing of PPPs

There are essentially two major types of financing utilized in most PPPs:

- (1) private sector financing and
- (2) user charges.



6. Build–Transfer–Operate (BTO)

A build–transfer–operate (BTO) PPP involves a private partner building a facility or asset and then transferring ownership to the public partner. After transfer, the public partner leases the facility asset back to the private partner.

7. Build–Own–Operate–Transfer (BOOT)

PPP is one in which a private partner builds, owns, and operates a facility or asset for a specified amount of time. The length of time involved in the concession is related to the need of the private partner to recapture its investment. At the end of the concession, the private partner transfers ownership of the facility or asset to the public partner at no cost. At the expiration of the concession, the public partner, at its discretion, can elect to operate the facility or asset itself, extend the concession with the original private partner, or select a new private sector partner. BOOT PPPs have been used successfully utilized in many countries.

1. Private Sector Financing

Financing is crucial to any PPP and most commentators on PPPs suggest that the private partner should provide most if not all of the partnerships financing. Private sector financing generally takes one or two forms: the creation of the so-called “special purpose vehicles” (SPVs) for a specific PPP, or institutions created by governments for the purposes of infrastructure development in general. SPVs are typically formed by a group of banks or other financial institutions to coordinate capital and expertise for a specific PPP

2. User Charges

User charges are tolls and other fees paid by those individuals who utilize facilities and assets involved in a PPP. Examples of user charges include road, bridge, and tunnel tolls as well as admission charges to museums, parks, and other public venues. There is a belief in at least some circles that private sector organizations have more latitude in increasing user charges than do govern

ments. In the best-case scenario, the utilization of user charges can make a facility or asset self-supporting.

Characteristics of Successful PPPs

PPP identifies six characteristics of successful PPP:

- (1) political leadership,**
- (2) public sector involvement which we will term “partner accountability,”**
- (3) a well-thought-out plan,**
- (4) a dedicated income stream,**
- (5) communication with stakeholders, and**
- (6) selecting the right partner.**

(1). Political Leadership

The use of political leadership in the development of a PPP is very important. Not only should political leaders be able to play a role in the development of the partnership through planning and any sort of statutory development, but they should also be advocates of the plan to the general public. By their participation and assurances to the public, it will make it much more likely that the citizens will support the partnership and its goals.

(2) Partner Accountability

In the initial plan or contract, it should be stated what the involvement of the public agency will be. To reduce waste and provide results in a timely manner, the sort of accountability and monitoring standards that will be enacted to facilitate timely progress should be written into plans and contracts. Specificity of terms is extremely important and whether this monitoring is done on a daily, weekly, monthly, or quarterly basis should be noted as such. Even though the public agency and private entity enter into a partnership, it is still imperative that accountability and standards be in place, to facilitate a mutually beneficial relationship.

(3) Well-Thought-Out Plan

Like anything in life, PPPs require a great deal of planning and development. Rushing into a partnership, without the right type of expertise and planning, could prove to be fatal for any blossoming partnership. Involvement by someone experienced in the field would be greatly beneficial for the plan. The plan itself should be incredibly detailed and indicate the specific responsibilities of individual partners and also lay out a clear method of conflict resolution, should one arise. As in any relationship, there is always a real possibility of disagreements between two parties and to avoid them or at least facilitate

(4) Dedicated Income Stream

One of the most important factors in a partnership would be the repayment of loans or investments that were provided by the private partner. There are many options that can facilitate this revenue stream, but fees, taxes, and tolls are a few good examples of how this can be done. As with every thing included in a partnership, this should be addressed in the contract, to ensure a consistent payment method for the life of the partnership. Because benefits and rewards are shared, it is important to ensure that financial obligations are taken into consideration during the planning phase of the partnership.

(5) Communication with Stakeholders

Public perception, on all levels, is a very important consideration for any partnership. To build support for a partnership, it is important to inform community leaders and the general public of the Partnership’s intentions. Without the support of the public, a partnership is sure to run into many obstacles. Being open and creating an effective communication and marketing campaign is a key component to developing a partnership. Without the understanding of all of the stakeholders, a partnership will be in real danger of failure.

(6) Selecting the Right Partner

Selection of the correct partner in a PPP should be one of the foremost considerations of the public agency. Although government is always looking for ways to cut costs, it should not be the only consideration in the selection of a partner. It is incredibly important to establish a relationship in which the private partner is experienced and trustworthy in the field of the partnership. This will allow the public agency to find a partner with the “best value” providing a high level of partnership for a cost that is justifiable. These six drivers provide a very thorough guide to the development of a successful PPP. None of these six are necessarily more important than the other, but they will of course vary from partnership to partnership, as there is no cookie cutter or formulated way to develop a successful PPP.

Evaluating PPPs

In terms of an overall evaluation of PPPs, performance of this governance tool is mixed” OUT of ten PPPs created under the Public Finance Initiative reported that the best deal was, ... “probably obtained in every case and good VFM (Value For Money) was achieved in eight of ten cases” In terms of increasing the funding available for public infrastructure, studies also present a mixed picture. The major lesson here may well be that

there is no worldwide success/failure pattern to PPPs. The success or failure of an individual PPP may well be related to its nature infrastructure/-functional, its financing (private sector/user charges), its country of origin, the allocation of risk between the public and private partners, and other factors.

Challenges of PPPs for Public Procurement

PPP presents several challenges for public procurement including

- (1) the challenge of selecting the right type of solicitation and contract,
- (2) the challenge of dealing with risk and complexity,
- (3) the challenge of building and maintaining trust, and
- (4) the challenge of long-term contracts.

(1) Challenge of Selecting the Right Type of Solicitation and Contract

PPP as involving non-routine contracts that start with many more unknowns and take unexpected turns during implementation. Increasingly, governments are coming to the realization that traditional procurement and contracting relationships are insufficiently flexible and can actually constitute an impediment in attracting private sector partners and creating PPPs. A major government commenter on the European Commission's Green Paper on PPPs, suggested that procurement and contracting rules and regulations actually restrict the use of PPPs. For low complexity contracts, he suggests that traditional bidding is appropriate. For moderately complex situations, he suggests multi-step procurement. However, for highly complex contracts like PPPs he suggests using "negotiated procurements" which correspond most closely to "requests for proposals" (RFPs) and "invitations to negotiate"

(INTs). This suggests that, while still striving for a transparent and competitive procurement, when the quality of the service and even perhaps the very scope of the partnerships itself cannot be determined ex ante, a form of "competitive dialogue" may be the solution. Include a commitment to resolve issues without resort to litigation; open and transparent transactions, books, and record; and shared decision making through leadership teams comprised of all partners based on consensus. The U.S. federal government has gone so far as to create a new type of contractual arrangement that is called a cooperative agreement to deal specifically call with PPPs.

(2). Challenge of Dealing with Risk and Complexity

Complexity creates and vice versa. Because PPPs are more complex than traditional forms of government contracting, risk assessment is more difficult. Conversely, the difficulty of risk determination and management in PPPs makes them more complex. How then can or should governments conduct risk assessments? The answer, according to, is to combine: traditional risk assessment and risk management methods with a new found appreciation for 'trust' as a moderating variable. Can the partners trust each other to do the right thing and to act in the best interests of the partnership? Yet another risk and complexity challenge is determining how much risk can, and should be, transferred to the private sector partner. The corollary here is what type of compensation and incentives are necessary to induce the private partner to agree to this risk transfer. The complexity of PPPs also makes them riskier in political terms. Elected officials, citizens, and other stakeholders are generally familiar with contracting, but not with PPPs. In an era of governmental reform that prides itself on "transparency," the education of stakeholders about what PPPs are and are not is an important task.

(3) Challenge of Building and Maintaining Trust

Although a PPP "provides the basic architecture of the arrangement" it cannot cover all contingencies that may arise over the life of the partnership. A PPP is a high trust relationship. Because of the risks inherent in PPPs, trust and trust assessment becomes an important consideration. How much trust can the public partner place in the private partner "to do the right thing" and vice versa.

(4) Challenge of Dealing with Long-Term Contracts

As points out, short-term contractual relationships are a part of the government procurement and contracting culture. Managing long-term PPPs present unique challenges. Away from the project; for a variety of reasons including both economic and political, the public partner does not have the same luxury. An additional consideration is who will be around in 20 years (the theoretical average life span of a PPP) who is familiar with the original goals and understandings of a PPP and can thus make informed decisions about changes and alterations? Some 15 years into a PPP and several years after one of the authors of this chapter had left his position with a government agency, he was contacted and asked specific questions about the original agreement. Apparently no one was still working for the government who had any knowledge about the PPP and much of the original documentation could not be located.

6.

Sheffield Island Lighthouse, Norwalk, Connecticut, USA



In 1872, the original keeper of this lighthouse died while watching ships with a spyglass and the reason why has never been explained. It was first built in 1868, to help ships reach Sheffield Island safely.

In 1991, an archaeologist working on site preservation, reported hearing strange sounds such as piritual music, distressed cries and even the sound of a foghorn, while there were none present on the island.

t is believed by a lot of people that these were the sounds of Captain Robert Sheffield, who purchased the islands in the early 1800s.

Guided tours are now offered around the lighthouse during the summer.

7.


Winchester Mystery house, San Jose, California, USA



Owned by Sara Winchester, when her daughter died of a childhood illness and her husband of tuberculosis, she commissioned a Victorian funhouse to be built. Believing they had both been killed by ghosts, the building was constructed as defense against them. This was recommended by a seer, suggesting that continuous construction of the mansion was the only successful method of protection. Eerie features include windows leading to haunted passages, doors opening onto brick walls and staircases that lead to the ceiling. Beginning in 1886, renovation only ended when Sara died in 1922.

8.

Sunshine 60, Ikebukuro, Tokyo, Japan



This 60-story shopping and office building was built on a site where the Sugamo Prison once sat. The name 'Sunshine 69' was given, to distract visitors from the sites' unfortunate past.

Holding political prisoners before 1945, around 5000 Japanese war criminals were incarcerated here. Construction began in 1971 and freak accidents, as well as a few deaths were reported.

Today, maintenance workers have reported hearing strange noises such as laughter, chanting and whispers. Ghost sightings and floating fireballs are two other reported sights.

People still reveal tripping or falling when there's nothing in the way.

9.

5285 Dean Martin Drive, Las Vegas, Nevada



There is a rumor that this site was once used by the mob as a burial ground, but enough research hasn't been done. It has been used for a number of purposes since it first opened in 1991, from a Mexican restaurant, to a nightclub and even a strip joint, but remained abandoned after it was bought in 2010. After 'numerous unexplained experiences' in 2009, the Paranormal Investigation Team of Nevada was brought in to collect evidence and stated: "It definitely has paranormal activity'. Fires remained disturbingly common at the site and in 2017, a fire caused an estimated \$120,000 in damages. After this event it was demolished.

10.

San Fernando Cathedral, San Antonio, Texas, USA



Built between 1738 and 1750, when the oldest church in Texas was first constructed it wasn't unusual to bury people within the walls. For many years, visitors have apparently seen faces on the outer walls of the church wondering, are these pictures real or is it just my imagination? Renovation started in 1936, when construction workers unearthed bones, nails and aged military uniforms on-site. This is believed to belong to three soldiers of the Alamo, whose bodies were burned here after the battle in 1836.

Construction TECHNOLOGY 2021



Check out the construction technology of 2021 aiming to coordinate safe jobsites, adapt to new realities, and automate processes with computer-vision technology.

- BY ZACH MORTICE -

- **Advanced construction technology strives to help people experience spaces while keeping a safe distance.**
- **Robots, drones, and smart wearables for construction sites continue to evolve.**
- **Sustainability - whether through advanced materials, electric equipment, or circular business models - remains a priority.**

As 2021 marches on, what started as a somewhat bleak year has turned more hopeful—more economies are opening, anxieties are starting to ease, and more construction sites are firing back up. Nevertheless, when it comes to construction technology in 2021, there's increasing pressure to create ways for people to experience and understand spaces virtually to keep safe distances.

Sharing data more intuitively and intimately also top the “want” list for innovation. So for this list of trends to watch in 2021, it is clear that builders are also looking for creative ways to keep people safe under current conditions, removing them from physical sites while accelerating their ability to work together.

1. Pocket LIDAR

LIDAR is the most precise, efficient way to verify that what has been built on a construction site matches the digital BIM (Building Information Modeling) model. Existing laser-scanning hardware is bulky and awkward, and most are uni-taskers. But that's changing, led by two giants of consumer technology: Apple and Google.

circulation routes, or detecting use patterns before the drywall cures.

Bringing pocket-size LIDAR capabilities onto construction sites is an ideal way to manage the extreme dynamism of these places. As materials and personnel flow across sites, LIDAR can document each stage with unparalleled precision



The Apple iPhone 12 Pro and the newest Apple iPad Pro come with LIDAR scanners, which use nanosecond-long laser pulses to measure the distance from objects. This data can be aggregated to create 3D maps of incredible depth and complexity. Similarly, **Google** is working on a radar-based system that operates as an advanced motion detector. For consumer smartphones, LIDAR systems will primarily boost augmented-reality applications such as Apple's **ARkit**, integrating synthesized environments and characters onto existing ones. That can be a great help on construction sites, too, for transposing BIM models onto the site, flying the finished building's

in near real time. It can also be used to maintain and repair large infrastructure, especially across places that are too vast - such as power grids - for a pair of human eyes and a CCTV channel.

Indoors, LIDAR can detect small cracks or **imperfections** in walls that could become safety risks. Construction safety also benefits from more detailed, up-to-date circulation guidance and a reduced need for in-person inspections of dangerous places. Apple is currently **investigating** head-mounted LIDAR sensors, ideal for workers who need to go hands-free while using tools or driving heavy machinery.

2. Charging Up the Construction Site

As batteries get bigger, going electric on construction sites means cleaner, more sustainable operation. Heavy construction equipment is following the **rechargeable** trend. **Excavators, cranes, drilling rigs, and heavy trucks** are becoming just as carbon-neutral and efficient as their power source—which could be solar, wind, or geothermal.

Driven by plummeting battery costs, Gammons Construction has deployed shipping-container-size **Enertainer** lithium-ion batteries, creating construction sites free of diesel fumes. Beyond the smaller carbon footprint, these units (which can be purpose-built or **retrofits** of diesel engines) are more dependable and

require less maintenance. The decrease in noise and pollution also allows construction to go on longer in residential areas.

Many of these units still require power cords, but that could also become a thing of the past. San Francisco-based startup and Autodesk Technology Centers resident **PHION Technologies** has developed a prototype over-the-air wireless power and data system that can reach nearly a dozen feet to recharge devices, no power cords or charging pads required. The ultimate goal is scalable power across a 30-foot radius that also delivers position-tracking functionality for construction robots and aids wireless network connectivity.

3. Eyes on (or in) the Site From Anywhere

The COVID-19 pandemic has been a crash course in remote collaboration for everyone. But even before the pandemic struck, some companies had been researching how construction software and hardware can better facilitate collaboration over distance.

Autodesk Technology Center resident **ZEITdice**, from Canada, takes a novel approach to

remote collaboration using high-definition, time-lapse cameras instead of digital models. By sorting through endless hours of footage of construction sites, ZEITdice uses machine learning to recognize patterns and anomalies, generating reports on efficiency and safety improvements and providing thermal and infrared imaging.

4. XR for Construction Applications



XR - the umbrella term for virtual reality (VR), augmented reality (AR), and mixed reality (MR) - continues to make waves in the construction industry, from facilitating site simulations to workplace VR training.

Resolve allows designers and builders to inspect BIM models at different scales, looming over them like a giant or at ground-level, going floor-by-floor. Using the Oculus Quest wireless headset and operable with Autodesk MBI 360, Resolve translates complex models into immersive VR environments, makes speech-to-text annotations, and lets colorful avatars measure and sketch within virtual models. The hardware bringing this sort of data into the

field is hands-free and intuitive to operate. Vuzix's smart glasses contain a GPS sensor, 3-axis accelerometer, a speaker, a microphone, and a 4K video camera for seamless audio and visual communication. And speaking of smart glasses, remember Google Glass? The eyeglass-mounted system never caught on as a consumer product but has quietly proved itself indispensable in manufacturing applications and is finding a place as enterprise hardware on construction sites.

For those wanting to get their hands involved, Microsoft's HoloLens 2 is responsive to touch and motion, allowing users to manipulate virtual images with a swipe or a wave.

5. Hardhat Drones



The first generation of drones for construction sites were there to look, not to touch. Their photogrammetry applications saved time and money - and boosted jobsite efficiency and safety. The new generation of aerial drones are getting their landing struts dirty, programmed to take the most dangerous or difficult jobs out of human hands.

Emerging from the Georgia Institute of Technology, Autodesk Technology Centers resident Skymul is developing a drone system that can tie rebar intersections, one of most tedious and physically taxing jobs on a construction site. It uses machine learning to map rebar connections autonomously. Likewise, Terra Drone has been experimenting with using drones to drop seismic

sensors across vast mountainous terrain.

And UAV giant DJI just released a new agricultural drone with powerful spraying capabilities that could be applicable to construction sites. The DJI AGRAS T20 has a sprayer payload tank that can carry up to 44 pounds with nozzles that project 23 feet. Its omnidirectional radar can track objects from all horizontal directions, and its software and hardware monitors crop health and generates variable treatment procedures. For orchards, it can generate routes simply by examining the shape of trees. This weighty payload capacity could also work for construction sites, as drones are called on to apply paint or adhesives, to water a green roof, or other uses.

6. Contact Tracing for Safety and Efficiency

The COVID-19 crisis has made it clear that contact tracing across a construction site is critical for workers' health and safety. Construction sites are heavily trafficked, complex, and constantly changing—an ideal place for an airborne contagion to spread.

Several companies are focusing on how to track health and circulation data across sites to keep people safe while they build. The WakeCap system uses helmet-mounted units that communicate with a receiver, using signal strength as a proxy for distance, and thus location, on a site. These units can be powerful aids for site work flow and social distancing, tracking circulation

choke points and mapping the most accessible locations for toolsheds and break rooms.

Whereas WakeCap has prized ease of use, the wearable-sensor company WorkerSense has opted for more complexity. It offers helmet-mounted sensors that detect temperature, humidity, light levels, and motion across nine axes. Its software platforms monitor crew locations, manpower composition data, cost codes, personal protective equipment usage, certification enforcement, incident logs, and environmental conditions. Nokia is developing automated thermal-detection systems accurate to within 0.3 degrees Celsius.

7. Construction - Site Robots

The proven ideas behind machine-controlled equipment - graders, loaders, backhoes, and so on - have been expanded to focus on autonomous control and robotic technology.

Researchers at Purdue Polytechnic Institute's Automation and Intelligent Construction (Auto-IC) Lab have created a robotic construction system that uses computer-vision sensing technology. With just one robotic end effector, which can both place and fasten objects, the system can

sense building elements and match them to BIM data.

“By basing the sensing for our robotic arm around computer vision technology, rather than more limited-scope and expensive sensing systems, we have the capability to complete many sensing tasks with a single affordable sensor,” said Jiansong Zhang, an assistant professor of construction management technology in the Purdue Polytechnic Institute.



8. Greener Asphalt

Beginning in the 1960s, the construction industry began successfully using recycled rubber - mainly from used car tires - as an asphalt admixture that improved quality, lowered material costs, and reduced landfill waste. In recent years, that practice has extended to using recycled bottles and other single-use plastics in asphalt. In fact, Rotterdam has even proposed building a new bike path entirely out of recycled, Lego-like, plastic blocks

that snap together. And plastic and rubber are not the only recycled materials being mixed into asphalt: Researchers at RMIT University in Melbourne, Australia, have shown that adding cigarette butts can improve roadway quality while safely containing heavy metals; and in Sydney, recycled printer toner is incorporated into an environmentally friendly asphalt mix.

9. Self-Healing Concrete

Concrete is the world's most used construction material. What if all that concrete could fix itself when cracks form? It might sound crazy, but the Romans used self-healing concrete more than two millennia ago, and modern-day scientists are finding ways to do the same.

One approach relies on limestone-producing bacteria. And materials scientists at Rutgers University are using a limestone-producing fungus called *Trichoderma reesei* as a concrete admixture that will fix fine cracks as they form.



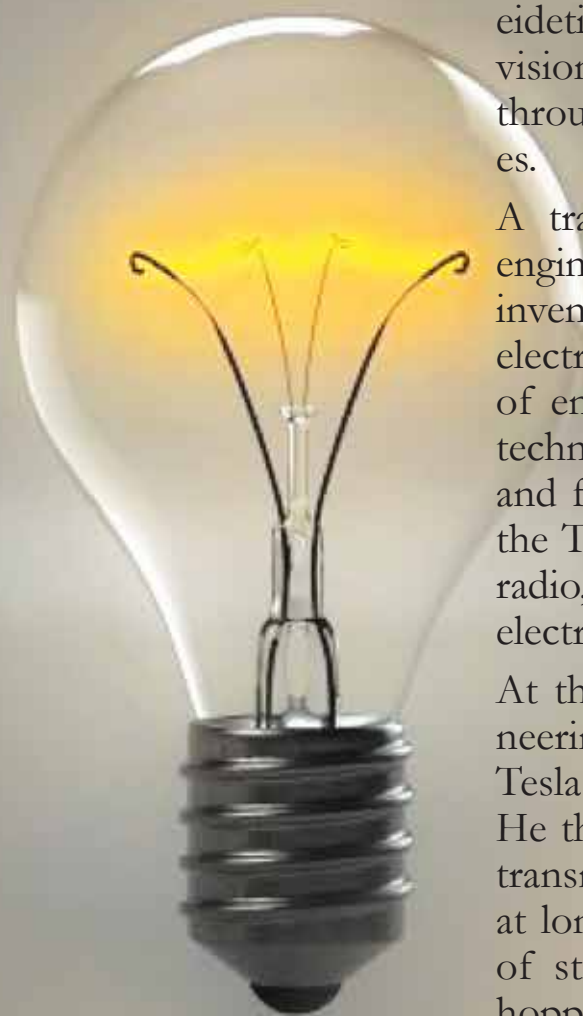
10. Circular Business Models

More a philosophy than a technology, circular business models, which consider the entire lifecycle of a project, continue to gain traction. Global consulting firm Roland Berger posits that circular business models in construction will create a global market worth more than 600 billion euros by 2025.

On the bleeding edge of this has been European construction group Royal BAM. Its Circl pilot project is a large pavilion intended for deconstruction from the outset. The idea is that

modular building techniques and careful tracking of resources should make it possible to reuse virtually all of Circl in other buildings.

“Some of the materials used should actually increase in value,” said Nitesh Magdani, BAM’s group director of sustainability. “In effect, we’re trying to create ways to lease materials so that this future value can be captured.” To that end, BAM is developing an online marketplace to enable 100% reuse, as well as new contracting methods that will better account for reuse.



Although best known for his development of alternating current electrical systems, Nikola Tesla, a Serbian-American inventor born between 1856 and lived through 1943, also created extraordinary contributions to the fields of electromagnetism and wireless radio communications. He was a genius child and possessed an eidetic memory including a futuristic vision for humanity which is evident through his discoveries and researches.

A trained electrical and mechanical engineer, Tesla's discoveries and inventions included the contemporary electric motor, a wireless transmission of energy, some basic laser and radar technology, as well as the first neon and fluorescent illumination and also the Tesla coil which is largely used in radio, television sets, and all other electronic devices

At the height of his career, the pioneering electrical engineer Nikola Tesla became obsessed with an idea. He theorised that electricity could be transmitted wirelessly through the air at long distances – either via a series of strategically positioned towers, or hopping across a system of suspended balloons.

Since Tesla's day, we've known that it's possible to wirelessly send electricity through magnetic induction. Or, to be precise, to use a magnetic field to generate an electric current and Tesla's dream of worldwide wireless energy is still alive.

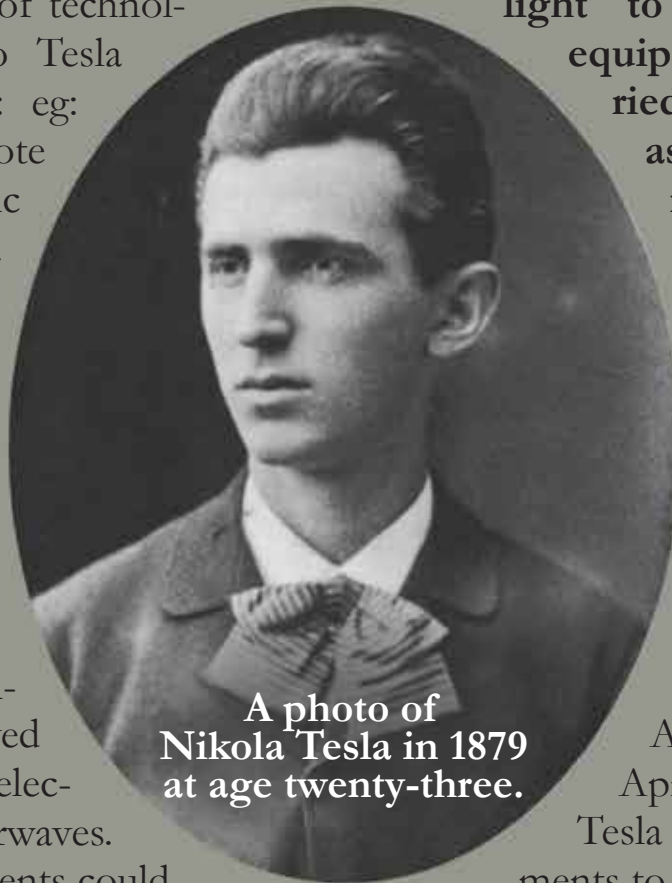
Nikola Tesla and Wireless Electricity



There's a long list of technology attributed to Tesla and his research: eg: radio, X-rays, remote controls, electric motors, to name a few. But one of his greatest ambitions has never been fulfilled: transmitting electricity around the world without wires.

His first experiments revolved around sending electricity through airwaves. But these experiments could only send power a short distance. Then Tesla got an idea: would the connection be stronger if he went through the ground instead of the air?

“Power can be, and at no distant date will be, transmitted without wires, for all commercial uses, such as the lighting of homes and the driving of aeroplanes. I have discovered the essential principles, and it only remains to develop them commercially. When this is done, you will be able to go anywhere in the world - to the mountain top overlooking your farm, to the arctic, or to the desert - and set up a little equipment that will give you heat to cook with, and



A photo of Nikola Tesla in 1879 at age twenty-three.

light to read by. This equipment will be carried in a satchel not as big as the ordinary suitcase. In years to come wireless lights will be as common on the farms as ordinary electric lights are nowadays in our cities.” (Nikola Tesla, *The American Magazine*, April 1921).

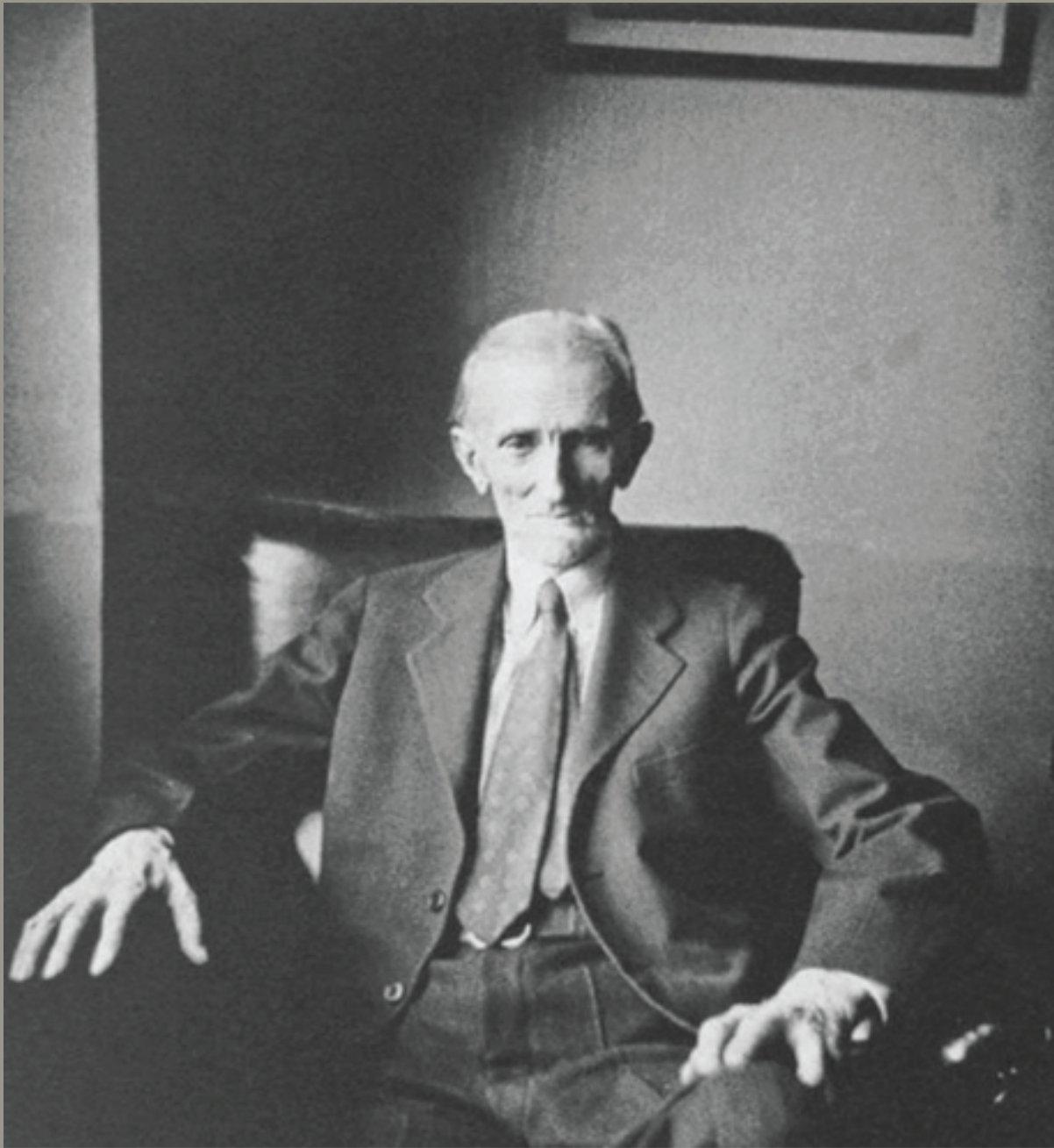
Tesla moved his experiments to Colorado Springs, Colorado in 1899. According to Tesla's lab notes, he succeeded in sending electricity from his lab to lightbulbs sitting on the ground hundreds of feet away.

But Tesla wanted to go bigger. He started building Wardenclyffe Tower in 1901 on Long Island. Wardenclyffe was to be center of a slough of experiments in transmitting wireless radio and telegraph signals - and sending wireless electricity. Tesla planned that the 17-story tower would send electricity from a coal-fired generator into the ground through 300 feet of metal rods, where the current would travel for hundreds of miles.

Tesla's business partner, J.P. Morgan, backed out of the Wardenclyffe project. Tesla eventually went

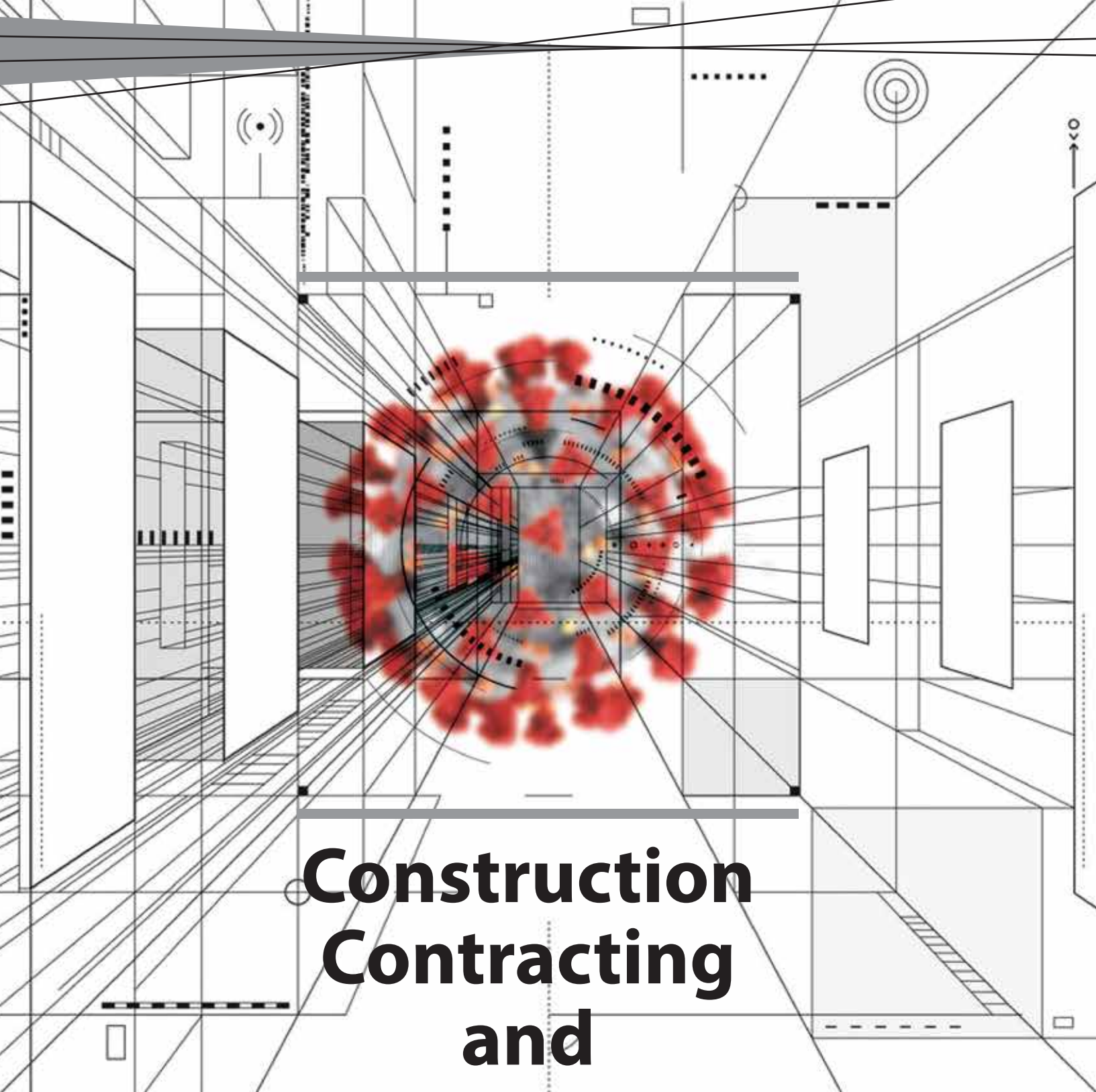
bankrupt and Wardenclyffe was torn down in 1917. With the story continued, his idea of using the ground to send electricity long distances was not thoroughly tested, and electrical engineers were skeptical it would work.

But Tesla's research influenced the ways we send electricity without wires today and Tesla's dream of worldwide wireless energy is still alive. Japan's space agency is developing a solar-satellite that would beam power back to earth with microwaves.



The master of lightning Nikola Tesla in his room at the Hotel New Yorker.

Courtesy : Internet

An architectural line drawing of a building interior, showing a hallway with a staircase on the left and a room with a door on the right. A large, stylized red and white coronavirus particle is superimposed in the center of the hallway, with lines radiating from it towards the architectural elements.

Construction Contracting and COVID-19: Negotiating in Uncertain Times

Determining what is foreseeable when embarking on a new construction project can be difficult, especially during a worldwide pandemic. Events that once seemed unfathomable may actually now be considered foreseeable. Since early spring 2020, there have been considerable delays to project schedules and significant increases in project costs resulting from emergency orders intended to slow the spread of the virus; new construction industry guidelines developed by the Centers for Disease Control and Prevention (CDC); on-site testing requirements imposed by local and state authorities; and additional cleaning and labor resources to ensure project site safety during the pandemic.

Given that the COVID-19 pandemic has been front and center for over a year now, is COVID-19 still something owners and contractors should be worried about in their contracts? The answer is a resounding yes! With the emergence of new variants of the virus, it is likely that the pandemic will continue to negatively impact construction projects for the foreseeable future. Project participants cannot afford to pretend that the pandemic is over or that another similar event (such as another public health crisis) will not happen in the future. With all the knowledge and risk exposure that this last year has brought to the construction industry, it is only prudent to address these issues head on at the commencement of a new construction project. Luckily, there are key provisions in the widely used legal forms and agreements that parties should be mindful of when negotiating construction contracts during both certain and uncertain times.

What is industry standard?

The principles of force majeure and excused delay are commonly used to excuse performance under a contract for events beyond the control of the party with the performance obligation (typically, the contractor). The American Institute of Architects (AIA) produces some of the most widely used form agreements in the construction industry. Section 8.3.1 of the A201 (the AIA's general terms and conditions document) addresses the principle of force majeure and excused delay and lists common triggering events such as actions or inactions by the owner, labor disputes, fire, unusual delivery delays, and other causes beyond the contractor's control. If any of the foregoing events occur, the A201 entitles the contractor to a reasonable extension of time to complete the work.

There are a couple of important things to note about the A201. First, it does not specifically

identify a pandemic, epidemic or similar health crisis as a triggering event. Instead, to be excusable, such an event needs to fall within the provision's catchall - as an event beyond the contractor's control. Now that we are over a year into the pandemic, an argument can be made that delays due to the pandemic are foreseeable and do not qualify as an excusable event beyond the contractor's control. As such, if a contractor wants to protect itself from the impacts of the pandemic, it should specifically address the pandemic in the construction contract, and, at the very least, it should add the terms "pandemic, epidemic and/or health crisis" in the list of triggering events in the force majeure or excused delay provision. Second, the A201 does not afford the contractor monetary relief for delays caused by events beyond its control, even if the triggering event causes the contractor to incur expenses that were not otherwise built into the cost to complete the work. While the A201 specifically states in Section 8.3.3 that neither party is precluded from recovering damages elsewhere in the contract, the other provisions that afford the contractor both time and money are related to differing site conditions, suspension of the work by the owner and owner's termination for convenience.

There are not, however, provisions in the A201 that allow the contractor to recover money damages if the project is delayed by other things like pandemics, labor shortages, material deliveries and changes in the work; rather, the contractor is only given extra time. Thus, contractors need to be diligent in contract negotiations to ensure that language is added to Section 8.3 - or elsewhere in the contract - that entitles the contractor to recover any extra costs it incurs as a result of a delay beyond its control. Similarly, the equivalent construction contract forms developed by ConsensusDocs and the Engineers Joint Contract Documents Committee (EJCDC) only allow the contractor an extension of time (and not an adjustment to the fee) should an excused delay occur.

Given the pandemic, what is reasonable for excused delays?

Now that we are over a year into the COVID-19 pandemic, parties to a construction contract should be able to reasonably understand and negotiate what delays (and potential costs) are foreseeable as it relates to health crises and other unavoidable situations. At this point, contractors should be incorporating certain increases into their contract price and project schedules that result from these unavoidable conditions, including:

- material and labor unavailability
- material price escalations (including labor)
- additional safety measures (including additional jobsite cleaning/sanitizing, providing personal protective equipment for workers, COVID-19 screening/testing, etc.)
- Many owners and contractors have been able to compromise during these uncertain times on what is foreseeable - and the relief afforded to the contractor should an unforeseeable event occur. Typically, compromises will cover impacts not known or reasonably anticipatable as of the date the parties sign the agreement, and relief will be negotiated such that the contractor will not be responsible for all cost increases. Because it is not standard for owners to be responsible for costs that delay the contractor's work, these provisions have been and continue to be heavily negotiated between the parties.
- In cases where owners agree to reimburse the contractor for unanticipated expenses resulting from a delay, we have found that owners tend to require a combination of any or all of the following qualifications:
 - timely notice from the contractor of the event causing the delay
 - detailed documentation from the contractor proving the additional costs (including some form of proof that the contractor has mitigated its costs during the delay)
 - entitlement to reimbursement is often tied to a government shutdown or executive order
 - a cap to all delay costs for which the owner will be responsible

What else can the parties do to address health crisis impacts?

As noted above, for the foreseeable impacts of the pandemic like additional cleaning and safety measures, material delivery, and shipping delays, the contractor should consider building such additional expenses into its contract price. Assuming this is not feasible, the contractor should discuss with the owner whether it makes sense to (i) include an allowance or contingency under the contract to cover COVID-19 costs, (ii) add a mutually acceptable material escalation clause in the contract, (iii) order materials early or through a local provider to avoid potential delivery and shipment delays due to the pandemic, and/or (iv) obtain business interruption insurance coverage to cover work stoppages and unexpected costs and losses resulting from the pandemic.

The COVID-19 pandemic has shown a spotlight on these once glossed-over contract provisions. As a result, the parties' focus has changed. As contracts continue to be negotiated during and post-pandemic, project participants should expect to adapt to change and negotiate a compromise to the excused delay and force majeure concepts, including the corresponding relief entitled as a result. We expect these challenges and negotiations to continue in a post-COVID-19 world as parties grapple with future unanticipated and unforeseeable situations.

Courtesy : Faegre Drinker Biddle & Reath LLP





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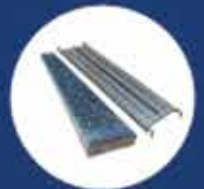
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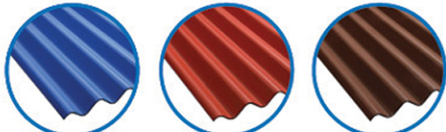
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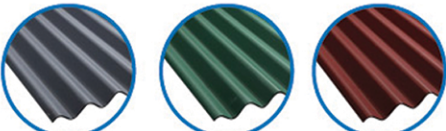
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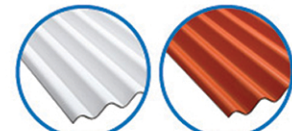
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