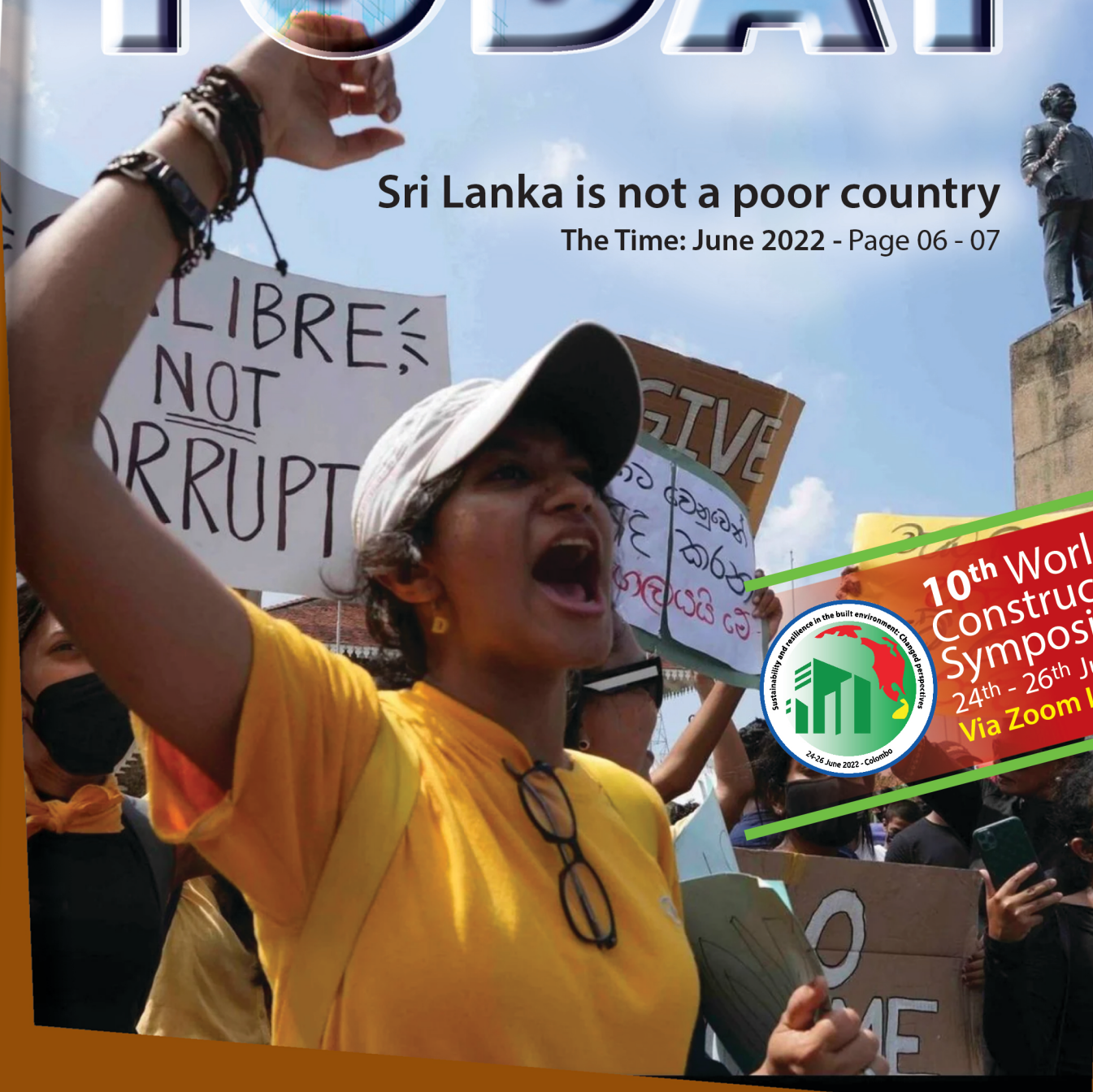




SRI LANKA CONSTRUCTION TODAY

Sri Lanka is not a poor country

The Time: June 2022 - Page 06 - 07



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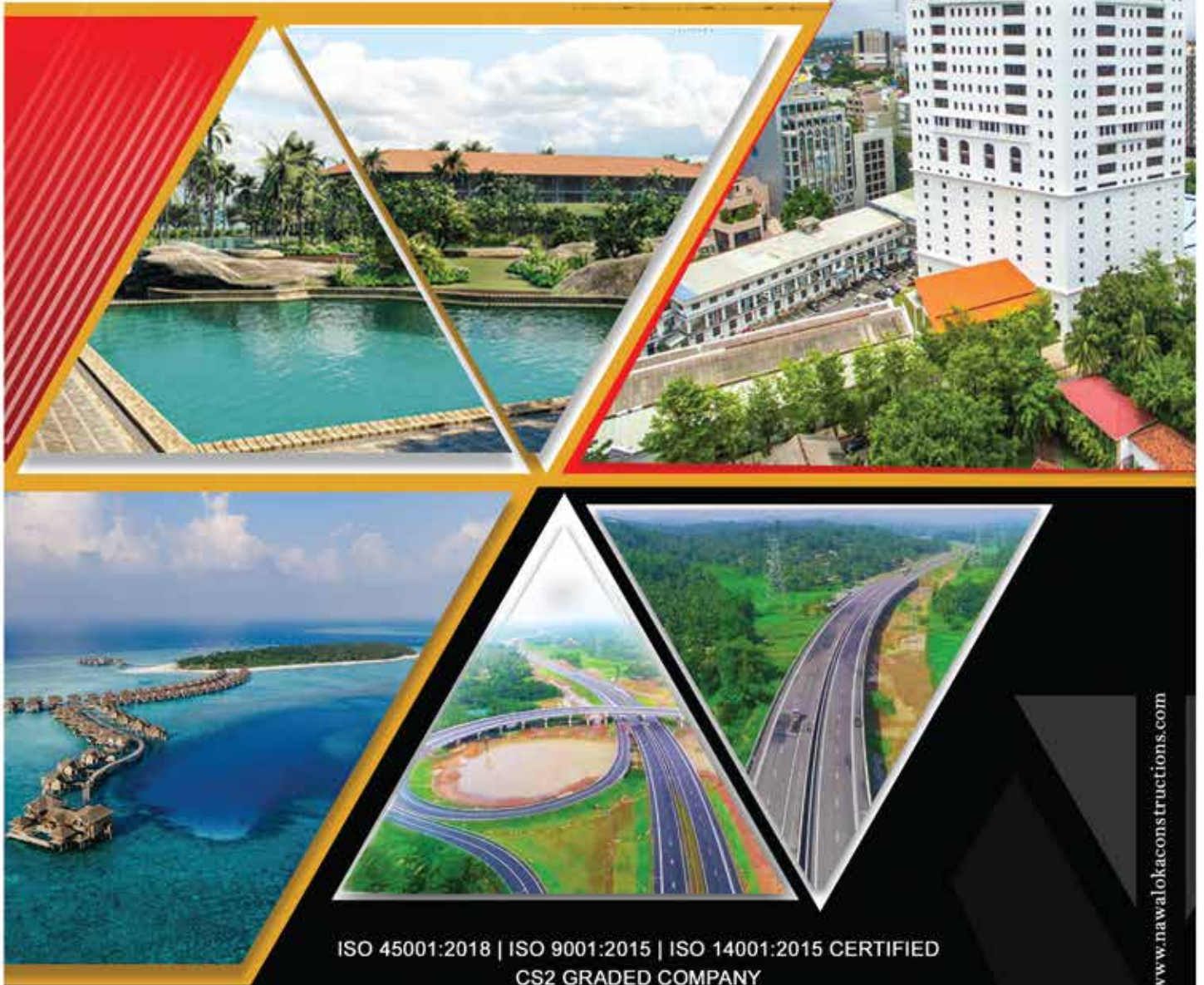
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**SRI LANKA
CONSTRUCTION
TODAY**

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Editor's Note

Mediation is an effective, well-tested form of alternative dispute resolution in the construction industry. Stakeholders in the construction industry should engage more in mediation proceedings to settle their disputes. By not having a thorough understanding of the construction mediation process, one may quickly fall prey to missed opportunities or even worse – a failed mediation. Understanding the construction mediation process is therefore the key to increasing your chances for a successful mediation.

Non-binding mediation is typically mandated by the construction contract or subcontract as a “condition precedent” to filing suit or an arbitration demand. This means you cannot pass go and proceed to court or arbitration until an effort was made to resolve the dispute through mediation.

Even when not contractually required, nearly all state and law courts have a mediation program, and there is usually a mandatory requirement to mediate prior to trial. Often, the lawyers agree to early mediation prior to discovery or depositions, so in effect, the very first

court proceeding is actually a non-binding mediation event. The American Arbitration Association, as well, has a parallel mediation platform which is both extraordinary cost-efficient and very effective.

It is recommended that the parties themselves may agree to have a neutral mediator whom they both trust and respect hear both sides of the dispute and try to facilitate a negotiated resolution.

Mediation is the alternative dispute resolution of choice for many stakeholders within the construction industry. It avoids the long legal process, which can take years to play out. It can save tens or even hundreds of thousands in legal fees. But perhaps most important, it puts you back at work making new money, or pursuing new endeavors, rather than keeping you stuck in the past.

Often, a mediated settlement outcome is one neither party will likely be ‘happy’ with, but it is one both sides can live with. With the right mediator and the right frame of mind, a resolution is achieved in the vast majority of cases.

What the Crisis in Sri Lanka Means for the World

The Time - June 2022



Many middle-income and developing countries are now suffering from a combination of internal political dysfunction and external economic shocks generated mainly by COVID-19 and the war in Ukraine. Sri Lanka provides a powerful example and a warning for countries in other regions that will face similar predicaments.

Sri Lanka is not a poor country. When adjusted for purchasing power, per capita GDP in this nation of 22 million people is higher than in South Africa, Peru, Egypt, or Indonesia. But the country now faces a political crisis powered by severe shortages of food, fuel, electricity, and medicine. The currency is collapsing, and the government can't afford imports or to make its debt payments. At times in recent weeks, violent protests have threatened to spiral out of control.

How did we get here?

A quarter century of civil war, which ended in 2009, has created a legacy of violence at the heart of Sri Lanka's politics. In 2019, a terrorist attack by an ISIS-inspired Islamist group on minority Christians made international headlines. On Easter Sunday, a series of bombs detonated in churches and hotels killed and injured hundreds of people. Those attacks, and the sense of insecurity they created across the island nation helped elect Gotabaya Rajapaksa, a former defense minister with a reputation for toughness, later that year.

Gota, as the president is widely known, then named his older brother, Mahinda, a former president, as prime minister. A landslide election victory in 2020 gave the Rajapaksas a two-thirds parliamentary majority, which then allowed them to rewrite Sri Lanka's constitution to give the president extraordinary new powers.

Then hubris kicked in. Family and friends were given important posts in government. A series of economic mistakes, including populist tax cuts, deprived the government of revenue and made it much harder to borrow money abroad.

External shocks have also played a big role in Sri Lanka's troubles. COVID-19 devastated a tourism sector still reeling from terrorism, a sector that's critical for government revenue and job creation in the country. The pandemic also cut deeply into remittances, money sent home by Sri Lankans working abroad.

The increasingly unpopular Rajapaksas refused to accept the need for government spending cuts and tax increases to help Sri Lanka avoid even tougher economic conditions. A ban on chemical fertilizers to push farmers toward organic farming in the middle of the economic crisis made matters worse for the country's food supply.

Then came Russia's invasion of Ukraine and the damage it is now inflicting on global food and fuel prices. Russia and Ukraine are both leading exporters of grain, and the war has shut in much of that production. Russia and its ally Belarus, which also faces Western sanctions for allowing Russia to use his country's territory as a launchpad for attacks on Ukraine, are leading producers of fertilizer. Higher prices for fuel are the natural result of supply worries that have pushed oil above \$100 per barrel. Sri Lanka also imports more than 80 percent of its medical supplies. Donors in India and in Europe have helped, but there's a limit to how much they are willing to do.

In Sri Lanka, public anger came to a head in early May. Economic pressures exacerbated infighting within the Rajapaksa family, particularly between the president and prime minister. After the government appeared to send counter-protesters to attack the mainly peaceful crowds that called for the prime minister to resign, bloodshed ensued. Enraged anti-government protesters then went on an arson spree, attacking the homes of Rajapaksa family allies, and threatening the prime minister's own residence. The PM was forced to step down, and he needed the protection of security forces for a 4 AM evacuation of his home.

A state of emergency was declared across the county. Angry mobs have launched more attacks on politicians and their homes. Hundreds have been injured in recent weeks, and some have died.

A member of parliament was killed in his car. Two more of President Rajapaksa's siblings and a nephew have resigned their cabinet posts.

Late last month, Sri Lanka defaulted on its debt for the first time in the nation's history.

What now?

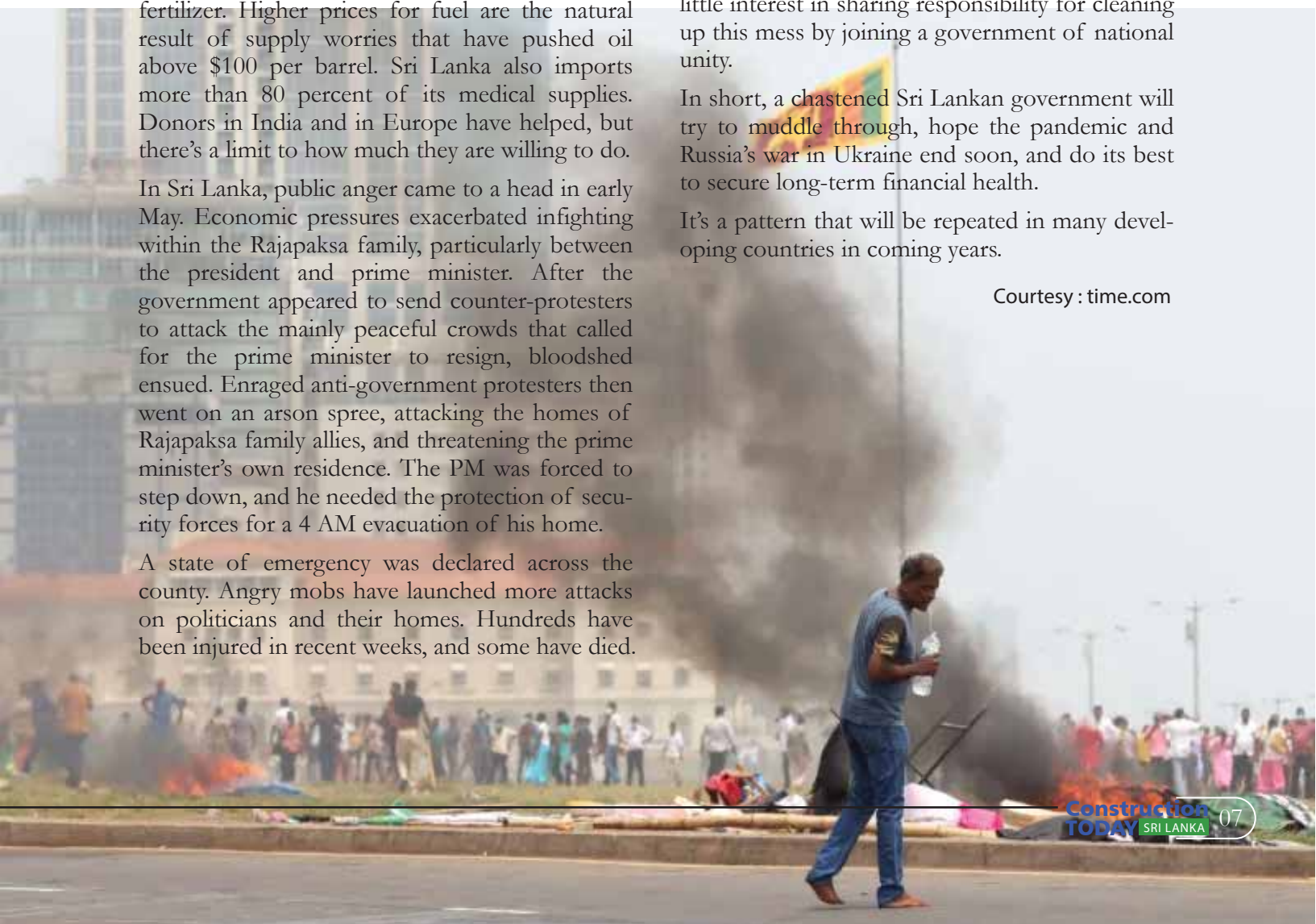
President Rajapaksa, struggling to survive politically, has pledged to reverse some of the constitutional changes that gave him more power. He has accepted help for Sri Lanka's economy from India and China, and he's appealed to the IMF for a bailout. New Prime Minister Ranil Wickremesing, a political veteran, has been brutally honest in his public comments on the scale of the problems Sri Lanka faces and the need for bold action to solve them. He has said Sri Lanka will raise tax rates to earn a bailout from the International Monetary Fund. He then used a televised speech to call on protest groups to join in the process of reform. He pledged that parliamentary committees will allow lawmakers, young people and experts to work together.

For now, the protesters continue to demand President Rajapaksa's resignation, though there don't appear to be enough votes in parliament to impeach him, and the opposition looks to have little interest in sharing responsibility for cleaning up this mess by joining a government of national unity.

In short, a chastened Sri Lankan government will try to muddle through, hope the pandemic and Russia's war in Ukraine end soon, and do its best to secure long-term financial health.

It's a pattern that will be repeated in many developing countries in coming years.

Courtesy : time.com





Journeys with cycling

Safer and more comfortable

Promoting the practice of cycling requires the creation of an environment adapted to it. The priority is the safety of all users of public space, starting with the most vulnerable users: pedestrians.

To contribute to the comfort and safety of all users, control operations by municipal police officers will be reinforced (respect for the tracks by other users, respect for the SAS Vélo, respect for pedestrian priority by cyclists, etc.)

The efforts of the City of Paris will be continued on these different aspects:

- Awareness and communication actions carried out with/by the municipal police and the Prefecture of Police, in particular around the problem of blind spots, still too little known to motorized users and cyclists.



- Identification of "black spots" and specific treatment to improve safety at these points.
- Actions of control of the agents of the City targeted on the respect of the cycle paths and the locks bikes.
- Securing intersections: continued development of "Dutch-style" intersections and protective islands, continued marking of bike locks.
- Improved equipment for heavy goods vehicles in the City fleet and delegates.

Comfort and safety issues were also addressed and provided :

- the creation of a Street Code to facilitate cohabitation between all users, with reinforced control provided by the municipal police;
- the staking which allows cyclists to orient themselves, but also to position themselves well and to circulate more easily on the main axes;
- cleaning and snow removal of cycle paths.

Parking lots to meet all needs



In Paris, 6,631 complaints of bicycle theft were recorded in 2020, i.e. a 7% increase compared to 2019.

81% of people who do not want to use a bicycle cite fear of theft as the main reason for this renunciation. The supply of parking, in particular secure parking, is therefore one of the determining factors for using a bicycle as a means of transport.

Learning and Maintenance



- Paris wants to generalize the "Know how to ride a bike" in all Parisian elementary schools, by setting up a "Cycling license". The objective is for all young Parisians to know how to ride a bike when they enter secondary school.
- Development of school bikes to facilitate adult learning.
- Creation of a self-repair workshop per district.



Support for associations



The APUR study on the evolution of shops in Paris shows a 57% growth in shops dedicated to bicycles (sales and repairs) between 2014 and 2017 and 29% between 2017 and 2020. We also observe exponential growth associative actors, which are nearly thirty to develop projects and offer services to users.

The question of cyclology is integrated into the ongoing process to develop an urban logistics strategy. This has several axes:

- adapt cycle paths to take into account the dimensions of tricycles;
- provide parking for these special bikes, or even specific delivery areas for cargo bikes near major two-wheeler flow generators (big brands like Monoprix or Carrefour for example);
- improve the working conditions and status of self-employed cyclist delivery drivers.

The City is working in particular on finding places for preparing rounds close to final distribution places (the range of a bicycle is around 2 km), in the form of real estate sites (urban logistics spaces) or in the public space (micro-hubs). These cyclology spaces must be accessible to heavy goods vehicles.

Encourage cycle tourism



Cycle tourism is experiencing a spectacular take-off at the national level. Four major national or transnational cycle routes cross Paris, with a common crossing point on the forecourt of Notre-Dame:

- La Scandibérique (EV3) covers 5,122 km of track between Norway and Spain;
- The green avenue London-Paris (V16) offers 470 km of cycle route starting from the forecourt of Notre-Dame;

- The La Seine à vélo cycle route (V33), linking Paris to Le Havre, was inaugurated in October 2020 and offers 420 km of dedicated facilities along the Seine;
- The Véloscénie (V40) connects Paris to Mont-Saint-Michel over a 450 km route.

The Sustainable Tourism Conference organized in 2021 highlighted the following needs:

- Take regulatory measures and support measures aimed at installing bicycle rooms in tourist accommodation;
- Improve the signage of the four major cycle routes crossing Paris, and the signage to tourist sites to guide visitors, particularly from intermodality points or entrances to the City;
- Combine the bicycle with other transport, in particular by the possibility of carrying two-wheelers on board boats, coaches, trains;
- For cyclists who would like to visit tourist sites, set up locker solutions to shelter bags and luggage.
- Pursue major cycling developments, also on a metropolitan scale, to facilitate and encourage access by bicycle to major tourist sites in the Ile-de-France region (Château de Versailles, Saint-Denis cathedral, Giverny, etc.).

Promoting the circular economy of cycling

- Develop partnerships like the one that exists between the City and Repar to recover wrecked bicycles in order to restore them and/or recover parts. In 2020, despite the sanitary context, more than 800 bicycles were thus restored to be resold at lower cost.
- Create one self-repair workshop per district, i.e. 15 additional workshop.

Encourage sports practice

Sports cycling cover various disciplines with very different practices: road, cyclo-cross, mountain biking, BMX race and freestyle, bike polo, and indoor cycling. Cycling on a daily basis is part of the “Sport Santé” objective, and improves public health by fighting against a sedentary lifestyle, for all audiences and especially seniors.



The Paris 2024 Games must be a highlight of cycling practice. Target: 15% of Games trips must be made by bicycle and 20,000 event parking spaces will be required (not including celebration sites). The cycling infrastructure and part of the secure parking should constitute the cycling heritage of the Games.

Courtesy: paris.fr/pages

Paying local dues - Money Printing to the rescue

The Writer is **Dr. Rohan Karunaratne.**

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Dr Rohan Karunaratne
President - Ceylon Institute of Builders

We appreciate the genuine answer given by the prime minister, Ranil Wickremasinghe, in his BBC interview, stating that money printing (although not his long-term term plan) is necessary in the short-term to continue paying government salaries. This is in part due to the fact that, the country's money stock is equal to the total amount of currency available in the Sri Lankan market at any given time. And money printing allows the government to finance itself. By injecting cash into the economy, this helicopter money can help deal with dangerous economic crises. This monetization is necessary for the following few months given that it is properly controlled by the central bank.

We believe it is extremely necessary, for this benefit to be extended to other sectors, which have been debilitated from the unbearable weight of unpaid government debt, and therefore have been unable to pay their employees. The temporary use of Money printing would settle the local debt of the country and would give the prime minister a fresh start to his journey as the man expected to save the nation.

Construction & other industries

There are over 100B outstanding debts to contractors. Simultaneously government projects have



been halted. Both of these cannot be borne at the same time therefore, firstly, debt should be settled. Second, essential and partially-completed government projects that have been abandoned should be completed, as local currency is used for these. If this issue is ignored, 5 to 600, 000 workers who have lost their jobs would be released onto the streets. To prevent the dissolution of the Construction Industry as well as the Bank sector, which would otherwise collapse because people cannot pay, this decision is essential. Along these lines, banks should not encash bonds and guarantees for contractors as the contractor is not at fault- it is the government that is at fault. So, it is mutually beneficial for banks to keep contractors alive, so they can continue benefitting from them, rather encashing bonds and guarantees which is a one-off gain for banks, as this would end contractors' careers and banks would lose repetitive clients.

Another criticism is that more than 60% of construction materials in luxury buildings (high-rises, hotels and so on) are imported items. Therefore, the focus should be on encouraging the local manufacturing of these, currently imported, items. Or changing our current choices of materials altogether, in favour of materials that are specific to and available in Sri Lanka.

Importantly, as per the prime minister's speech, vital industries such as Pharmaceutical (government is yet to pay an outstanding 34B to Pharmaceutical companies), Agricultural & Other Sectors, which provide essential products and services, should be protected in a similar way, by settling debt.

Paris plans to be completely cyclable by 2026



- France is investing 250 million euros (\$290 million) to make the city of Paris entirely bikeable.

- Mayor of Paris Anne Hidalgo aims to add another 130 kilometers (over 80 miles) of bike - safe pathways from 2021-2026.

- Plan Velo: Act 2 also outlines measures to teach children to ride bikes in schools, add repair workshops in each district and encourage cycling tourism.

Many European cities are bike-friendly, but cars often still dominate the roads. In a new initiative to update its existing Plan Velo for a more cycle-friendly city, Paris, France is investing 250 million euros (\$290 million) to make the city entirely bikeable.. That means if you want to bike from the Arc de Triomphe

to the Viaduc des Arts, you'd be able to do so safely.

The updates, called Plan Velo: Act 2, are slated to make Paris completely cyclable by 2026. The proposal stems from mayor Anne Hidalgo, who widely won re-election in June 2020, in part thanks to a focus on more measures for biking.

Paris hasn't always been known to be particularly easy to navigate for people on bikes compared to those who choose to drive in cars or who take the metro. But with the pandemic and a recent transportation strike in 2019, more people have turned to biking to make their way around the city. During the pandemic alone, more than 50 kilometers (31 miles) of what were temporary bike-only lanes, called coronapistes, have now been made permanent.

Under Plan Velo: Act 2, which spans from 2021 to 2026, Hidalgo aims to add another 130 kilometers (over 80 miles) of bike-safe pathways, in addition to the coronapistes, throughout the city. The plan will also add more cycling facilities, transform some car parking spots into bike parking and boost maintenance measures, like snow removal and cleaning, for cycle paths.

The city is already underway in removing more than 70% of existing on-street

between 2020 and 2021. On some axes, the increase between 2019 and 2020 rises to 60%," the original plan states.

As such, Paris is responding by adding a total of over 180 kilometers (112 miles) of dedicated two-way cycling paths and making safer cycling pathways against car traffic on 390 kilometers (242 miles) of one-way streets. The city also plans to configure traffic lights to benefit commuters who choose to bike or take public transit instead of driving.



parking spots designated for motorcars. Plan Velo: Act 2 also outlines measures to teach children to ride bikes in schools, add repair workshops in each district of the city, and encourage cycling tourism.

The first plan, Plan Velo, spanned 2015 to 2020 and added the REVe, an express cycling network on the north-south and east-west axes and along The Seine. Now, the city hopes to take its biking initiatives further as more and more people turn to cycling to get around Paris.

"Bicycle counters recorded an increase in cycle paths by 47% on average between 2019 and 2020 and by 22%

"Until now, automobile traffic has been favored through the regulation of traffic lights," the new plan reads. "From now on, priority is given to buses, trams and bicycles thanks to a 'green wave' system (specific setting of traffic lights)."

These measures will only help the city's goal to become one of the top bike-friendly locations in the world. With continued success, Plan Velo: Act 2 may even encourage other metropolitans around the world to follow suit.



Courtesy : weforum.org



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Top 10 Construction Industry Trends To Watch For In 2022



After a turbulent period of adjusting forecasts and changing expectations, 2022 will be a year of reemergence and growth in the construction industry. Rising construction costs and labor shortages persist, challenging the industry to innovate competitive new ideas, while stricter regulations contribute to a reduced margin for error and waste.

Since last year, the COVID-19 pandemic changed how the construction industry does business, from scheduling and closing projects to hiring workers to meeting with clients. Looking forward, many

industry trends will be affected by the fallout from the pandemic. New technology continues to change the construction site, improve the ability to win projects, and increase profit margins. Trends and movements are changing the roles of industry professionals and frontline workers.

As the industry becomes more competitive and the market shifts, harnessing these construction trends will prove valuable for any construction firm. Read on for the 10 must-watch construction industry trends for 2022 to help you stay competitive.

1. Protective Equipment



The COVID-19 pandemic drastically impacted the construction industry, already affecting construction site guidelines by way of updated state regulations emphasizing cleanliness and strict safety protocols. This also includes increased union influence in projects, possibly adding cost and time to projects.

The industry is also witnessing a rise of machines capable of identifying common safety issues and eliminating those threats one at a time.

Wearable innovations are making their way to the job site with work boots that connect to Wi-Fi and alert others if a person has fallen.

Material-moving “mules” transport heavy or hazardous materials, and tasked robots construct scaffolding or lay bricks autonomously.

Headsets can even actively reduce noise pollution while keeping workers in tune with their surroundings.

Beyond worker gear, we are already seeing robots that fully replace certain human workers. More accurately than “replacing” humans, these robots are changing the jobs humans do - in most cases, they’re augmenting human decision-making (like deciphering and translating data findings into actionable insights) and making room for different, higher-level jobs.

Reliance on 3D printing continues to skyrocket, resulting in decreased transportation risks, and environmental sensors that detect noise, heat and wind at construction sites provide warnings to evacuate construction workers and move costly construction equipment in the event of an emergency or natural disaster.



2. Efficient Technology

The biggest differentiator for builders and developers this year will likely be technology in construction — specifically, the innovations that can enhance efficiency. The COVID-19 pandemic

has caused increased reliance on construction technology, too. These are a few types of tech that will only increase in popularity through 2022 and beyond:

Smart Contracts



Experts see blockchain technology improving relationships in the construction industry - it's a powerful component in providing a more secure and fast-moving workflow that allows all involved parties access to improved productivity.

Smart contracts offer all organizations in a project a shared system to do business, allowing them to buy, track, and pay for services. Rather than getting contracts and tracking deliverables from separate parties, firms can use smart contracts as an all-in-one tracking system where rules and deadlines are set and the blockchain enforces them. This system will make for faster closeouts, increased security, better project tracking and an automated supply chain.

Construction Drones



Drone use in the construction industry continues to be one of the fastest growing trends, with usage rising by 239% year over year. The technology offers far more uses than just aerial photography for real estate and commercial efforts.

Today's drones are used for rapidly mapping large areas over long distances, producing valuable aerial heat maps and thermal images. The advancing drone software provides real-time, actionable data that can be used for rapid decision-making, further streamlining the entire construction process.

Personal safety and equipment loss continue to be the biggest liabilities in construction. Drones can perform jobs in place of human workers to prevent injury, such as jobs requiring scaling supertall structures. As on-site security tools, drones can be leveraged to reduce labor costs and minimize the risk of theft, keeping projects on schedule and minimizing hiccups.

More advanced future uses include monitoring equipment depreciation and incorporating AI to organize moving construction equipment.

Augmented Reality (AR)



The global AR market is expected to be valued at more than \$1.2 trillion by the end of the decade, up from about \$37 billion in 2019. On the client front, AR means efficient project-staging, and making preconstruction projects tangible for buyers and tenants.

For builders and developers, AR facilitates the use of wearable technology and 360-degree video to enable:

- 3D visualization of future projects on their surrounding environment
- Automated measuring of buildings
- Fast and affordable simulation of architectural and structural changes
- Safety training and hazard simulations

Building Information Modeling (BIM)



Building information modeling technology is helping industry leaders stand out with improved efficiency. BIM allows users to generate computer renderings of buildings and utilities. The ease of managing these models and sharing data can enable superior prefabrication of parts, leading to on-time and accurate completion. Autodesk describes

it as “an intelligent 3D model-based process to help professionals manage buildings and infrastructure.”

According to Finances Online, top-rated BIM software solutions available in 2022 include:

1. Autodesk BIM 360
2. Trimble Connect
3. Archidat
4. Navisworks
5. Revit
6. BIMx

3. Growing Need for Laborers



One of the most noticeable construction trends of the past few years is a vast increase in the demand for labor. Quality labor is expensive and competitive, though robots do pick up a lot of the slack.

Despite these robots’ best efforts, we will need more educated workers to manage and interpret the data produced by new technology. Fortunately, women are stepping in to fill more competitive roles. According to the Bureau of Labor Statistics, women occupy only 10.9% of construction industry jobs, and industry hiring trends show a 94% growth in female-owned construction firms from 2007 to 2018; additionally, 30% of construction companies promoted a woman to a senior position in 2018.

The industry is also targeting Generation Z, born between 1995 and 2010, in recruiting efforts.

In the past, negative perceptions of trade school were detrimental to efforts to hire new talent in construction. The COVID-19 pandemic caused a shift in attitudes toward alternative education options and resulted in increased positive attitudes toward trade school, positioning construction firms to show off the career growth potential in their industry and the abundant opportunities to experiment with new technologies.

4. Remote Worksites and Mobile Access



Mobile applications in the construction industry allow worksite access like never before, including real-time inspections, on-site accountability and accurate measurements taken from a mobile phone camera.

COVID-19 mandated that teams continue to collaborate without physical access to materials, spaces or even other teammates.

AECOM developed technology that allows

for public approval meetings to take place virtually so that public projects can continue to move forward without in-person gatherings.

Other mobile apps in the marketplace include measuring assistant AirMeasure and asset management software Infotycoon. Those without complete mobile connectivity will be at a productivity and sales disadvantage going forward.

5. Rising Material Costs



The U.S. Bureau of Labor Statistics reported that the Producer Price Index for construction goods increased by 17% year over year in 2021.

Rising interest rates are likely to compound all types of costs, resulting in further pressure on

total construction. Technologies like drones, AR and BIM will be key in helping to maintain project volume and combat this cost pressure. Innovative living materials and technology may push up costs further, even though they

ultimately provide more savings for users in the long run. Some of these innovative materials include:

- Self-healing concrete
- 3D graphene
- Transparent aluminum
- Light generating concrete
- Invisible solar cells

6. Green Building



Green construction is the expected standard for homebuyers, renters and commercial tenants. Unfortunately, many sustainable and eco-friendly features remain a luxury, despite their long-term savings - though this will change over the next decade as ecotech and sustainable construction become more mainstream.

Renewable energy sources captured 11% of the energy market in 2019 (per the U.S. Energy Information Administration) and are only expected to grow in their share as accessibility increases. That's a huge market, given buildings are still responsible for 40% of U.S. energy consumption and 30% of greenhouse gas emissions.

Green construction includes both the technology to lower a building's carbon footprint and the use of resources and building models to reduce the use of resources.

Perhaps an even greater driver of green building is proof of its value for occupants. Research shows that green buildings can have a positive

psychological and physiological impact on inhabitants and even passersby.

Greenscaping, the practice of outfitting rooftops with plant coverings and small parks, is now commonplace in urban centers around the globe, exemplified by Google's new multitiered London HQ. The developers deemed the project a "landscaper," a building with similar dimensions to a skyscraper but build horizontally rather than vertically. This enables vast greenscapes to cover the structure while also improving its resistance to high-powered storms driven by climate change.

7. Modular and Offsite Construction



Modular and prefab construction is in the middle of a multiyear boom that isn't showing signs of slowing down. The modular construction market, led by the residential sector, is predicted to balloon in value to almost \$110 billion by 2025, driven by a lack of skilled labor and an increase in cost-cutting technology.

New technology also enables these prefab and modular buildings to grow larger than ever before. The 21-story CitizenM Bowery Hotel, opened in downtown Manhattan in 2019, is now the tallest modular construction project in the United States, and the New York Department of Housing Preservation and Development recently partnered with a modular developer to construct a new affordable housing development in East New York. Many major international builders say they plan to pare down their on-site construction activity to just 25% by 2025 in favor of prefab construction.

The prefab industry hasn't been spared by the COVID-19 pandemic, with some manufacturers shutting down to address the shortage in large-scale, hospitality-focused modular construction. However, as a whole, off-site construction isn't going anywhere. Modular projects offer the ability to better regulate employee safety in climate-controlled, ventilated environments, making them ideal for those who want to maintain social distancing practices.

8. Construction Management Software



Comprehensive construction management software is a vital tool for remaining competitive, building a valuable business and mastering operational efficiency.

While each software service differs slightly in features and offerings, the best ones tackle end-to-end needs from RFIs to compiling data, sharing files with mobile teams, budgeting, document storage, payroll and HR, and inventory monitoring.

Top reviewed construction management software solutions for 2022 include:

1. Autodesk
2. Procore
3. Buildertrend
4. RedTeam
5. Fieldwire
6. Quickbase

Choosing the right construction management software is important for your firm. Begin with looking at ease of use and integration with other existing software. Look for scalable software that fits right now, yet will help manage your needs as those needs multiply. Evaluate customization options, upgrades and additional features, and check for availability of support and training to get up and running.

9. Focusing on Residential Projects



As global investment from tech companies increases in complex megaprojects, some of the largest construction companies, like Skanska, announced that they're no longer pursuing large transportation public-private projects, instead focusing on lower-risk arrangements.

The large-scale project downturn is already resulting in increased interest in private sector projects. Residential construction spending was up nearly 25% in 2021, and residential starts are expected to increase by 7% in 2022.

10. Smart Cities



Some of the biggest tech companies in the world, like IBM, Microsoft and Cisco, are investing heavily in megaprojects to build smart, sustainable cities. These cities are more intricate and interconnected than most megaprojects and require intense planning and development prior to commencement. The global smart city market is expected to grow 20.5%, reaching \$2.5 trillion by 2025.

Some of the most notable global megaprojects in the works include Masdar City in the United Arab Emirates, Songdo International Business District in South Korea, Hudson Yards in New York City and India's Delhi-Mumbai Industrial Corridor. These projects range in cost from tens of billions to over \$100 billion and are projected to influence the economy, improve the infrastructure and contribute to the health of the environment.

These construction industry trends are rapidly changing the global market — rising prices and skilled labor shortages are likely to continue in the coming decade, and regulatory challenges may become stricter with intense scrutiny on workplace safety and climate change adaptation. By adopting new practices, leveraging new technologies and investing in new projects, builders and developers can reduce risk, win more contracts and enjoy profitability.

The pandemic created an anomaly for statistics in the construction industry, but looking forward, the outlook is largely positive. After a tepid period, an upswing in construction is expected throughout 2022 as the U.S. economy recovers from the pandemic and new economic centers continue to develop and grow. As your firm strives for greater efficiency and safety, keep up with demand by using a reliable rental equipment network with BigRentz.

Courtesy: BigRentz, Inc.



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Sustainability and Fire Safety– Are they compatible?

By - Dr. Uthpala Rathnayake



In recent years, the concept of sustainability has been recognized as an important interest of many disciplines. Dovers and Handmer (1992) define sustainability the ability of a human system, natural or mixed, to resist or adapt to endogenous or exogenous change indefinitely. The recent interest in sustainability has increased primarily as a result of global concern for climate change, global warming, increasing pollution, increasing demand for buildings, and predicted insecurity of energy supply, making it imperative for policy-makers worldwide to devise strategies for a sustainable future (Sharma, (2018): Nguyen and Gray, 2016). As a result, to meet the growing needs of global change, interest in sustainable buildings is growing rapidly.

Sustainable buildings are frequently referred to as environmentally friendly buildings. According to the United States Environmental Protection Agency (2009), a sustainable building should be constructed using environmentally responsible and resource-efficient processes throughout the building's lifecycle: from siting to design, construction, operation, maintenance, renovation, and demolition. As per Akadiri, Chinyio and Olomolaiye, (2012), a sustainable building should inherently include resource conservation, cost efficiency, and design for human adaptation. Chow and Chow, (2003) identified that a sustainable building should pay attention to architectural features including building construction elements, electrical and mechanical systems to provide a comfortable environment (but the system will use energy, directly or indirectly), management such as energy management, environmental management, and fire safety management. According to Huang et al., (2016), "safety" and "energy savings" are both equally important for a sustainable building. However, the current emphasis on sustainability as a function of energy may be detrimental to other areas, including fire safety.

A 'sustainable' building is not so 'sustainable' if it burns down and needs to be reconstructed. A single fire event has the potential to negate several, if not all, aspects of sustainable design. In the absence of adequate fire protection systems, fire would escalate carbon emissions by 30-40 kg of CO₂/m² over the life cycle of a standard building (Cho & Chae, 2016), and if exposed to extensive fire hazards, it can add up to an extra 14%. In addition, the efforts to improve energy efficiency without considering fire safety has the potential to expand the fire risk by a factor of 3 (Tidwell, 2010). It must combine sustainable design and fire safety in such a way that they reinforce rather than undermine each other, resulting in a net benefit to both humans and the environment. Without this consideration, sustainable design may unintentionally increase fire risk.

Currently, sustainable building architectural features are fundamentally rooted in sustainability (environmental, economic, and social) but are not always focused on fire safety. Several major fires involving sustainable materials, systems, and features in buildings have occurred in recent years, including the tragic Grenfell Tower fire in London (2017), which involved combustible insulation; the Dietz & Watson cold storage warehouse in Delanco, New Jersey (2013), which involved photovoltaic panels and combustible insulation; and the energy storage system explosion and fire in Surprise, Arizona (2019). There could be hundreds of unidentified fires involving sustainable building materials, systems (technologies), and features. New sustainable features such as double skin façades may provide thermal barriers but accelerate vertical fire propagation and atriums that provide natural light may increase fire and smoke distribution. High ceilings may reduce the effectiveness of fire sprinklers, and the use of lightweight structures might weaken the structure's strength, causing it to collapse quickly in the case of a fire. Sustainable construction materials like bamboo, straw, Linoleum, sheep wool, paper flakes panels, seagrass, cork, coconut, lignin, and wood fiber plates can quickly set off flashover rapidly. More ventilation options are often available when air flow through the building is unrestricted, but it may accelerate the spread of fire.



Source:(https://www.designingbuildings.co.uk/wiki/Grenfell_Tower_fire)



Source:(<https://www.solarpowerworldonline.com/>)

Communication between the sustainability and fire safety communities is critical for addressing these concerns. Fire safety professionals can identify areas where more research is needed by staying up to date on new developments in sustainability. Risk-informed performance-based methods should be devised to provide insight into the range of possible realizations of complex system designs and to inform mitigation strategies to keep risks tolerable levels. Building sustainability and fire safety can complement rather than compete if the two disciplines engage in meaningful dialogue early in the design process.

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The Future of Construction 2022 and beyond



The construction sector plays a major role in driving economic growth in both developed and developing countries and has a direct impact on global GDP. Even so, construction is recognised as one of the least digitised sectors. According to a study by McKinsey, this industry is plagued by high levels of inefficiency, with large construction projects typically exceeding 80 per cent of their budget and taking 20 per cent longer than projected. And while the long-term benefits of new digital technologies are significant, the construction sector has been slow to embrace these developments. Technological advances, the pandemic, increased competition, and the demand for shorter construction times are, however, slowly but surely starting to transform the construction sector. And it's about time.

Sensor technology and wearable devices help contractors track productivity and monitor the use of equipment and materials on site, and 4D and 5D simulation help them enhance and

improve project planning processes. Maintaining cash flow, ordering construction materials, and managing resources are also increasingly being moved to the digital realm. AI-based platforms provide paperless organisation for architectural designs and ideas, digital channels increasingly transform how materials are sourced and purchased, and advanced analytics are used to improve project efficiency and decision-making. Using a decentralised database like blockchain enables the construction process to become more transparent and minimises the risk of fraud.

Robots build more efficiently

Robotics offers tremendous potential to enhance efficiency, productivity, and manufacturing flexibility in the construction sector. Think robotic welding, the fabrication of modular homes, 3D printing of houses and customised structures, as well as materials handling on building sites. Construction robots will automate painting, bricklaying, welding, and many other

repetitive tasks with great precision, reducing human error and minimising materials losses. Robots will also increasingly automate demolition, load lifting, transportation, and concrete works, improving worker safety and productivity and significantly reducing operational time.

Demolition robots



Demolition is a fundamental part of most construction processes. Using robots for demolishing large structures and buildings significantly accelerates the demolition process, improves efficiency, and leads to significant cost savings. Demolition robots look like mini-excavators. They run on tracks, have hydraulically powered arms to which crushers, drills, breakers and buckets can be attached, and deliver exceptional amounts of demolition power. Many of these robots can travel up and down stairs and fit through standard doorways. They are operated remotely by using joystick-type controls, enabling human workers a safe distance from any crushing debris and potential contaminants. Demolition robots can assist with breaking down walls, crushing concrete in confined or hard to reach locations, and collecting debris.

In the beginning of this year, Brokk Inc, a manufacturer of demolition machines for construction, tunneling, and mining, introduced the world's largest and most powerful demolition robot, the Brokk 900. The standard Brokk 900 weighs more than 11 tons and is equipped with the most powerful breaker ever attached to a demolition robot. It can break the hardest materials, such as granite, and delivers a phenomenal punch with each strike. The Brokk 900 Rotoboom has been fitted with a high-precision rotating boom system and has been designed for optimal flexibility in applications where precision and access are more important than power. Brokk CEO Martin Krupicka explains: "All in all, the new Brokk 900 represents what we are known for. More power in a compact and smart package. And that stays true even for our biggest demolition robot." Today, thousands of remote-controlled Brokk robots are at work at projects in more than 100 countries all over the world.

Welding robots

As welding tasks are dangerous, uncomfortable, and expensive, manual welding is often limited to short time periods. Welding robots are becoming increasingly important as they deliver high quality and (cost)-efficient welding jobs in shorter periods of time, sometimes even in the most complex locations. They are, however, expensive and require highly qualified personnel to programme and operate them. They can also only perform certain types of welding tasks.

Drones

According to a study by McKinsey, drones – or unmanned aerial vehicles (UAVs) – are key to the disruption of the construction industry. They can be deployed for various tasks, such as transportation, aerial monitoring, contour construction, 3D scanning and map creation, and so on. Companies building and managing large infrastructure, such as industrial complexes, airports, railways, roads, dams, bridges, water reservoirs, power complexes, and gas and oil plants have considerable potential to use drones to optimise their operations. These flying robots enhance construction site safety, improve communication and collaboration, and lead to significant time and cost savings. They can be used to create real-time aerial footage from buildings and terrain and reveal potential challenges. Drones can provide intelligent and convenient site supervision and management options and lead to improved planning and operations. As drones across construction sites evolve and mature, their uses continue to expand. In fact, this year has seen the launch of various new construction drones.

The Wingtra One VTOL (vertical take-off and landing) drone is an excellent fit for construction and infrastructure projects. The rotary aircraft can take off and land autonomously, and features well-integrated, high-quality GNSS sensors and positioning systems. The UAV's extended flight time and resulting increased coverage makes it particularly suitable for surveying large projects, such as railway tracks, highways, airports, or water retention basins. In one flight, WingtraOne can map almost 2 times more area than a conventional fixed-wing drone and approximately 10 to 15 times more than multicopter drones. The WingtraOne drone offers fully-automated flight, and can take off from and land in confined spaces without an operator needing to risk entering a construction site. The drone is equipped with a 42 MP full-frame Sony RX1R II camera and a multi-frequency PPK GNSS receiver, enabling it to generate high-resolution imagery of large areas and provide excellent accuracy when it comes to earth volume and stockpile calculations.

Bricklaying robots



Most bricklaying robots at work today are equipped with industrial robot arms with which they assemble the structure of the building. A bricklaying robot can lay up to 3,000 bricks per day, is exceptionally skilled at lining bricks up vertically, keeps operating as long as it has enough bricks, mortar, and fuel, helps reduce labour shortage challenges, significantly increases efficiency and productivity, and reduces operational costs. The latest bricklaying robots are equipped with CAD and data-tracking technologies to ensure more productive, safe, and sustainable building processes. And as these technologies continue to develop, we can expect construction automation to undergo increasingly significant transformations.

Hadrian X, the world's first mobile bricklaying robot developed by Australian company FBR, made headlines when it laid 1,000 bricks in an hour. And compared to human bricklayers, who generally lay up to 500 bricks per day, the robot is rather impressive. The sophisticated machine uses specially designed, interlocking blocks that are 12 times larger than traditional bricks, and it can lay 200 of these bricks per hour. What's more, Hadrian X can also grind and cut the bricks to make them fit in a specific area. The telescopic arm of the robot even enables it to build curved walls. It can also build structures from 3D CAD models and produces significantly less waste. In the near future, Hadrian X will be able to build a typical home within two days.

Exoskeletons



The exoskeleton is a mechanical suit that exponentially increases the strength, speed, and agility of human construction workers. It enables workers to safely lift and carry much heavier objects, even overhead. Some exoskeletons consist of tool-holding suits, while others support the worker's back while they repetitively bend and lift. These suits ensure that weight is handled correctly and in the right posture in order to avoid back injuries. Some exoskeletons offer crouching and standing support in the form of lightweight 'chairs'.

Hilti, a designer and manufacturer of specialised technology, software, and services for the construction industry – in collaboration with leading prosthetics, orthotics, and exoskeleton provider Ottobock – recently announced the launch of its first exoskeleton for construction tradespeople. The Hilti EXO-01 overhead exoskeleton is designed to reduce the stress of overhead work on the arm, back, and shoulder muscles of the wearer. The system weighs just under 2 kgs and straps around the arms, shoulders, and waist, providing dynamic support without restricting the range of motion of the arms and torso. The exoskeleton is particularly useful for employers on large construction projects. It provides support during the installation of overhead air ducts, piping, or ventilation equipment, while hanging drywall board, or fitting overhead conduits and cables, and reduces fatigue and muscle injuries.

3D printing and contour crafting

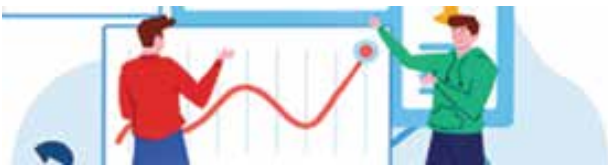
3D printing technology offers a vast number of applications, ranging from producing complex shapes to building a block of apartments on site within a week. 3D-printing robots can significantly accelerate production and reduce waste materials. A task that would take months to complete using traditional construction processes can be dramatically sped up using 3D printing technology. Contour crafting is a layered fabrication technology that can be used to create one residential home or even a whole range of homes in a single run, while still being able to create a different design for each one. As a result of contour crafting's speed and its ability to use in-situ materials, the technology is also ideal for the creation of emergency shelters or low-income housing, as well as buildings that involve complex shapes.

French company XtreeE is helping to lead the transformation in the construction sector. It has developed an industrialised solution for producing 3D-printed buildings, encompassing not only the hardware but the full spectrum of tasks – from the digitalisation of the project all the way through to its production. XtreeE uses six-axis robots and proprietary software to produce design-led building components that cannot be achieved using traditional construction methods. This provides new possibilities for design in manufacturing and new scope for the mass customisation of structures at a competitive price. XtreeE president Alban Mallet says: "It is on demand, adaptable and tailor made. One day you can make a table, the next day you can make a wall, the next day you can make street furniture – 3D printing will print with the same consistency time after time."

AI is important for the transformation of construction

Robotics, artificial intelligence, and the Internet of Things can reduce building costs by up to 20 per cent. AI in particular will play an important part in the transformation of the construction sector. It will lead to safer construction sites, mitigate labour shortages, help measure and monitor construction progress, facilitate predictive equipment maintenance, and plan the routing of plumbing and electrical systems in modern buildings. Construction workers can be fitted with smart helmets and vests that measure biometric data, such as heart rate and body temperature, ensuring their wellbeing at all times. Smart image recognition technology can be deployed to monitor the real-time interactions of workers, machinery, and objects on construction sites and flag unsafe situations or undesirable behaviour. Artificial intelligence can also be used in construction training programmes – simulating real-life construction site scenarios and training best practices. Furthermore, artificial intelligence can be connected to IoT sensors in construction vehicles and other construction equipment. These sensors can monitor equipment operations and automatically send out alerts in case of potential concerns.

Predicting cost overruns and timelines



Despite the very best construction project teams, as a result of obstacles and uncertainties during the planning and implementation of a construction project, contractually agreed costs are often exceeded, interfering with the sustainable realisation of construction and renovation projects. Artificial neural networks can be used to predict cost overruns and realistic timelines using data such as past projects and their associated costs, planned start and end dates, the type of contract, the size of the project, and project manager competence levels. AI algorithms can account for any increases in labour, materials, and project scope over the years to better predict the cost of future projects. AI can also reduce cost overruns by predicting potential delays as a result of supply chain issues, adverse weather conditions, or other causes. Integrating plans for these delays into a

project estimate, AI can generate more accurate predictions, which makes planning easier and reduces the chances of cost overruns.

Worker safety

The construction sector is an inherently risky industry with each project, irrespective of its scope, posing its own dangers. Construction sites continuously change, with large machinery, equipment, and trucks moving across the area and multiple labourers with varying communication and skills levels working together. As construction workers encounter many different hazards while on site – such as falls, electrocutions, getting caught in or between objects, or being struck by an object – this often leads to a disproportionate number of fatalities. In fact, one in five worker fatalities take place in the construction sector, according to the US Occupational Safety and Health Administration (OSHA).

Fortunately, the rapid development of artificial intelligence (AI) tools is increasingly improving safety on construction sites all over the world, leading to more desirable working environments. Combining big data with the capability of AI to parse and analyse information in real time, it is now possible to create many solutions to improve worker safety. AI and robotics significantly decrease the risks, physical demands, and hard labour in the construction sector, with prefabrication and 3D printing becoming more and more prevalent in construction work. AI systems and sensor technology can be implemented to observe, assess and communicate on-site hazards. This is done by gathering data from real-time footage and monitoring and assessing it for warning signs. These warnings can then be communicated to site managers in order to help prevent accidents.

Generative design

Generative design is a relatively new design technology that's slowly making its way into the world of architecture and construction. It helps provide fast and effective solutions to various construction issues. Instead of a human and a computer co-designing, generative design enables the discovery of unexpected novel designs and navigates trade-offs between sketch constraints, high-performing designs, and objectives. It helps create multiple creative options within a short period of time, something human architects, engineers, and other construction professionals are

simply unable to do. The designs produced by generative modelling technology generally don't need to be simulated or tested. The construction sector increasingly makes use of generative design – a design exploration process that uses machine learning algorithms to explore all the variations of a design solution and generate alternatives.

Increased efficiency and productivity

Ranging from optimising work schedules to keeping a secure watch on construction facilities and improving workplace safety, AI is already proving its value in construction. Project managers can use AI to track work in real time, using on-site cameras and facial recognition technology to monitor and assess productivity. AI uses pattern recognition and historical data, which enables it to make predictions and finetune schedules, preventing costly delays that can arise as a result of various different circumstances. With many large-scale, multi-year projects requiring the perfect coordination of a multitude of complicated tasks – including designs, blueprints, and permits – and unexpected occurrences like changes and delays, the assistance of artificial intelligence is increasingly becoming a necessity, rather than 'nice to have'.

Autonomous vehicles

Robotic and autonomous equipment have the potential to make construction sites safer, faster, and more productive. Some construction companies are already starting to offer autonomous construction machinery to perform repetitive tasks, such as pouring concrete and excavation and prep work, freeing up human workers for the actual construction work and reducing the overall completion time. Using GPS, cameras, sensors, and radar to navigate, as well as hardwired and wireless stop buttons to ensure the safety of workers, autonomous equipment is capable of detecting its surroundings and operating without human intervention. Noah Ready-Campbell, CEO of American company Built Robotics, explains: "By enabling customers to rent Built-upgraded equipment from Sunstate, we reduce the barrier to trying this technology out and make it more approachable for contractors and operators around the country."

Barcelona-based robotics startup Scaled Robotics has developed a construction machine that can autonomously navigate a building site and produce an accurate 3D-map of its surroundings using a 360-degree camera and a custom lidar

system. It's equipped with advanced object recognition technology that enables it to differentiate a staircase from temporary stairs for electric work, or a constructed wall from a piece of sheet rock leaning against it. The 3D model created by the autonomous machine is then compared against a CAD model of the building to monitor and evaluate the progress of the construction work.

Downsides of AI in construction



As we can see, deploying artificially intelligent machinery on construction sites can offer a number of benefits, but it also has various downsides. For instance, machines can only perform tasks they were programmed to do. Anything other than that could lead to irrelevant or undesirable outputs and result in backlogs, damage, or accidents. Increased use of artificially intelligent construction equipment could also lead to a further shrinking of the human labour force and result in increasing unemployment. Other drawbacks are the cost of the hardware and the software. These sophisticated and complex machines will need to be purchased, installed, maintained, updated, and repaired, which will require significant investments.

Augmented construction is rapidly gaining traction

Using augmented reality (AR) in construction means that a digital 3D model of a proposed design is overlaid onto an existing space or site, using a mobile device or AR headset. In essence, AR combines the real world with the virtual. With advanced AR technologies, like object recognition and computer vision, the overlaid information becomes interactive and can be manipulated. AR is rapidly gaining traction in the construction sector as its uses span everything from design and collaboration, to safety and security. Here are some examples of the benefits of AR in construction.

Safety and training

Safety is critical in construction. And as AR can be used to highlight the location of other workers, supplies, and equipment, it can help make the working environment safer and more efficient.

AR headsets can be used to simulate potentially hazardous scenarios, such as scaling multi-storey scaffolds or using powerful and potentially dangerous tools – offering workers rigorous and extremely life-like safety and security training in a safe environment where mistakes have no dangerous real-life consequences. AR also enables workers to receive on-the-job instructions so they can safely carry out complex tasks, step by step.

Project planning and collaboration

Building Information Modelling (BIM) and advanced 3D modelling software have fundamentally transformed the design and planning process, and the static physical models of days gone by are increasingly being replaced with digital technology. 3D modelling and AR enable designers to create collaborative, extremely detailed, and fully interactive models of structures that are in the process of being built. Prospective home buyers, as well as remote workers, can walk around and through these structures, view them from any angle, and even manipulate them. These sophisticated AR models enable the people working on a project to see how changes will be incorporated in the design without them causing delays and interfering with schedules and timelines. AR enables all members of a building project to visualise the effect of alterations in real time without having to wait for a decision maker to be physically present, and helps to pinpoint errors or complications at the earliest possible stage.

Underground construction

During excavation projects, there's always a risk of potentially wrecking underground utilities or hitting a gas line or water pipe. One wrong move by an excavation machine can lead to all kinds of problems, such as explosions or pipe bursts. Using a smartphone or a tablet, a contractor planning to dig a hole will be able to see, from above the ground, whatever is under his feet, such as buried cables, pipelines, or trenches, avoiding potential damage and costly mistakes. Using real-time AR techniques, workers can either view the layout of cables and pipes in a 2D plan form or as a 3D drawing overlaid on the device's camera view. AR can also be used to capture 3D records of work that was carried out before the excavations are filled up again, improving the accuracy of data for any future work at the same location. AR provides visibility to underground networks and leads to greater safety, less risk, improved accuracy, and greater certainty about where assets are located and where work is to be carried out.

The connected construction site



More and more construction companies all around the world are realising productivity gains from connecting their sites. The connected construction site is all about hardware and software – sensor technology, artificial intelligence, and the Internet of Things – working in harmony to enable improved quality and on-time delivery. A connected construction site can provide construction companies with an overview of the entire project; from start to finish. It enables all stakeholders to continuously monitor progress and cost in real time, which means potential challenges can be pinpointed and addressed before they have a chance to negatively impact delivery.

Improved productivity

Connected construction increases coordination and collaboration among project teams and helps to break down data silos, which increases project visibility, leads to improved problem solving, limits risk, and improves productivity. A connected construction site improves office-to-site communication, which also leads to less travel time for job managers, and less frustration for workers needing to wait for decisions.

Productivity tools such as 3D-modelling software, laser scanning, global navigation satellite systems (GNSS), machine control, imaging, and inertial navigation can dramatically improve productivity of all construction-related tasks. In comparison to traditional techniques, surveyors, engineers, and machine operators using these new, connected technologies have significantly improved productivity levels.

Sustainability

And while many of the benefits of connected construction sites relate to quality, it also significantly improves sustainability. Field work where real-time models are used leads to improved accuracy and results in fewer errors. For instance, unintentionally removing too much soil during excavation results in rework and additional fuel consumption. It also means having to allocate different resources for extra machinery, like for

instance a compactor, and manpower to correct the mistake. Having detailed, advanced knowledge of the work that needs to be done also reduces waste. Fabrication teams, for instance, who have precise information about what will be needed for each project will avoid over-ordering materials.

WakeCap Technologies

UAE-based startup WakeCap Technologies develops smart tracking systems for construction sites, manufacturing facilities, mining sites, and oil and gas operations – even if they're underground. The firm connects and tracks equipment, tools, and workers while on the job in real time. Smart tracking enables instant field reporting on site operations, workforce attendance, and employee productivity, and significantly improves the safety and security on any construction site. WakeCap “enables site networks of integrated sensors to connect job sites with a proprietary, patented wireless mesh network technology to provide an in-depth understanding of all site activity.”

SmartBarrel

US-based company SmartBarrel develops real-time, connected construction site IoT devices, providing employees and their supervisors with an overview of the project, and enables real-time allocation of tasks, construction site and weather conditions monitoring, and efficient timesheet and payroll processing. The company's biometric timekeeping tech makes use of facial verification to make payroll and job costing processes more efficient and ensures only verified and approved employees and stakeholders are given access to a construction site. Its advanced communication systems ensure improved collaboration and enable sending broadcast messages to all the people on the site.

Blockchain and the future of construction

Embedded Blockchain for IoT

French firm Kalima Systems creates the requirements for enabling embedded blockchain for IoT devices at construction sites. This enables real-time work-in-progress management, detailed progress reporting, and geo-localised views of construction sites in progress. “Kalima Systems Blockchain empowers enterprise and developers to build the next generation of sustainable Blockchain applications for IoT, building a bridge between the physical and the

Construction management is time-consuming and complex, and to ensure overall project quality it's critical to have effective quality control in place. Traditional management methods are, however, cumbersome and inefficient and often lead to costly mistakes, delays, and discrepancies. This is where blockchain technology can make all the difference.

Let's say a contractor pours 100 metres of concrete at a site; a gauge on his truck could signal when the task is completed. Then an invoice for the work is generated and the contractor is instantly paid for the job. John Chappell, director of energy business development for Brooklyn-based BlockApps, says: “It becomes your back office. It knows what was agreed upon, it matches the purchase order with that action, and then tells the system to generate a payment automatically. Nobody in accounting has to approve anything.”

Blockchain technology is already used by many companies in the construction sector to manage projects and, as it is decentralised, secure, transparent, and scalable, it's expected to become increasingly integral to the sector. Blockchain enables instantaneous collaboration, accelerated payment processing, and streamlined supply chains. It also offers proactive third-party oversight, predictive asset maintenance, smart contracts that stay on track, and effective carbon tracking.

Briq's digital twin on blockchain

California-based blockchain firm Briq has developed a digital twin of a new office construction, incorporating a room-by-room inventory of every asset. Briq CEO Bassem Hamdy says: “When a product or specification needs to be found in a building, there is finally a place to go to simply search for what is actually in that building. The blockchain-encoded specifications are granular: paint colours, ceiling fixtures, LED bulbs, door hardware – plus manuals, warranties, and service life in a countdown clock that building owners can monitor.” And Ellis Talton, Briq's director of growth marketing, adds: “Any improvements and refurbishments to the building can be documented, and the whole repository can be transferred to new owners if the asset is put up for sale.”

HerenBouw's blockchain-enabled project management system

Amsterdam-based building company HerenBouw is making the building development life cycle

more efficient by using a blockchain-based project management solution developed by Propulsion Consulting. The firm operates in commercial real estate and uses blockchain in a large development project in the harbour of Amsterdam. The blockchain-based system registers all transactions, holds all stakeholders accountable for the completion of their respective tasks, and provides transparency, improved communication, accuracy, and an unchangeable audit trail. The blockchain system developed by Propulsion Consulting is centred on the interactions between real estate developers, contractors, and their subcontractors. Contracted work is divided into individual tasks, with smart contracts structured to govern the execution of all of these tasks. As contractors don't want subcontractors to know about their arrangements with developers, or to have one subcontractor's arrangements known to others, permissions on the blockchain are carefully structured.

Advanced construction materials and design



The construction industry has been consuming exorbitant amounts of sand for the manufacturing of concrete, glass, and various other construction materials. And with sand reserves facing rapid depletion, and the construction sector also being one of the largest solid waste producers in the world, you can see how this leads to serious concerns. One way we can minimise the environmental impact of the construction industry is to focus more on renewable materials. Advanced building materials (ABMs), for instance, are a new generation of construction materials that make buildings and infrastructure more resilient, smarter, more energy-efficient, and more sustainable. Advanced construction materials can include bio or nanotechnology-enhanced versions of existing materials or bioinspired materials that replicate natural systems. ABMs also encompass new types of materials, such as concrete that possesses air purification capabilities or self-healing properties, photo-voltaic-embedded construction glass, or innovative wooden structures. ABMs could decrease or even eliminate the need to replace, restore, or repair built structures and represent a transition

to incorporating cutting-edge, sustainable solutions to speed up construction time, enhance profitability, and lessen the construction industry's impact on the environment. Here are some examples of advanced building materials and designs:

Self-healing concrete using red blood cells

Over time, air, moisture, and changes in temperature can weaken even the toughest construction materials. A new generation of concrete now has the ability to heal itself, using a substance found in red blood cells – repairing cracks and eliminating the need for repairs. Some earlier experimental self-healing concrete made use of limestone-producing bacteria, but this is a slow and expensive process that could also pose safety issues.

ut adding an enzyme found in red blood cells can give concrete even faster self-healing powers.

Nima Rahbar, associate professor of environmental and civil engineering at Worcester Polytechnic Institute, was inspired by the way humans inhale oxygen and exhale CO₂. He found that, when you add carbonic anhydrase to concrete powder, the enzyme that takes CO₂ from cells and transfers it into the bloodstream, helps the material turn CO₂ in the atmosphere into calcium carbonate crystals. Whenever a tiny crack forms in the concrete, within a day the calcium carbonate fills it in, preventing the cracks from expanding. Rahbar says: "Concrete production and repair and transport is a very, very, energy-intensive problem. The material is responsible for around 9 per cent of global CO₂ emissions, more than three times more than the airline industry. If you can make concrete that can last longer, so you don't have to replace it, you can make a dent in this 9 per cent of emissions."

Cross-laminated timber

Created from planks of sawn, glued, and layered solid wood, cross-laminated timber can be an important sustainable and durable construction material alternative. Its layered design at perpendicular angles leads to incredible compressive and tensile strength, making it nearly as strong as structural steel or reinforced concrete. Cross-laminated timber could be used in the same way in similarly-designed structures. Cross-laminated timber is composed of a renewable resource, which also makes it a sustainable material. It is used in forms for concreting structures like bridges, as support and infrastructure in large

construction projects, and its structural strength and pleasant appearance make this material particularly suitable for small construction. Cross-laminated timber is currently being used in the construction of various high-rise buildings across the world.

Recently, the New York City Council approved the use of mass timber as a structural material for the construction of low and medium-rise buildings of up to 25.9 metres tall (or up to seven storeys) across the city. The decision comes as globally, mass timber is being more widely adopted as a structural building material. A representative from the New York City Department of Buildings said: “The updated Construction Codes now includes cross-laminated timber (CLT) as an approved Type IV construction material here in New York City.” And timber specialist architect Michael Green said: “With the opportunity to build in mass timber, New York can now join many cities around the world as an important leader in carbon sensitive large and tall wood building.”

3D-printed (bio)plastic



While plastic, which is made with fossil fuels, is extremely versatile, long-lasting, and strong, due to its notoriously slow biodegradation process it's also one of the most polluting materials in the world. Bioplastic is an excellent green alternative made from cellulose, marine chitins, algae, and various other renewable materials, making it a much easier and more biodegradable material. Bioplastic's various beneficial properties make it ideal for use in structural elements and cladding. The growing popularity of bioplastic – which is even touted as the future of 3D-printing – is based on the ease with which it can be transported and, of course, its minimal carbon footprint.

Working towards building a more resilient future, Dutch firm Aectual uses 3D-printed bio and recycled plastics to create customisable and sustainable flooring solutions. The company's Pattern Terrazzo floors combine 3D printed patterns with a bio-based terrazzo infill, offering designers a wide choice of designs and patterns. This makes this type of material ideal for architects, interior designers, and end-users who appreciate a high level of artistry in details like flooring,

facade panels, and stairways. Aectual has installed plastic floors at Amsterdam's Schiphol airport and is expanding to department stores, hotels, museums, and retail projects in Europe and Asia. “Our in-house developed industrial digital production technologies and software tools enable designers and companies to create tailor-made floor designs on any scale, anywhere”, says an Aectual spokesperson.

Power-generating windows

Energy-generating solar panels have been around for quite some time but one of their drawbacks is that they require lots of space – whether on rooftops or on the ground – which, especially in urban areas, is becoming increasingly limited. Researchers have been working on finding a solution for this challenge and have developed solar glass that can turn existing windows, atriums, or skylights into on-site power-generators, thereby striking a balance between functionality and aesthetics. Thin-film modules, such as cadmium telluride or amorphous silicon, can be worked into the design of a building and enable windows to generate electricity in a variety of conditions and locations. Solar glass can be produced in varying degrees of opacity, with the versions with greater opacity providing maximum power-generating efficiency, as well as shading and glare control. Thanks to its multi-layered structure, solar glass also possesses sound insulating properties which can be adjusted by decreasing or increasing the thickness of the glazing. The heat radiating from solar glass when exposed to the sun can also be harnessed to provide thermal control.

Silicon Valley-based tech company Ubiquitous Energy spearheads the development of next-generation solar technologies. The company's innovations are founded on the principle of seamlessly integrating solar technology into everyday surfaces and products. It recently installed the world's first truly transparent solar window facade at its headquarters in California, demonstrating its ability to generate clean, renewable energy while maintaining aesthetic beauty, high transparency, and colour neutrality. The transparent solar coating absorbs and converts invisible ultraviolet and infrared light into electricity while maintaining transparency. The electricity produced by the windows is used to power the LED lighting within the building. Ubiquitous Energy cofounder and CTO Miles Barr says: “Not only did we improve the thermal insulation in the conference room by replacing the single pane windows, but our Ubiquitous Energy

windows also generate enough electricity to power the lighting in the conference room. We are thrilled with the outcome of this installation and look forward to completing other installation projects in the near future.”

The challenge of digital crime

While the construction sector may not appear to be an obvious target for cybercrime, just like other sectors it too is vulnerable to digital attacks of various kinds. In fact, cyberattacks are a serious threat to the construction industry. According to IBM's Cost of Data Breach Report 2020, the average cost of a data breach in the industrial sector was \$4.99 million, and in the past three years alone, cloud-based email breaches have cost US businesses more than \$2 billion. According to predictions from research firm GlobalData, by 2033 the value of the industrial sector will rise to \$12.9 trillion, increasingly catching cybercriminals' greedy eyes. And while IBM's X-Force Threat Intelligence Index 2021 has witnessed a nearly 50 per cent annual increase in industrial control system attacks, almost 70 per cent of companies in this sector still do not have adequate security measures in place.

Juta Gurinaviciute, chief technology officer of cybersecurity company Nord Security's Nord-VPN Teams, says: “The construction industry is heavily interconnected. Several building sites need to exchange data with headquarters and routinely access cloud services. Most workers use laptops and other end-point devices, with architects, engineers, and sub-contractors contributing online. The building industry isn't manual labor anymore — it's a sophisticated and digitally-managed trade, using high-end innovations and tools.”

Colonial Pipeline

In May 2021, a group of hackers launched a ransomware attack on Colonial Pipeline, the United States' largest pipeline network for the delivery of refined petroleum products. The attack happened amid growing concerns over the vulnerability of (critical) infrastructure after several earlier high-profile cyberattacks. The company shut down its main lines for five days, which led to major disruptions of almost 50 per cent of the fuel supply for the eastern part of the country. Concerned car drivers emptied fuel stations in the Southeast, logistics firms were forced to locate new sources of fuel, traders were hit by unexpected price volatility, and airlines saw no other

options but to reroute flights to airports with adequate fuel availability. The attackers also stole nearly 100 gigabytes of data and threatened to release it on the internet if the company refused to pay the requested ransom of almost 75 bitcoin, which equates to approximately \$5 million. Assisted by the FBI, within several hours after the attack Colonial Pipeline paid the ransom, after which the cybercriminals sent the company a software application to restore its networks.

Professional Excavators and Construction



An attack on Canadian company Professional Excavators and Construction in April 2021 started with a couple of the company's printers acting up, and a few weeks afterwards all the company's systems froze. The timing was very unfortunate as well, as the cyber attack happened a day before the company was due to submit a bid for a large construction project. “The damage of not being able to get one of the biggest pursuits in our company's history is obviously damaging, but to get back up and running has been brutal”, said a spokesperson for Professional Excavators and Construction.” While the contracting company refused to pay the ransom, it was forced to fork out large sums of money to repair its systems. Company president Jan Gryckiewicz said: “To recoup that money, we probably have to do \$1m of additional work this year just to be able to cover \$100,000 in additional cost.”

How to best prepare for cyberattacks

Cybercriminals can inflict tremendous harm in various ways. For instance, by compromising construction equipment, which could lead to injuries. They can also steal critical data, breach intellectual property, and cause downtime, leading to project delays and financial losses. To prepare for disruptive cyberattacks like ransomware and similar, it's important to take pre-emptive action. For instance, companies should develop a comprehensive step-by-step cyberattack plan and ensure that business functions are separated from production operations to prevent attacks from disrupting production and supply. It's also critical

to secure your remote workforce – such as freelance construction workers shifting between various construction sites. Workers requiring access to the cloud or a corporate network should do so via a secure, encrypted VPN connection.

Establishing a protected network is another critical step. As collaborating on construction projects relies on constant communication, it's important that team members do so via a business VPN: a secure software-defined perimeter protected from outside threats. And before you give third-party stakeholders – such as architects, engineers, contractors, sub-contractors, clients, and consultants – access to your corporate network, robust cybersecurity measures like a VPN connection should be in place.

Employee awareness is another critical factor. As they often accidentally click on phishing emails, which can launch an avalanche of security challenges, all employees should receive cybersecurity awareness training. And last but not least: back up your data. Backups can be used to quickly restore any lost or inaccessible data in the event you are faced with a ransomware attack. These backups do, of course, need to be developed with cyber safeguards in mind.

The importance of business model transformation



New ways of working have emerged and we are now not only witnessing but also creating new opportunities to help us transform the way we build. It is high time for the construction sector to shift away from sub-par productivity, low margins, destructive environmental impact, and investment in innovation being an afterthought. The sector should focus on the transition to circularity, launching strategic initiatives, and preparing for the next wave of transformation.

But to create the required conditions for transformation, business models in the construction sector need a serious overhaul instead of just a few tweaks here and there. Company culture, for instance, is as important as digitisation and the implementation of smart technologies. And shifting from a linear to a circular economy will offer so many more benefits than 'just' ecological improvements.

Many construction stakeholders are increasingly exploring innovative emerging business models as well, such as Building-as-a-service and City-as-a-Service'.

Circularity

Aside from the obvious ecological benefits, a circular approach to business models also brings significant economic and social gains. Not only does the use of sustainable construction materials positively influence the wellbeing of all stakeholders who work with these materials, it has also shown to increase productivity by up to 10 per cent. Circular economy ecosystems and business models in the construction sector will lead to the discovery of new revenue pools. It's important to realise that holistic transformation is best achieved if all stakeholders in the supply chain – including designers, builders, and investors – prioritise circularity over linear approaches and create ecosystems as well.

The implementation of digital technology, innovation, and research and development are also critical for circular business models in construction. Compared to traditional business models, in which collaboration throughout the value chain is not often favoured as the focus is primarily on competitiveness and financial gain, circular business models actually depend on collaboration by all stakeholders, and using materials that retain the highest value throughout their lifecycle, minimising waste and reducing the sector's CO2 footprint. According to a recent survey, circular businesses perform better than linear ones. It's no secret that collaboration is key to circularity and as such, the way forward is clear: 'business as usual' is no longer an option.

Building-as-a-Service



The demand to monitor buildings 24/7, end-to-end, is increasingly gaining popularity, as is the need for other high-end services, like (pre)inspections, air conditioning issues that need to be sorted out, or an elevator that needs to be serviced. Smart buildings have the potential to become 'Building-as-a-Service' platforms that enable all stakeholders to ensure the building

meets their needs and generates benefits as well. 'As-a-Service' concepts offer high-quality, cost-efficient service to owners, tenants and users of smart buildings and enables them to move away from upfront capital expenditure to a comprehensive service at a monthly fee. We are seeing the rise of the 'as-a-service' approach throughout the commercial construction space. Think 'Space-as-a-Service', for instance, which is becoming an increasingly attractive option for small to medium-sized companies.

Via 'Building-as-a-Service', residential building owners can offer their tenants various service packages which include, for instance, ways to monitor energy usage, access to Wi-Fi connectivity, and more. Warehouse and corporate building owners can offer tracking capabilities like safe data management systems, or autonomous systems use. Services can vary on the basis of the location of the building or based on the use of the space. Smart buildings that are able to offer smart services that integrate with their surrounding urban areas, also contribute to expanding the possibilities for smart city development. Think wireless connectivity in buildings, along streets, in infrastructure like bridges and towers, and combine this with data generated, captured, and shared among buildings and municipalities. Now imagine all of this combined with building and municipal systems, and we can see how this can play a critical role in the development of smart cities.

City-as-a-Service

In order to survive and thrive, cities of the future and the people, the businesses, and the municipalities within them will need to transform the often inefficient city experience to a citizen and consumer-centric service. This transformation would entail the phasing out of traditional

services and the introduction of new service models. Think Data-as-a-service, Mobility-as-a-service, Tourism-as-a-service, Lighting-as-a-service, and even Democracy-as-a-service.

A comprehensive 'City-as-a-Service' model enables public sector engagement and the delivery of municipal services – such as housing, employment, public transportation, and employment – through data-driven, digital platforms that citizens can access via their computers or smartphones. It is about high-quality, frictionless, and flexible engagement with municipal departments. Many cities are striving towards offering clean, smart, digital, and autonomous transportation options as-a-service, and increasing the number of areas where citizens can walk or cycle. Various surveys indicate that citizens find Mobility-as-a-Service – where citizens no longer pay to own a car, motorbike, or bicycle – a realistic and welcome service model. Communication-as-a-service, such as rental laptops with maintenance and repairs included, and house management-as-a-service (outsourcing household tasks) are becoming increasingly popular as well.

Predictive analytics-as-a-Service

Predictive analytics involves the analysis of vast amounts of real-time data and translate this into meaningful insights to enable forecasts. This ability has become a game-changer for the construction industry as it enables the simulation of multiple scenarios that can be used to arrive at estimations and avoid failures. This can be particularly valuable at the stage of building design, but certainly also during the actual construction and operational phases of a building. And as construction projects have to take a myriad of risk factors into consideration, predictive analytics-as-a-service can also play a critical role in risk assessment and management.

Courtesy: richardvanhooijdonk.com

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1st World Construction Symposium on the theme "Global Challenges In Construction Industry" held during 28 – 30 June 2012 at the Cinnamon Grand Hotel, Colombo.

2nd World Construction Symposium on the theme "Socio-Economic Sustainability in Construction: Practice, Policy & Research" held during 14 - 16 June, 2013 at the Cinnamon Lakeside Hotel in Colombo.

3rd World Construction Symposium on the theme "Sustainability & Development in Built Environment: The Way Forward" held during 20 - 22 June, 2014 at the Galadari Hotel in Colombo.

4th World Construction Symposium on the theme Sustainable Development in the Built Environment: Green Growth & Innovative Directions" held during 12 - 14 June, 2015 at the Galadari Hotel in Colombo.

5th World Construction Symposium on the theme "Greening Environment , Eco Innovations & Entrepreneurship" held during 29 - 31 July 2016, at the Galadari Hotel in Colombo.

6th World Construction Symposium on the theme "What's New and What's Next in the Built Environment Sustainability Agenda" held during 30 June – 01 July 2017, at the Galadari Hotel in Colombo.

7th World Construction Symposium on the theme "Built Asset Sustainability: Rethinking Design, Construction and Operations" held during 29 June – 01 July 2018, at the Galadari Hotel in Colombo.

8th World Construction Symposium on the theme "Towards a Smart, Sustainable and resilient built environment" held during 8 - 9 Nov. 2019, at the Galadari Hotel in Colombo.

9th World Construction Symposium on the theme "Reshaping Construction : Strategic, structural and cultural transformations towards the Next Normal" held during 9 - 10 July 2021, Online.



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Climate change impacts on facilities management worker health and safety



Dr. Ashan Senel Asmone

Occupational safety and health (OSH) is a vital component of decent work. Annually, 4% of global GDP is lost from accidents in workplaces; through stoppages, interruptions, treatment of injuries, rehabilitation and compensation [1]. OSH is further considered a key policy area in addressing environmental, economic and social sustainability [2]. On the other hand, the Intergovernmental Panel on Climate Change (IPCC) has concluded that climate change is happening due to human activity and is already occurring. The effects of climate change on OSH of future work have not been explored. Climate change brings about increased variability of weather and more frequent and extreme events (i.e. storms, droughts, floods, heat waves), which increases medium to long term risks [2]. Climate change is a major component in transforming the workplace [3]. This is especially true for traditional industries such as building and construction, where green retrofitting and climate adaptation have been observed, altering traditional patterns of employment.

The negative impacts induced by climate change on employment include damages to buildings and the impact on labour productivity by affecting working conditions and OSH of the facilities management (FM) industry. While climate change adaptation and mitigation have direct impacts on work with exercises such as reinforcing buildings and infrastructure, and transferring and deploying new technology; ILO warns that future new jobs arising from climate change adaptation and mitigation can be “dirty, dangerous and difficult” [4]. On the other hand, OSH implications arising from climate change adaptation and mitigation measures are already observed [3].

The IPCC Sixth Assessment Report notes that climate models have accurately simulated trends in extreme conditions such as heavy precipitation

and heatwaves which will become more frequent, widespread, and intense during the 21st century. The impact of climate change is felt across nations and sectors: food, increase in groundwater table, ice melting, extreme weather (high rainfall, high temperature, strong winds and floods). Research [5] has shown that as early as 2050, many cities around the world (22% out of 520 cities studied) would have morphed to an unprecedented climatic regime. Most (64%) of these cities, including Colombo, Singapore, and Jakarta, exist in the tropics. Therefore, more and more tropical cities across the globe will feel substantial impacts of climate change.

The myriad of climate change implications faced by tropical cities such as Colombo has an overarching negative impact on building systems and components. Taking the example of a façade system of a building, increased occurrences of thermal shock can cause warping and glass breakage. Heat stresses can further affect the atmospheric degradation (i.e., corrosion) of material surfaces. On the other hand, wind driven rain and moisture stresses can cause façade surface degradation (e.g. erosion, soiling, discoloration) and bio-deterioration; facilitate moisture induced physicochemical deterioration of building façades (e.g. mildew/ mould formation and mould germination); and deteriorating the hygrothermal performance of buildings. Increases in UV radiation is known to be a cause of polymer degradation (i.e., plastic, rubber); affecting the life span of many products used in buildings. For example, this reduces the resiliency of seals and sealants, resulting in a loss of elasticity. Similarly, the changes in atmospheric composition such as relative humidity, salinity, acidity, ground level ozone and dust can lead to increased formation of mould, increased weathering of material, accelerated corrosion, chemical degradation and increased staining, respectively.

Consequently, climate change can impact the FM industry in numerous ways; including possible new hazards from climate change adaptation measures such as when increased installation and use of PV panels and vertical greenery (increased work at height exposure), and the use of electric cars and charging stations (fire and electrical hazards); that may increase the risk of existing hazards. Climate change can also contribute to increased exposure to existing hazard, increasing probability of accident or ill health. Examples to this would include the rapid deterioration of building materials leading to higher frequency of high risk at-heights maintenance activities like roof or high-rise façade repair (e.g., façade sealant deterioration accelerated by extra UV exposure) and exposure to mould-infested building material which can lead to respiratory diseases.

Further hazards exacerbated by climate change include the greater severity of accident or ill health. More severe climate conditions (e.g., higher temperature) and increased occurrences of extreme climatic events will increase the likelihood and severity of heat stress, fatigue-related accidents, and vector-borne diseases. Finally, risk control measures over climate change may also introduce additional hazards, such as when reduced service lives of building components can create unique safety hazards (e.g., high diurnal temperature variation may impact façade/roof safety anchorage, if service life is reduced then to ensure maintenance worker safety it requires additional adaptation measures).

The impact of climate change on green jobs and workplaces must be assessed to identify the new or increased OSH risks or other risks relating to human health and the environment (see Fig. 1). Having an understanding of the future of work is important in putting in place measures to smoothen the transition and to enhance the adaptation and mitigation actions. It is also important to plan for skill development and capacity building for workers and employers; to improve work environment and minimize occupational hazards. ILO provides that employers should identify potential risks and improve OSH by actively participating to design, implement and monitor policies and measures. This is paramount in implementing future OSH policy and practices, which are proactive in seeking to prevent new risks, rather than being reactive.



Figure 1. Responding to OSH challenges and opportunities of the future of work (Source: [3])

Climate change in real, and climate change is here. But we are yet to understand the gravity of its impact on our communities and industries. Health and safety of FM workers is identified as an area of interest as many FM workers are exposed to the natural elements in their work activities. Further detailed information on the impact of climate change on FM workers health and safety can be found in our recent research paper. <Lan, T., Goh, Y. M., Jensen, O., & Asmone, A. S. (2022). The impact of climate change on workplace safety and health hazard in facilities management: An in-depth review. Safety science, 151, 105745.>

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Greatest Architectural Wonders Of Ancient World

The centuries old constructions around the world symbolize the architectural brilliance of our ancestors. The tools and different materials used for the construction of such wonders of ancient world completely beyond our imaginations. It is very hard to believe that the wonders like great wall of China, Colosseum of Rome, Great Pyramid of Giza and Taj Mahal were constructed at a time with no technology. Followings are 10 architectural wonders of ancient world.

1. Great Wall of China



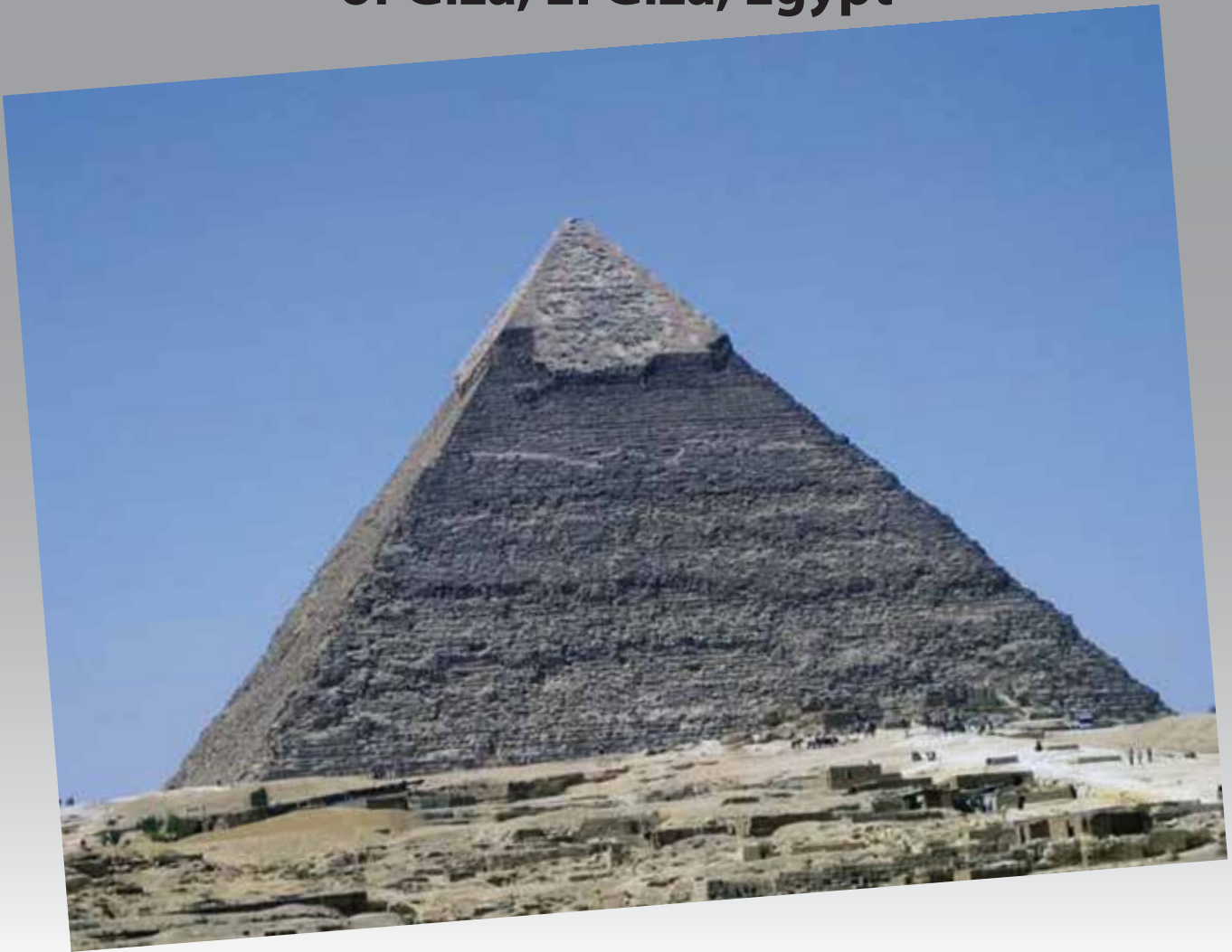
The longest man made structure ever built on the face of the world. It is a non-continuous structure originally built by emperor Qin Shi Huang to defend attack from ancient Yayun tribe. It was completed by different dynasties in different period of time. Considering the architectural significance and historical importance UNESCO recognized the great wall of China as a world heritage site in 1987.

The great wall of China was originally built between 220 and 206 B.C. Bricks, stones, tamped Earth and woods were the main materials used for the construction of the wall. Only a few section of original wall remains today. Later Liano, Jin, Yuan and Ming dynasties added defensive walls between 10th – 14th centuries.

Thousands of watch towers were also added to great wall by that time.

Today great wall stretches over 50000 kilometers in length. The height of wall ranges from 16 to 33 feet and has an average width of 15 feet. Great wall lost military operations at present stage and attracts millions of tourists from around the world.

2. Great Pyramid of Giza, El Giza, Egypt



Great pyramid of Giza is one of seven wonders of ancient world and also the largest pyramid in the world. It was built as a final resting place for Egyptian pharaoh Khufu. It is also considered as one of greatest achievement of ancient Egypt. Still there are only a few records about methods used by ancestors for quarrying, shaping, transporting and placing massive stone blocks for the constructions of great pyramid of Giza.

The pyramid of Khufu was constructed between 2560 B.C and 2540 B.C. At initial height of 146.5 metres it remained as tallest building in the world for next 3800 years. Great pyramid of Giza is the only Egyptian pyramid to have both ascending and descending passageways. Archaeologists believed that ancient Egyptian architects were used the knowledge about alignment of stars for planning and designing of great pyramid of Giza.

It is estimated that around 2.3 million stone blocks were used for it's constructions. The stone blocks were transported from nearby quarries via Nile river. It is believed to be the builders used to cut the enormous stone blocks by hammering with wooden wedges. They also used 500000 tonnes of mortar for the construction of pyramid. It is impossible to reproduce such strong mortar today.

3. Stonehenge, Salisbury, England

Stonehenge is a massive prehistoric stone monument located in Salisbury city of England. It is a circle of standing stones of different size. Archaeologists estimated that the monument was built before 4000-5000 years ago. Stonehenge also represent architectural brilliance of ancestor lived in the area at that time.

There is no written record about people behind the construction of stonehenge and exact purpose of it.

Ancestors mainly used two types of stones for the construction of stonehenge known as bluestones and sarsen stones.

The bluestones weigh more than 25 tons and sarsen stones weigh up to 4 tons.



All the massive stones for the construction of monuments imported from faraway places. But the method used by stonehenge builders for importing and placing the enormous stones still unclear. It took more than 1500 years for the construction of monument like stonehenge at that time.

Stonehenge is also aligned with midwinter Sunset and midsummer Sunset. There are many speculations on the reason behind the construction of Stonehenge, ranges from burial site to religious site to astronomical observatory.

4. Colosseum of Rome, Italy



Colosseum is the most impressive monument of Roman empire and finest example of Roman architecture. It is also the largest amphitheatre in the world. It was commissioned by emperor Vespasian in A.D 70 and completed in A.D 80 by his son Titus. The building has an elliptical structure and standing at 159 feet. Once it was used for staging fight between gladiators and wild animals. The colosseum remained in active for four centuries and abandoned in 5th century. The monument was also heavily damaged by earthquakes of 847 AD and 1231 AD.

Colosseum is originally built as a four storey building with 80 entrances and had capacity to hold 50000-80000 spectators.

It was decorated with marbles and contain hundreds of life size statues. Each floor of the amphitheater was dedicated for people of different classes, top floor for lower classes and lowest floor for important citizens. There is also an underground cage section for keeping the wild animals for the gladiatorial fights.

Most of interior section of Colosseum was made of wood.

The builders were used tiered arrangements for seating in the Colosseum. They also built box type seats for Roman emperors and other members of royal family. Today the surviving parts of Colosseum contain wall at the Northern side of the monument. The underground passageways that once used for transporting wild animals also opened for public.

5. Taj Mahal, Uttar Pradesh, India

Taj Mahal is the most important historical monument and outstanding example of Mughal architecture in India. Taj Mahal means 'Crown of palaces' in Arabic language and it is also considered as most iconic symbol of love. The marvelous marble mausoleum was commissioned by Mughal emperor Shah Jahan. The monument represents the combination of Mughal, Ottoman Turkish, Persian, Islamic and Indian architectural styles. In 1983 UNESCO recognized Taj Mahal as a world heritage site under the criteria of masterpiece of human designs.

The construction of Taj Mahal was started in 1632. It was designed by a group of three skilled architectures named Ustad Ahmad Lahauri, Makramat Khan and Abd ul-Karim Ma'mur Khan. Thousands of craftsmen, artists and painters employed for the construction. The domed mausoleum along with its huge garden was completed in 1653.



Sandstones, white marbles, jasper and jades were mainly used for the construction of monument. The white marble for Taj Mahal was imported from Makrana of Rajasthan. There are also 28 different types of precious and semi-precious stones were used for the decoration of the mausoleum. Many parts of the Taj Mahal were also inscribed with important verses from holy Quran. The paintings on the monument also represent different geometrical patterns.

The 35 meter tall dome is the most attractive feature of Taj Mahal, built using traditional Persian and Hindustani architectural styles. There are also four impressive minarets at each corners topped by small domes and equally divided by balconies. The large garden of Taj Mahal symbolize the concept of 'paradise garden' describe in mystic Islamic texts. The garden is filled with many beautiful flowering plants, trees and birds. It is also divided in to four main parts by marble canals.



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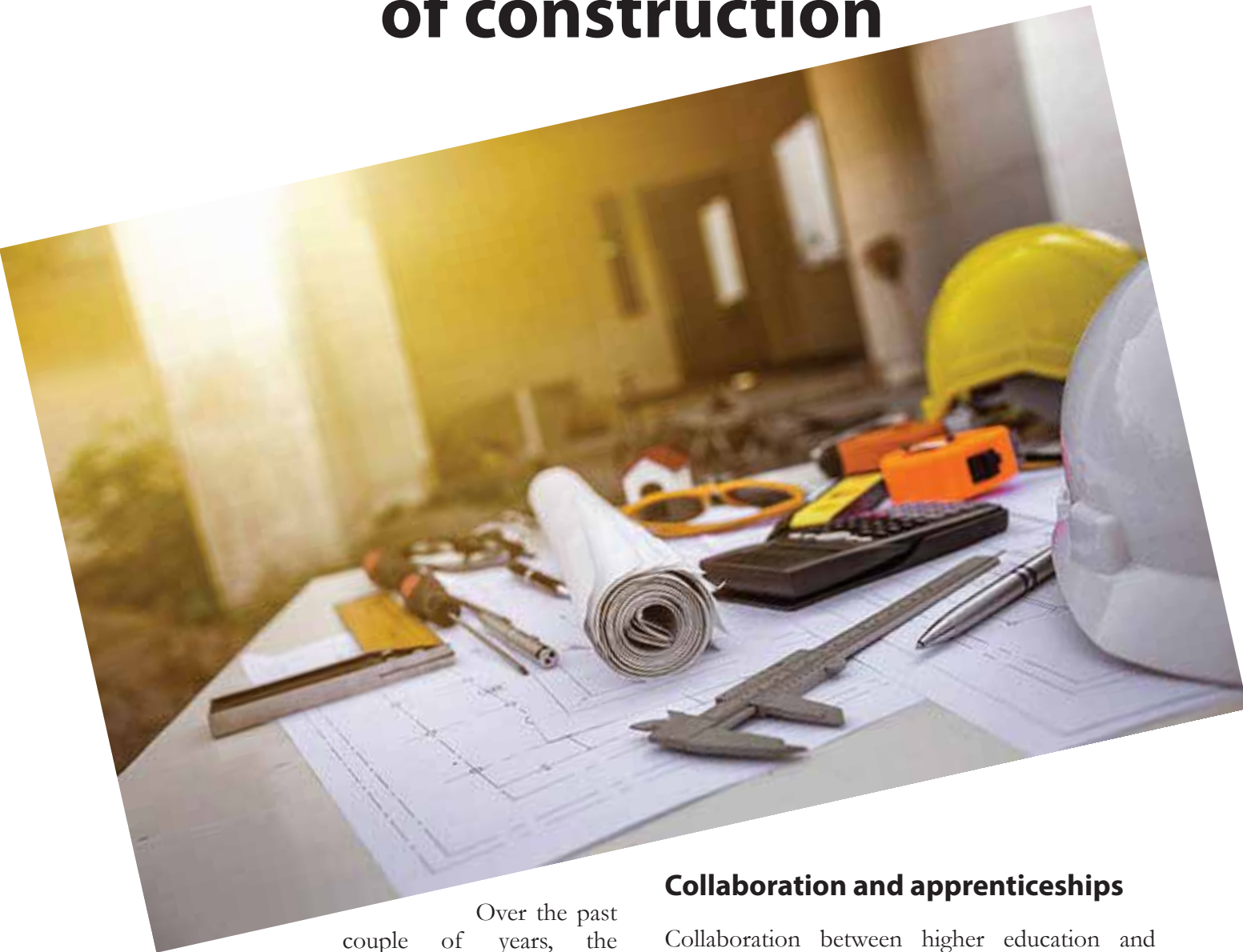
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EDUCATION

for the future of construction



Over the past couple of years, the construction sector has witnessed a growing shortage of skilled workers. But universities and colleges, businesses, organisations, and industry associations are increasingly getting involved with innovative programmes, including apprenticeships and ‘returnships’. These help attract, train, and retain construction sector workers, and offer those seeking to enter or return to the construction workforce a myriad of opportunities to gain valuable skills. As a result of the pandemic, online training in construction has also seen a tremendous increase, with learners receiving real-time online education via digital platforms or watching pre-recorded training material that can be accessed at any time.

Collaboration and apprenticeships

Collaboration between higher education and commercial businesses helps improve opportunities for hands-on learning through access to mentoring and apprenticeships. These collaborations play a vital part in providing young people with an interest in construction with valuable skills. Apprenticeships in plumbing and electrical or mechanical engineering, for instance, have been seeing an increase in popularity, and Lutger Deitmer, senior research fellow and lecturer at the University of Bremen in Germany, says: “Apprenticeships are not specifically just about learning a trade. It’s about becoming well-rounded and learning lots of different things while learning a trade.”

Returnships

A returnship is a professional-level, competitively-paid internship or apprenticeship designed to assist people who have not been part of the workforce for a number of years to successfully make their return. Returnships typically last three to six months and often offer a permanent role at the end of the programme. It's a relatively new concept with an innovative take on traditional apprenticeships.

Returnship programmes have already been implemented by companies like Microsoft, Amazon, Dell, and many others. They offer employees who have not been active in the industry for a while support and refresher training to help fill knowledge gaps and to introduce them to the latest job-related skills to facilitate successful re-entry into the workforce. Returnships are an exciting way to provide more opportunities for returners and are becoming an increasingly popular and integral part of many construction companies' talent strategies.

Augmented reality training

The future of the construction sector relies on the skills and capabilities of new employees who start their career journeys at educational facilities like colleges and universities. It goes without saying that it's critical to enter the construction workforce adequately equipped with the skills and knowledge to tackle the complex challenges of design and construction processes. During their education, however, students are not always exposed to such processes, which make it difficult to fully develop an understanding of the spatial and temporal constraints in construction processes. Educational facilities often attempt to remedy this lack of exposure by means of presentations or visits to construction sites.

Augmented reality technology, however, enables innovative new education methods and helps students, interns, and apprentices virtually inspect construction sites without the added time and travel expenses. Interactions via AR enable the practising of different approaches and alternative techniques and teach critical safety concepts without potentially dangerous real-life consequences. The interactive nature of AR also enables training that goes beyond the passivity of lectures from a book or the use of pre-recorded video content.

Construction equipment manufacturers use AR to train and assist maintenance and operations staff with servicing or repairing this equipment. This eliminates the need for printed instructions and manuals, which can lead to significant time and money savings and fewer errors.

Learning labs and research facilities

As universities and colleges across the world look for ways to reprioritise their investments, they may in the future decide to move away from building large educational facilities and instead focus on research and innovation and the construction of mixed-use learning labs. And while virtual learning options will certainly play an increasingly important role in the future, some professions and specialties – such as in the construction sector – rely heavily on hands-on learning and in-person training, which will make designing and building labs and research facilities a priority.

Roger Williams University in Rhode Island, USA, developed its SECCM Labs (School of Engineering, Computing and Construction Management) as a hub of experiential learning. Throughout its construction, the lab served as a real-life learning environment: the university professors integrated experiential learning opportunities into their curricula while the construction project partner provided real-world construction lessons. This enabled students to learn each step of the construction process hands on – from excavation to structural engineering – and directly from industry professionals.

Future leadership in construction

Oftentimes, existing leaders within the construction industry are the initial companies' founders. This can mean they tend to want to continue doing things the way they've always done them. This 'founders effect' can prevent these established leaders from seeing the bigger picture and inhibits their willingness to change with the times – which is needed for strategic planning and growth.

Servant leadership

The construction sector is changing rapidly, and organisations in this industry – and many other sectors, for that matter – need 'servant leaders' who challenge the status quo, are willing and able

to leave the old 20th-century management style behind, and inspire and facilitate change. Servant leaders are open to being mentored and inspired by younger team members, are transformational thinkers, provide space and opportunity for growth, and offer an environment in which the construction firm can be taken to the next level and achieve optimal performance.

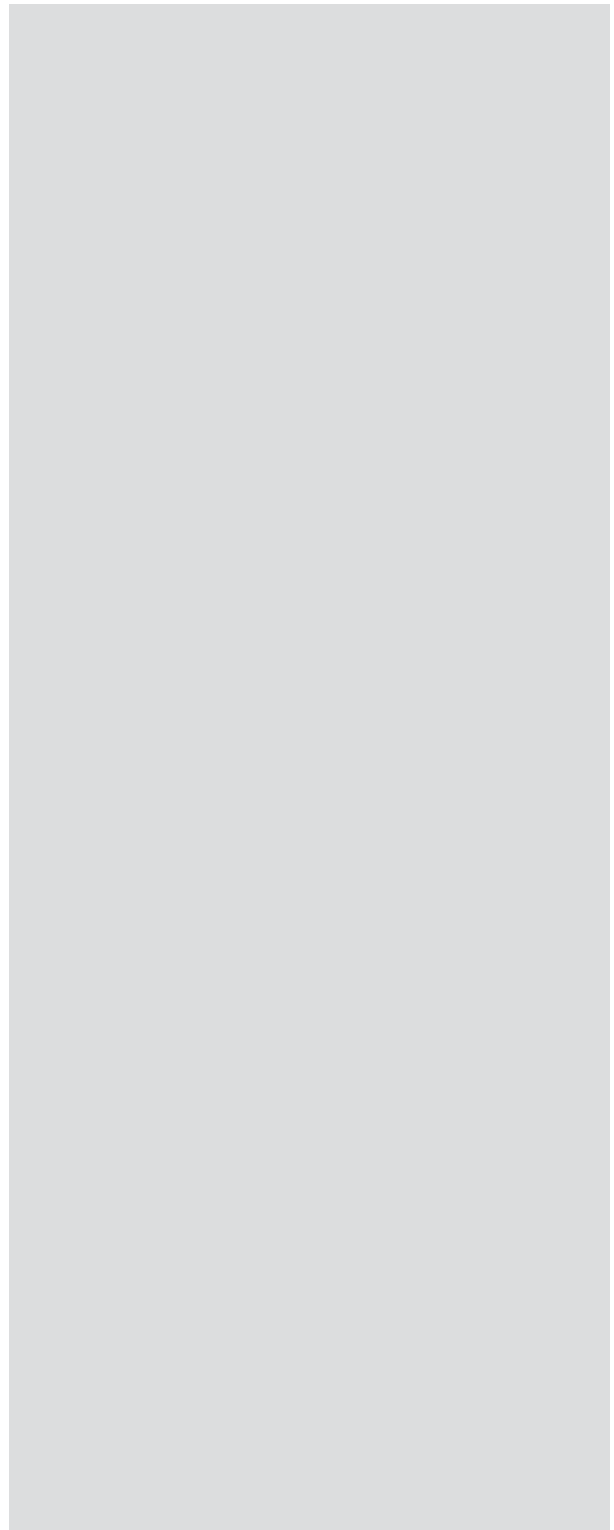
Compelling vision

By creating a compelling vision of the future, leaders in the construction sector can achieve things that were previously considered impossible. It enables them to develop clear, meaningful strategies, attract top talent, and take their organisations to a promising future. Through their words and actions, great leaders often already live and breathe their vision, and this is a great way to inspire others to commit, persist, and give their best. To keep morale among team members high and get the most out of employees in this increasingly competitive environment, leaders in the construction sector need to possess solid collaboration skills and inspire with passion.

Collaborative leadership

They need to recognise the importance of building interpersonal and cross-functional relationships based on communication and trust. Collaborative leadership entails leading horizontal teams in which each member is embraced and feels that they play an integral part in reaching the company's goals. An inspirational leader will remind others of the silver lining, even when times are tough, lead by listening and asking questions, and invest in their workers through training, effective communication, and showing recognition. According to Richard Branson, "the ability to inspire is the single most important leadership skill, and the ability to infuse energy, passion, commitment, and connection to an organisation's mission and direction is essential in any growing company."

Courtesy: richardvanhooijdonk.com



Innovative Construction Materials

Innovation in Construction is also supported by Innovative Construction Materials besides the technologies and trends.

New construction materials and technology helps in improving the efficiency of the construction process.

In this article, we will discuss the latest innovations in civil engineering materials

1. Translucent Concrete

The concrete structure is known more for its stability than its great lighting. That was until translucent concrete started to make its way onto the market. This best innovation in construction materials for decorating purposes.

Translucent concrete is manufactured by using glass fiber optical strands, which create a solid but sheer block. Transparent concrete can be used in flooring and pavement.



From Research and testing transparent concrete, it is clear that the optical fibers make up only 4 percent of the mixture. So it shows that concrete blocks made from this material still have the ability to support load-bearing walls.

2. SensiTile

Think about if you walk across your kitchen floor to get something from the refrigerator, the floor twinkles with a lighted path that guides your way through the darkroom, this is now possible if you had SensiTiles.



In this type of tiles, concrete acrylic fiber-optic channels that transfer light from one point to another are embedded in it. As a person moves across Terrazzo's surface, the light channels flicker with a randomized, twinkling effect. Tiles are available for use as flooring, in bathrooms, and even ceilings, so you can have twinkling lights follow you all over the house.

3. Electrified Wood

Now you may never have to deal with the Bunch of wires that you need to handle while lighting for home decoration purposes. The Wood European manufacturing company has material that can incorporate a source of electricity directly into tables and chairs. In that system they inserted two metal layers are pressed between the wood of the furniture, making it possible to pass an electrical current through the whole thing.



The power is supplied by 12-volt power is fed to the metal layers via one connector, and lamps and other devices can be connected via the other. But there is a doubt that if this furniture will work with all electrical outlets, but we're for any piece of furniture that means we don't have to find a way to tie all our wires together.

4. Flexicomb

This material name Flexicomb describes itself quite well. The material was designed by PadLab's Dan Gottlieb while he was still an undergraduate at the Yale School of Architecture. This material is made up of a flexible honeycomb matrix, which can be used to build lighting fixtures, furniture, and sculptural installations.



The Flexicomb material is made from thousands of closely packed polypropylene tubes that will bend in the convex direction while remaining rigid in the concave one. Flexicomb can be used for almost any imaginable purpose. This is a game-changing innovation in construction materials.

5. RichLite

A Countertop like wood made of paper might not sound too strong, but a Richlite counter material is almost indistinguishable from one made of wood.



The material is made with 70% of recycled paper. This countertop material is made by treating paper with resin and then baking it to create solid sheets.

This material was first used in the aerospace, boating, and sports industries as reinforcement for surfaces like fiberglass, but now is available for architectural purposes as well.

6. Self-Healing Cement

It is important Innovative Construction Materials. Lots of research have been done to replace concrete, but cement is itself still evolving. A newly invented self-healing cement is currently being developed which has the ability to repair its own cracks.



This cement is manufactured by mixed with microcapsules that release a glue-like epoxy resin that will automatically repair any cracks that form in the sidewalk or roadway.

It is a material that can absorb or release large amounts of heat have also been included in the ingredients. This material can save energy by developing buildings that can control their own temperature, and save money on repairs.

7. Carbon Fiber

Carbon fiber is a material that is extremely strong and light-weighted. The carbon fiber material is 5 times as strong as steel, two times as stiff, yet weighs about two-thirds less.



These fibers are made up of carbon strands that are thinner than human hair. The carbon strands can be woven together, like cloth, and then that can be molded to any shape you might want.

In addition, carbon fibers are strong as well as flexible, so it's the perfect material for construction projects in areas that are exposed to hurricanes and tornados.

8. Liquid Granite

It is important Innovative Construction Materials. According to its inventor, liquid granite has the ability to completely replace cement in concrete.

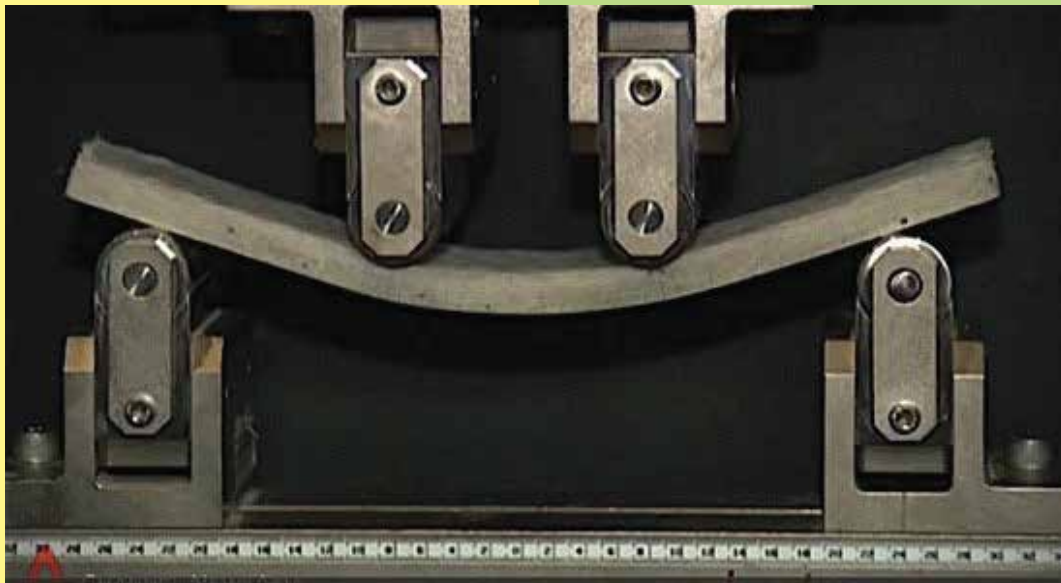
Liquid Granite is made up of between 30 and 70 percent recycled material and uses less than one-third of the cement used in precast concrete. So it can greatly reduce carbon footprint and liquid granite is also fire resistant.



It can handle temperatures of up to 1,100 degrees Celsius while still maintaining its structural properties. It does not explode in high temperatures like concrete.

9. Bendable Concrete

Normally concrete is a very brittle material; any buckling or bending will cause it to crack. This problem of concrete can be removed by new fiber-reinforced bendable concrete might just be putting an end to that issue.



The new fiber-reinforced bendable concrete is around 500 times more resistant to cracking than regular concrete thanks to the tiny fibers, which account for two percent of its makeup. There are new construction materials in civil engineering.

The fibers inside the concrete slide within the concrete when bending occurs, providing it with enough stretch to prevent breakage. In addition, this concrete has a much longer life expectancy, which means it will cost less in the long run too. it is important Innovative Construction Materials.

10. Concrete Canvas

It is a flexible cement impregnated fabric that hardens on hydration to form a thin, durable waterproof, and fireproof concrete layer. In this type of concrete, it is just required to Add Water on a roll.



Concrete Canvas (CC) is available in man-portable rolls for applications with limited access or where heavy plant equipment is not available.

Once hydrated, CC remains workable for 2 hours and hardens to 80% strength within 24 hours. Rapid, Flexible, Strong, Durable, Water Proof, Fire Proof, CO2 Savings, Low Wash Out, Environment Approval (UK).

11. Low-E Glass / Films

Low-E glass is window glass that has invisible metal or metallic oxide invisible coating, creating a surface that reflects heat while allowing light to pass through.



This type of glass is proven to reduce energy consumption, decrease fading of fabrics, such as window treatments, and increase overall comfort in your home.

12. Transparent Aluminum

Transparent Aluminum has extremely-durable crystalline material with excellent optical transparency.



It is important Innovative Construction Materials. It has clarity.

The total absence of birefringence Outstanding hardness and high strength. Available in a wide variety of sizes, shapes thicknesses. Produced using proven ceramic forming process. Cost-effective advanced material.

It can be applicable to a wide variety of industries including aerospace, security, defense and semiconductor, energy and consumer products.

Courtesy: Civiconcepts

South Korea floating city



South Korea will start building a floating city for 12,000 residents in 2023

- The world's first prototype floating city that adapts to sea level rise has just been unveiled at UN headquarters in New York
- OCEANIX Busan, in South Korea, aims to provide breakthrough technology for coastal cities facing land shortages and the threat of climate change.
- When built, the three interconnected platforms, totaling 15.5 acres, will provide homes for a community of 12,000 people.
- It's one of many solutions being found to the growing issue of rising sea levels.

Housing the growing global population is one of the key challenges facing policymakers today - and one made even more challenging by climate change.

Without curbing emissions, it's predicted more than 800 million people, living in 570 cities around the world, could be at risk from sea level rise by 2050, according to the C40 network of global cities addressing climate change.





The network estimates the cost of rising sea levels and inland flooding could reach \$1 trillion by mid-century.

But it's hoped that this sustainable floating city prototype could go some way to solving the problem of providing safe homes for vulnerable coastal communities.

'Solutions to global challenges'

OCEANIX Busan, based in the waters off South Korea's second-largest city, was recently unveiled at the UN headquarters in New York. It's a collaboration between UN-Habitat, the Busan Metropolitan City, and OCEANIX, a blue tech company based in New York.

"We cannot solve today's problems with yesterday's tools. We need to innovate solutions to global challenges. But in this drive for innovation, let's be inclusive and equitable and ensure we leave no one and no place behind," Executive Director of UN-Habitat, Maimunah Mohd Sharif said at the launch.

The floating city is designed as three interconnected platforms, totaling 15.5 acres, that will initially provide homes for a community of 12,000 people, potentially rising to 100,000, with construction due to start in 2023.

Each of the platforms has a specific purpose - living, research, and lodging - while the link-span bridges that connect them to the land create a sheltered lagoon, providing space for recreation on the water.

Floating city design has sustainability built in

Another key element of the design is sustainability. The OCEANIX Busan has six integrated systems focusing on energy, food, water, waste, mobility and coastal habitat regeneration to ensure the floating city reuses and wastes as little as possible.

Floating and rooftop photovoltaic panels will generate 100% of the operational energy needed for the city.

Each neighbourhood will treat and replenish its own water, reduce and recycle resources, and have urban farm areas to grow food.

Floating into the future

Busan is not the only floating city project being developed. In September 2021, King Willem-Alexander of the Netherlands officially opened the carbon-neutral Floating Office Rotterdam in the Dutch port, which is able to move as water levels rise.

Construction is also due to start this year on Maldives Floating City. The archipelago in the Indian Ocean is one of the most climate-vulnerable nations - with more than 80% of its land area at less than one metre above sea level.

Floating cities and offices are just one solution to the impacts of climate change on coastal communities, but many more challenges face the ocean, and urgent action is needed to address them.

Courtesy : World Economic Forum



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Construction Safety Statistics for 2022

Despite advances in construction safety equipment, technology and training, the construction industry continues to face high rates of fatal and nonfatal injuries and accidents among its workers. For example, roughly 20% of worker deaths in the United States are in construction, but construction workers make up only 6% of the U.S. labor force. This disparity emphasizes the need for a continued push to improve safety on the job for those working in the construction industry.

To highlight the importance of construction site safety, we've compiled 25 construction safety statistics that offer a clear picture of the state of the industry in 2022.

1. Fatal Construction Injuries
2. Non-Fatal Construction Injuries
3. Cost of Construction Injuries
4. Safety Training Statistics

Click on one of the links above to jump to a specific section, or read on to see all 25 statistics.

Fatal Construction Industry Statistics

1. 1 in 5 deaths among U.S. workers is in the construction industry.
2. Of the 42 annual crane-related deaths, around 60% involve a falling object.
3. A total of 1,008 construction workers died on the job in 2020.
4. Each year, 10.2 of every 100,000 construction workers suffer a fatal injury, which is the third highest rate of any industry.
5. Falls account for 34% of all construction deaths – eliminating falls in construction would save more than 300 lives every year.

**CONSTRUCTION'S
“FATAL FOUR”**



The infographic is divided into four quadrants, each illustrating a different type of fatal construction accident. Each quadrant features a stylized illustration of a worker in an orange shirt and dark pants, with a white starburst effect indicating the point of impact or the nature of the accident. The quadrants are labeled as follows:

- Falls:** A worker is shown falling backwards off a ledge.
- Struck by an object:** A worker is being struck in the back of the head by a large blue object, possibly a pipe or beam.
- Electrocutions:** A worker is reaching out to touch a blue electrical panel or wire.
- Caught in or in between an object:** A worker is being crushed between two large blue structural beams.

**Together, these account for over 60%
of all construction-related deaths.**

Source: OSHA

6. The “Fatal Four” leading causes of construction deaths (falls, struck by equipment, caught in between objects and electrocutions) account for over 60% of all construction-related deaths.

Non-Fatal Construction Injuries

7. Each year, 1.1% of construction workers suffer an injury serious enough that they miss work.
8. The construction industry accounts for 6% of all injuries that result in lost days of work.
9. Injury and illness rates in construction were 24% higher than they were across all industries on average in 2020.
10. More than 25% of construction workers indicate that they have failed to report a work-related injury.
11. In 2020, there were 174,100 cases of injuries in the construction sector.

Construction workers ages 25-34 are most likely to sustain an injury on the job.



12. Construction workers ages 25-34 were most likely to sustain an injury on the job.

Cost of Construction Injuries

13. Fatal construction injuries are estimated to cost the United States \$5 billion each year in health care, lost income, reduced quality of life for family members and lost production.
14. Total workplace injury costs exceed \$170 billion each year.
15. Workers' compensation claims for nonfatal falls account for \$2.5 billion annually.

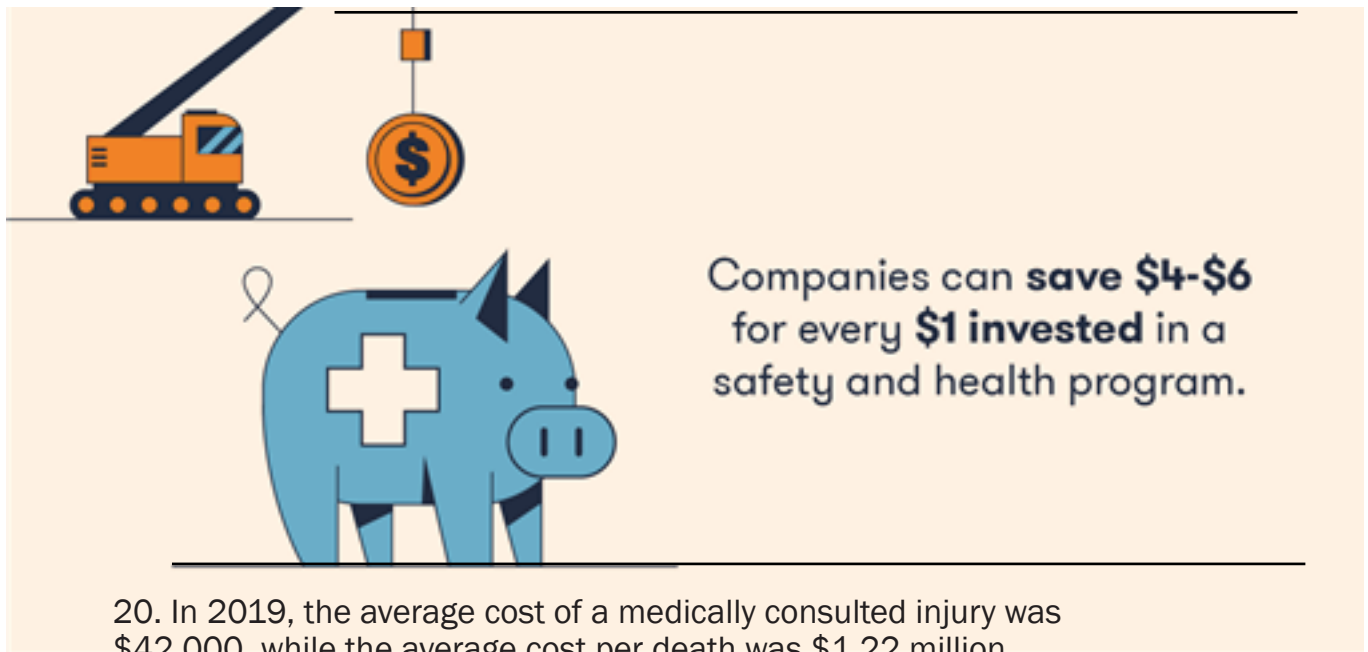


More than 130,000 construction workers missed days of work due to injury in 2020.

16. More than 130,000 construction workers missed days of work due to illness or injuries in 2020, decreasing productivity.
17. Occupational Safety and Health Administration (OSHA) penalties can cost anywhere from \$13,653 to \$136,532 for safety violations.
18. One of the highest proposed fines for safety violations in 2021 was \$1.2 million levied against Allways Roofing in Washington.

Safety Training Statistics

19. OSHA estimates that construction companies save \$4 to \$6 for every \$1 invested in safety programs.



20. In 2019, the average cost of a medically consulted injury was \$42,000, while the average cost per death was \$1.22 million.
21. On average, construction companies spend 3.6% of their budgets on injuries, but only 2.6% on safety training.
22. 67% of construction workers feel that standards are higher for productivity than for safety.
23. 55% of workers believe they need more safety training, and 25% worry about being injured every day.
24. OSHA safety certifications take between 10 and 30 hours to complete and cost between \$60 and \$180.
25. Over 60% of construction accidents occur within an employee's first year of work, highlighting the need for proactive, high-quality training.

The State of Construction Safety in 2022

Construction safety continues to evolve, and improvements in equipment and wearable technology are helping push the industry forward. Still, a renewed commitment to safety and training is essential in 2022, given the number of preventable injuries and deaths in the industry each year.

Doubling down on safety requires investment in proper education for workers. For example, techniques like three points of contact help reduce falls, which are the leading cause of death and injury among construction workers. Meanwhile, a proper understanding of equipment like aerial lifts or cranes is vital to avoid accidents involving falling objects or collisions. Finally, improvement in communication — whether it's an overarching safety plan or specialized communication like hand signals — has a measurable effect on safety.

Over the past two years, the focus on protective equipment skyrocketed due to the pandemic. Early research suggested that construction workers were five times more likely than the general public to contract COVID-19, and new variants have added to that risk as workers provide an essential service in building new structures. As with all other dangers construction workers face, the proper response involves continued awareness, training, regulation and equipment.

Putting safety first is key in helping to reduce the high rate of injuries in the construction industry, and companies who put safety first save money over time. Everyone benefits from fostering a culture of safety on the construction site, so don't delay in reviewing your safety protocols now.

Courtesy : BigRentz, Inc.

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MEDIATION

in Construction

Mediation is a consensual process off dispute resolution in which a third party mediator, appointed by the parties to the dispute, assists in the negotiated resolution of the dispute.

Facilitative mediation

Facilitative mediation involves a neutral third party (the mediator) whose primary role is to assist the parties in reaching a negotiated solution. As a facilitator, the mediator manages the negotiation process, helping the parties overcome deadlocks and encouraging them to think creatively about solutions.

They help the parties to focus on their underlying interests and concerns and move away from fixed positions that often obscure the real issues. They assist in identifying common ground and act as a reality tester, encouraging the parties to reflect realistically upon their position and the consequences of failing to reach a negotiated solution.

Evaluative mediation

The mediator learns the facts of the case and each party's position. They then express a view on the overall merits as they see them. Conciliation, may be considered as a form of evaluative mediation in so far as, if a settlement is not reached with the conciliator acting in facilitative mode, then they issue a 'recommendation' setting out how, in their opinion, the matter should be resolved.

Settlement mediation

Also known as 'compromise mediation', this process aims to arrive at an eventual compromise at a 'central point' between the parties' original positions. The mediator's role is to determine the parties' 'bottom line' and to use their influence to foster re-consideration of priorities until compromise is achieved.

Therapeutic / Transformative mediation

Therapeutic, or transformative, mediation focuses on the underlying causes of the parties' dispute with the final settlement being enhanced by an improved relationship. The mediator works to encourage the parties to vent their feelings and emotions in order to learn from one another, and hopefully repair their relationship as opposed to just arriving at a 'quick fix' compromise solution.

Primarily, this approach is taken in family/social disputes but can also be beneficial in a construction situation, as it offers a real resolution to the dispute where a continual healthy relationship between the parties is a priority (where there is a Joint Venture Agreement between them for instance).

Other techniques

The range of procedures provided by leading mediation organisations, includes:

- Assisted negotiation and independent chairing.
- Coaching.
- Early neutral evaluation.
- Expert determination.
- Independent intervention.
- Independent investigation and review.

Mediations have no rigid procedure but a typical one might proceed along the following lines:

The first step is for a mediator to be chosen, either by agreement between the parties, or by selection by an organisation such as CEDR or CI Arb. A proposed mediator should not accept an appointment unless all parties have agreed to the appointment.

A date, time and venue for the mediation meeting will be fixed. Commonly the venue will comprise a large room capable of accommodating all the participants, which is used for joint sessions, and a separate room for each of the parties involved in the mediation.

At a set time (usually two to three weeks) before the date fixed for the mediation meeting, the parties simultaneously produce written statements, together with any documents which they wish the mediator to see, and serve these on the other party or parties and the mediator. There is commonly a limit on the length of the written submissions and the numbers of documents.

On the appointed day for the mediation meeting, the mediator will meet all the parties in an initial joint session at which each will present a brief oral

summary of their case, possibly through their legal advisers. A limit on the time allowed for each party is common.

Each party will then retire to their separate rooms and the mediator will talk to each party in turn, either by visiting them in their separate rooms or by calling them into the main room. Such private meetings are known as 'caucuses' in the jargon of ADR practitioners. Everything that takes place in the caucuses is private and confidential and their purpose is to enable the mediator to establish his understanding of the possibilities for reaching agreement and the approach most likely to encourage settlement.

The mediator will then shuttle between the various parties as required in an effort to find a settlement to the dispute. Nothing disclosed to the mediator in confidence in the caucuses will be disclosed to any other party without the express permission of the party disclosing the information. Private meetings between the mediator and only some of the parties may take place.

Working with the parties, the mediator will examine the issues arising in the dispute. The mediator does not take sides but they may challenge a position being adopted by one or other party. The mediator may suggest looking at the dispute from a different angle. They may test out possible ways of resolving the dispute. In short, they will examine the dispute and work with the parties to find an acceptable solution.

During the various joint and private sessions, the mediator will be using the conventional negotiating techniques such as:

1. separating the people from the problem – being easy on the people and hard on the problem;
2. getting behind the position to find the interest;
3. encouraging a constructive problem-solving approach rather than dwelling on past quarrels and arguments.

The mediator may decide at any time to bring the parties together in joint session to report progress and seek mutually agreeable ways forward.

When and if the mediator reaches the position at which a settlement has been achieved, they will bring the parties together in joint session for a final time and will work with the parties to reduce the settlement to writing by means of a binding legal agreement and/or a consent order.

If no settlement can be reached at the meeting, but some progress has been made, it is still open to the parties to adjourn to another time and place. The evidence is that even when no settlement is reached at the meeting itself,

the parties will often reach an agreement shortly afterwards as a consequence of the discussions and progress made at the meeting.

The process is voluntary, confidential, non-binding and without prejudice to the parties' legal positions. The fact that legal action is underway does not prevent mediation although the cost benefits of achieving settlement through mediation are obviously greater the earlier mediation is employed to resolve the dispute.

Mediation is now very much a core procedure in construction contracts and, whilst it must of necessity remain consensual, the courts will enforce mediation clauses in contracts. The courts cannot insist that the parties reach an agreement, however they will order parties to engage in the mediation process if there is a contractual obligation and can stay legal proceedings pending mediation. An unreasonable refusal to mediate may prejudice the right of a successful litigant to an award of legal costs.

Mediation has strong public policy support from the UK Government, public authorities and the private sector.

Courtesy: Construction Wiki





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6. Petra, Southern Jordan

Petra in Southern Jordan is one of the most famous archaeological site in the world. The rock-cut city was the capital city of ancient Nabataeans (between C.E 37-c.100). Petra is also known as 'Rose city' because of red-rose sandstone of mountain out of which the city was carved. The word 'Petra' means rock in Greek language. Petra is also a unique example of rock-cut architecture and it attract tourists from all over the world.



Nabataeans built houses, temples, tombs and altars on sandstone cliffs of Petras 2000 years ago. The city served as a caravan for ancient traders who travelled between Mediterranean and Africa. Petra remained hidden from outer world until 1812 and rediscovered by Swiss explorer Johann Ludwig Burckhardt.

There are 800 monuments in Petra and most of them represent the fusion of Nabataeans rock-cut and Hellenistic architectural styles. The 'king' wall' is one of focal section at Petra city. It contain three large royal tombs on the mountain face. All the tombs are highly decorated and have inscriptions.

Khazneh el Faroun is another finest construction on the rock of the mountain. It is also known as 'Treasury of Pharaoh' which is adorned with great architectural elements such as sculptures and columns. There are also important relics from the Roman rule in the city.

7. Borobudur, Central Java, Indonesia

Borobudur is the largest Buddhist temple and a world heritage site situated in Central Java in Indonesia. The impressive archaeological marvel was built 400 years before the construction of great Angkor Wat (largest religious monument in the world) in Cambodia. Borobudur is a three-tier temple that covers an area of 1900 square meters. The monument has a pyramidal base, a cone structure at the center and a stupa at the top level. The temple also houses 504 Buddha statues and 72 open work stupas. In 1991 UNESCO recognized Borobudur as a world heritage site.

According to the inscriptions Borobudur temple was built between 8th and 9th centuries. But until now there is no data about the builders of the great architectural wonder. The temple remained hidden from the outer world for centuries and rediscovered back in 1814.

Archaeologists estimated that 55000 cubic meters of andesite rocks for the construction of the temple. Knobs and woodworking joinery were used by the builders for joint together the massive stones. The three levels of the temple represent three main areas of Buddhist cosmology called kamadhatu, rupadhatu and arupadhatu.

The Buddha statues found on different sections of temple also express six different types of mudras. There is also a giant puzzle made of two million volcanic stones. Another important architectural attraction of Borobudur temple is its water gutters. In fact the temple has 100 water gutters in total, made in the shape of elephant headed fish known as 'makara'.



8. Saksaywaman, Cusco, Northern Peru

Saksaywaman is a walled Inca fortress located in Cusco city in Northern Peru. The complex is one of the most important archaeological site in the country. The large monumental complex is located at an attitude of 3701 meter and covers thousands of hectares of land. It is three level complexes made of large stones. The size and shape of stones used for the construction also varies at different sections of the site and biggest stones weigh more than 200 tons.



The large complex was built by Inca empire (between 1438 and 1533). The Inca architects rough-cut the large stones and fit together perfectly without using the mortar. The large rocks were imported from miles away places using only man power. The method used by Incas for match the stones are still a mystery. They also used stones of variety of shapes for the construction of the complex. It helped many parts of Saksaywaman to remain intact.

9. Leshan Giant Buddha, Sichuan Province, China



Leshan giant Buddha is the largest carved stone Buddha statue in the world. It is carved on cliff face of mountain in Sichuan province of China, site at which Minjiang, Dadu and Qingyi rivers meet. It is the most important attraction of Leshan city and faces sacred mount Emei.

The 71 meter Buddha statue's shoulder is 24 meter wide and has 27 feet fingers.

The construction of the great Buddha statue started in 713 by Tang dynasty and took long 90 years for it's completion. It was commissioned by a Chinese monk named Haitong. The monk hoped that lord Buddha would protect the site from turbulent water of confluence of three rivers.

The head of the Buddha statue is decorated with 1021 buns. It is one of the most highlighting architectural features of the statue. The hidden drainage system of the Leshan Buddha statue also represents the architectural brilliance of builders of that time. The hidden channels of drainage system go through head, cloths, arms and behind of ears of the statue. It plays an important role in keeping the Buddha statue from easy degradation.

10. Pont Du Gard, Remoulins, Southern France

Pont Du Gard is a 50 kilometer long ancient Roman aqueduct bridge (waterhouses used by Romans) across Gardon river in Remoulins commune of Southern France. The bridge is a true masterpiece of ancient Roman architecture.

It was built in the half of first century A.D to transport water from Uzès commune to Roman province of Nîmes. It is one of the best preserved monuments of ancient Roman architecture and a world heritage site in France.

Pont Du Gard is a three storey aqueduct bridge standing 50 meter high and longest level measuring 275 meters in length.

The number of arches and span change from lower level to upper level. The bridge was constructed out of 50400 tons of limestone without using mortar. The blocks were precisely cut by the builders so that they fit closely together.

Historians also found numbering on the blocks of bridge, used by builders for scaffolding. The walls of bridge also inscribed with messages and instructions by the builders. Today the bridge is a pride of France and globally popular for it's historical importance.



Courtesy : themysteriousworld

Why is Project Management not enough?

RICHARD BROTHERTON



*Do you feel like you lack an overview of your construction company?
Do you put all your efforts into improving your project management, but you
still fail to obtain the expected level of company efficiency and profitability?*

**What if I tell you that Project Management is not enough to
manage your company successfully?**

We live in the **4th industrial revolution**, where technology is advancing faster than ever. Consequently, risks, unpredictabilities and opportunities are emerging much quicker too. In such a reality, focusing only on your project management feels like an outdated strategy.

But actually, why?

And what can you do instead? Let me show you!

The Situation within Your Projects

Think about your project management. Probably, your main objectives are **fulfilling projects on time and within budget with the required quality**. Of course, every company is different, but when it comes to a project management approach, we can distinguish the following steps:

1. **After receiving a project, you start planning and scheduling its delivery.**
2. **You distribute tasks and set respective deadlines between your team members.**
3. **During the execution, you control project progress, its financial health and the specific aspects of delivery.**
4. **You finish the project, store the needed documentation and analyse what could be improved next time.**

Sounds familiar, doesn't it? Well, such a way of managing a construction company is common and has undoubtedly many benefits. You can focus on your project, assure better control over execution and deliver outstanding work to your clients. However, you are missing something important along the way.

Meanwhile in Your Company

Let's look at the bigger picture. Your company manages different processes, always trying to ensure timely and quality delivery within the set budget. To do that, you treat your projects separately with distinct team members, equipment and activities. Everything is good until some risk occurs to one of your projects.

It happened. A risk occurred. The situation in one of your crucial projects changed and now, it is time to react fast to avoid exceeding your budget or delivery date too much.

- You could move some of your employees between projects, but it is hard to quickly check their current occupancy without an overall view of your employees' schedules.
- You can assign more equipment, but it is tough to instantly have information from different projects about the available time to use the machines.
- After all, if you do not want to make significant changes in other projects, you can hire an outsourcing company. However, it might be hard to predict which option is more beneficial for your budget without a proper financial view of the whole company.

Well, you must admit that without treating your company's assets as a whole and without a proper business approach, dealing with a construction project's challenges might seem more like fortune-telling than appropriate risk management.

What Can You Do to Manage Your Company Better?

To understand your company's needs, apart from focusing on your project delivery, you need to look at it as a whole. **Your company management should consist of both: project and business approaches.**

Thanks to the joined perspective, you can better respond to your company's needs and challenges. For example, imagine having all the data from your projects (presented in an easy-to-comprehend way). It is much easier to check which processes need more attention or additional employees/equipment. As a result, thanks to introducing business management, you can deliver your projects even better!

To sum up, let me present you with tips for successful project and business management

1. **Include in your company's management both project and business aspects.**
2. **Do not treat your projects like entirely separate processes.**
3. **Try to set the golden thread for your company so that information can fly fast between departments.**
4. **Manage your assets (labour, money, equipment) more flexibly according to current needs.**
5. **Apart from monitoring specific projects, assure a full view over the company's processes, profitability and financial stability.**

Invest in a Professional Support

Assuring project delivery on time and within budget while at the same time, keeping control over the company's assets and monitoring financial stability is a challenge. However, you do not have to do it all by yourself! As I mentioned before, we live in a world of technology, so it is a perfect opportunity to take advantage of it!

The solution that can help you manage it all is a construction management platform. If you follow construction management trends, you have probably already heard about solutions like a project management system or ERP. Well, a construction management platform is more than that!

Based on an example of our **Archdesk software**, the construction management platform connects project and business levels with streamlined information flow. As a result, you always know the up-to-date situation in the projects and within the whole company. Moreover, a modern construction management system has a modularity feature. It means that you do not receive an off-shelf solution, but just like the Lego pieces, the software's tools can be put together according to your company's processes and needs.

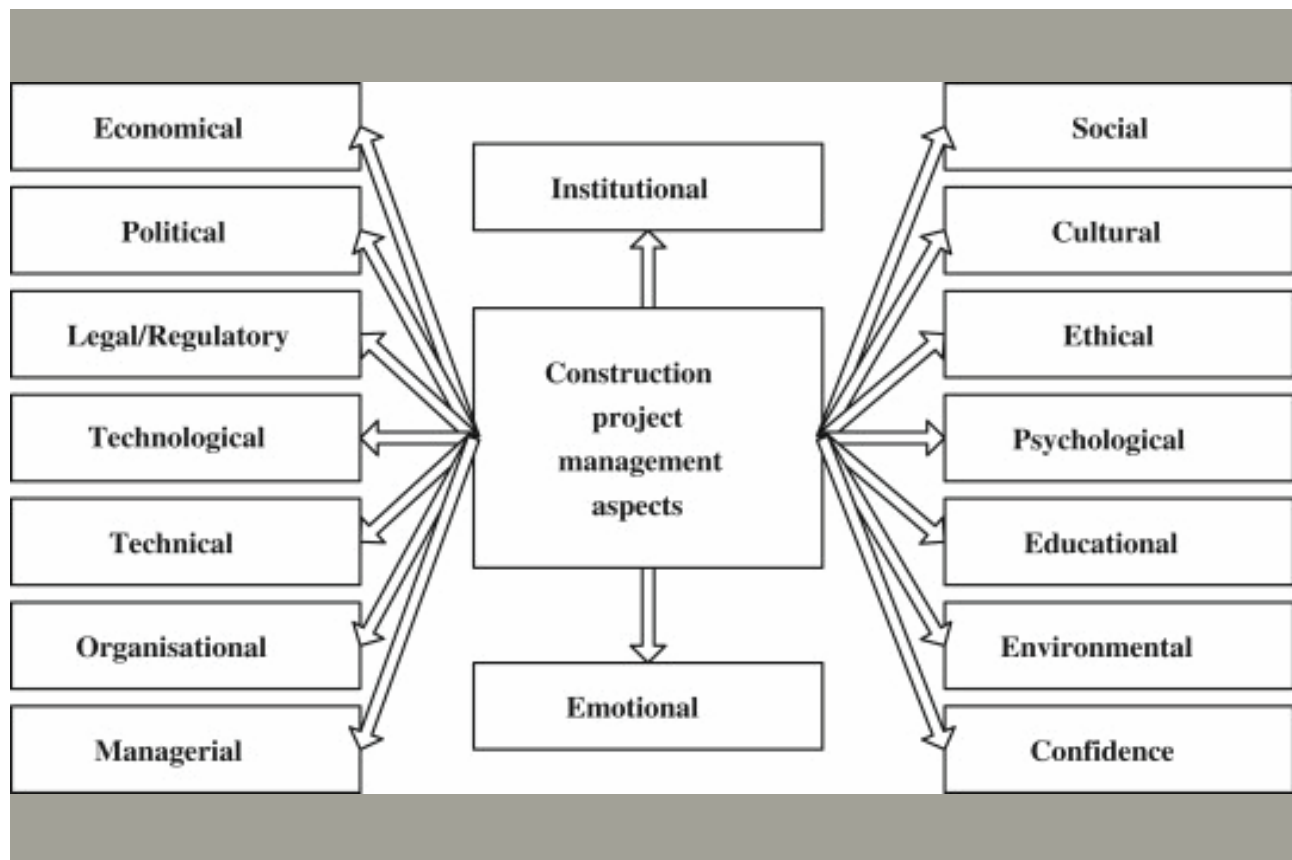
There are many benefits of including a business perspective.

You can:

- look at your company, see better which aspects still need more attention and support

- better manage your assets between projects, maximising the efficiency of used machines and reducing time and money
- react fast to any changes thanks to the streamlined information flow inside your company
- have a complete overview of your company's data available anytime without having to gather them from each project and calculate on your own

I could add many more points to the list of benefits, but it is better to experience them yourself! Schedule a call with us, and discover how your business can benefit from the joined project and business management with the use of modern digital tools!



Courtesy : ARCHDESK



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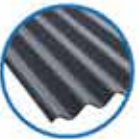
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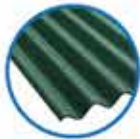
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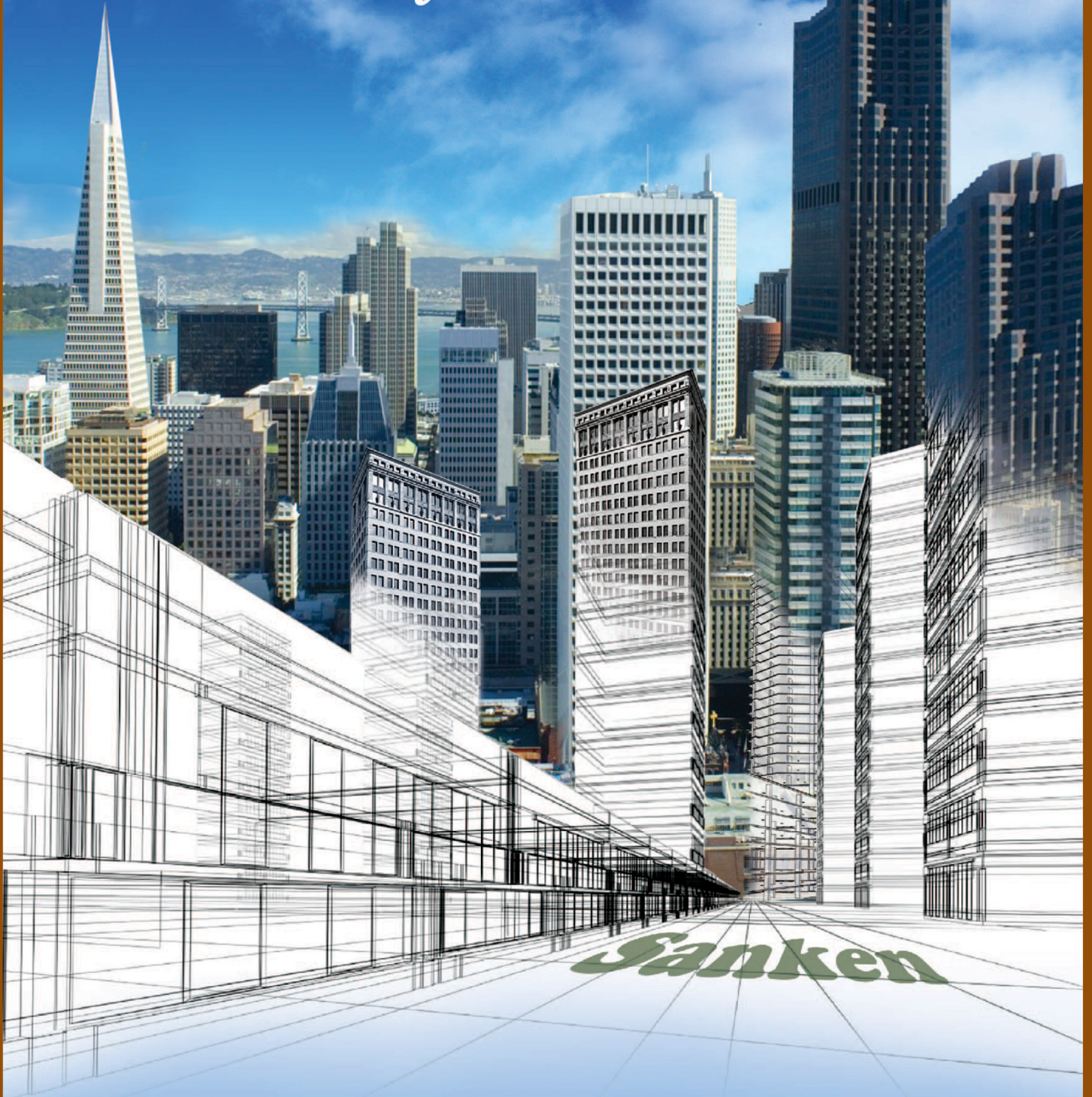


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