BUILDING SERVICES DESIGN CONSULTANTS LIMITED

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What the Future Holds Series:

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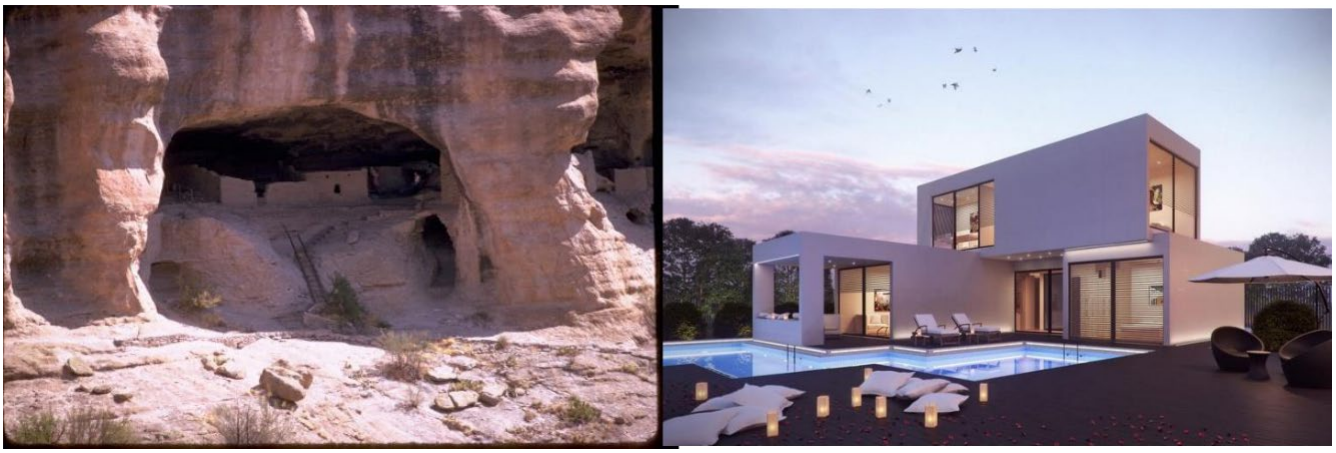
Emerging Technologies: The future of Building Services Engineers

Buildings have evolved greatly, from being located carefully under rocks, hewn out of tree trunks or soft rocks with primitive tools, established in water-carved caves, bound together with natural ropes on tree trunks, put together with skin and sticks as tents, made of woods to where we are today! Jaw-dropping multi-level edifices!

According to history, human buildings have always reflected what is available to be built within habitat space namely material, and knowledge (technology) powered by the immediate needs of the builders. These needs range from safety (keeping away wildlife and potential competitors) to having personal space to raise a family. The services therein have presumably followed the same trends, from simple clay pots to keep water cold, light stone doors to keep wild animals away to actual wood doors, and windows hewed out of walls for good ventilation.

Buildings and their services have since lost all tincture of their rather very humble beginning; they now represent a mixture of high-end art, architectural, science, and engineering marvels carefully concocted to satisfy a range of desires very outside the pedestrian need for shelter or security. These extra necessary desires tend to allow professionals in the fields to test their mettle to display competence on a transnational sized stage. Building has also become a methodology of satisfaction for social wanderlust for owners, a measure of professional brilliance for building professionals, and a measure of prosperity for governments.



At the heart of this evolution is technology, apart from satiating socially engrossed clients, the building industry is always working to adapt technological breakthroughs from science and engineering to offer cheaper, more efficient, easier to build, more environmentally friendly, more aesthetically pleasing homes, offices and facilities.

Technological appropriation in the building industry and particularly the building services has been a sustained culture that has ingrained itself into the very essence of building services engineering. Services Engineers are expected to continue to find applications for new technologies in the industry. While there are no generally defined qualifications that suggest a particular technology will be adopted, it's noteworthy that if a technology marks yes to the answers below, it will be considered for adoption by teaming services industry equipment manufacturers and technology developers.

1. Does it make the services cheaper to procure?
2. Does it make it less dangerous to install and use?
3. Does it make it more environmentally friendly?
4. Does it satiate the cravings of a social class in terms of luxury and aesthetics?
5. Is it more efficient cost-wise to maintain?

As technology evolves, the engineering industry (including building services) must respond by changing design and implementation thought processes to harness the new advantages that these technologies might offer. Here are quite some popular emerging technologies that might find application in the building services industry and become ubiquitous within the next 2 decades.

Robotics & Drones

Robots have been with us for decades in the factories and recently at home, with advancements in electronics, sensor technology, machine vision, machine learning, and programming; more robots are expected in homes, offices, and buildings generally. Mobility, dexterity, and safety are important considerations in robot applications. Robots will be expected to undertake more menial tasks at lower costs and higher efficiency. Tasks like lawn mowing, leave packing, floor vacuuming, windows cleaning, and kitchen sterilization to harassment of an intruder. These applications would include the incorporation of sensors within buildings, integration of systems, wireless communication, and programming based on application and space constraints. The Services engineer might find himself/herself working with the architect to design robot routes within living and office spaces, a robot recharging nest where a robot can crawl back to upon finishing a task to recharge for the next task.

Drone delivery systems and drone-type air taxis are been tested run and drones might be ubiquitous in the next decade; drone nests might become a common feature on roofs where a local pickup robot would retrieve packages and bring them down to the living space. Think of this, you order a meal from **McDonald's** and an **Uber drone** delivers to your reception point on the roof and your small retriever robot brings it down to the living room for you.

Culled from:https://futuristspeaker.com/future-of-transportation/mini-airports-coming-to-a-city-near-you/

Artificial intelligence is everywhere!

Artificial intelligence is a gamut of technologies revolving around machine learning, advanced pattern recognition, and others; its objective is to get machines to evolve to a changing environment and solve evolving challenges by learning the way humans do. The application of AI is guaranteed to pervade all industries as its offers a cheaper, more controllable, and committed substitute for human staff intellectual input- this can be very desired in certain situations. AI-powered technologies are numerous and quite a number of them will find application in future buildings as detailed below

Distributed generation powered by AI

Distributed power generation allows home occupants to elevate their status from energy consumers to energy prosumers. As PV technology is becoming increasingly affordable, greater efficiency PV panels are been produced at a cheaper cost, fashionable ones that serve dual purposes such as being usable as carport cover, roofing sheet or plain window glass has also led to social acceptance.

Services engineers will find it indispensable in the future to incorporate a system that allows homeowners to use PV power directly in the afternoon and sell the excess to the grid when the supply exceeds the demand while relying on the grid when the solar irradiance goes down at night. The building will have to be modeled to reveal its Solar energy generation capacity in terms of available open areas on the roof, windows, carports e.t.c and the services engineer will have to incorporate this into the power system design intuitively to ensure the clients receives value for the sun that strikes his property appropriately over the years. An American firm named PG& E developed technology that has allowed over 200,0000 US homes to be connected to the grid in this manner

Telemedical stations and safety robots powered by AI

Most homes rely on 911 (or similar services) to tackle emergencies and occupants would take physical trips to the hospital when they feel sick. The issues are that people still die because not all emergencies lead to visual panic wherein 911 would be called, also quite a several people who do not need 911 call in just to be double sure thereby wasting resources. In the future, AI would make it possible for homes to have a telemedical station where occupants feeling sick would simply walk sit, and strap a few sensors to the right place. The sensors would take readings and refer to a central server remotely in milliseconds, the server will quickly compare the reading from sensors and symptoms from visual input (cameras) to millions of records via AI technology and quickly recommend in a jiffy potential lifesaving procedures (advice on CPR,e.t.c), contact ambulatory services automatically, pre-inform doctors of the status of incoming patients. Google's AI mind boasts of the ability to power Telemedicine applications. Cameras can also spot a collapsed person utilizing a machine learning algorithm and call 911 (in the future, it should be able to activate a robot that would perform CPR) while underwater cameras can notice the swimming motion of swimmers and know when a person is drowning, drain the pool while calling for help.

Culled from: https://mercomcapital.com/h4d-raises-funding/

AI-enabled BMS system

Intelligent BMS systems are already ubiquitous, but AI is destined to take BMS to new heights. While it's already possible to control music, lighting, and cooling based on several parameters such as time of day, weather condition, outside temperature, presence of people e.t.c; AI would add new dimensions such as being able to incorporate the mood of occupants into control schemes. E.g. AI might read your countenance through input from a camera and offer to play you relaxing music or ask whether it should order a beer for you, it would learn your habit of taking a bite of an apple every day via camera and offer to order an apple crate when the apple stock is low (also know by a camera), it would sense a grass due for trimming

and offer to deploy a robot mower to get the job done or send an email to the gardening company or sense dirty glass on a tower and deploy automated glass-cleaning drones….the possibilities are endless.

AI will also allow amazing controls methodologies in the future, we already speak to Alexa and Siri in the future people with speech impairment would also be able to communicate with hand gestures, and the blind would wear a braille hand glove or braille table that would enable them to communicate with BMS. The services engineer would be saddled with the responsibility of ensuring BMS are provided to meet the personalized yearning of the occupant in a building. Home Soli gesture control technology already allows controls via hand gestures sensed by tiny radars that could be strategically located within a building.

Concept of Net Zero energy building

The drive for clean renewable energy gathers more momentum every day. This is powered by the public drive to live healthier lives and damage the environment less for the future generation. The zero net energy building concept is gaining ground and will become a dominant concept in the future. The building will be expected to generate and deliver to the grid a sizeable fraction (if not all) of their yearly KWH consumption via a renewable source such as PV, solar heating, and wind turbine, this will be powered by quickly improving renewable energy generation technology which featured dropping initial investment cost per KWH and reduced running cost also. Services Engineers will have to provide energy audits in the future along with their design to prove to approve agencies that their design meets the requirements clean energy component of the building and provide a design that ensures the carbon footprint will be reduced to acceptable levels.

Culled from: https://www.pbctoday.co.uk/news/energy-news/ukgb-net-zero-carbon/56393/

Wireless Energy transfer

Wirelessly charged phones by magnetic induction technology have become popular, it's logically perceived that wirelessly charged tablets, laptops, home workshop equipment, electric scooters, and toys would soon follow suit as the technology matures. In the future, the services engineer might find a need to designate wireless charging stations within office buildings, public buildings, and holes; maybe it will be possible that one day that any table you put your phone, tablet, or laptop on in an airport will cause it to pop up a message asking whether you will like to have it charged wirelessly! Other architectural possibilities would be floating lights, lights that would not need physical wire connections, or inbuilt batteries, these would open a new vista of lighting design upgrade possibilities for existing buildings.

Culled from: https://www.youtube.com/watch?v=hNgtcgiWJ0c

Ultra-efficient large-capacity batteries

In the mix of trying to harvest renewable energy and trying to make up for the inconsistency of supply from such sources and the grid, the battery as the storage device is key. Battery storage technology has grown in leaps and bounds lately with solid-state batteries more energy can be stored in smaller volumes that can be depleted to near Zero and be charged very fast when need be and can be repeatedly used without fear of damage for a long time. Such batteries will become more affordable and will doubtlessly be required to be incorporated into building designs as expedient.

Realistic life-like companion

As robotics technology advances, present electronic pets are bound to give way to more realistically looking robotic pets that can learn and replicate the actual emotions of the animals they are meant to imitate. For example, your e-dog would no longer be attached to a key and bark awkwardly but will look like a real dog with furs, runs around the house, jumps at you, follow facial & hand movements, learn emotion, and instructions to provide actual dog-type companionship. This would be a toy dog that grows by applying AI to learn about its environment and behaviors in its environment over time-It is envisaged that it would be possible to download the desired personality for such toys to match the owner's mood. Infrastructure to support this type of pet would be standard in future houses.

Culled from: https://www.wired.com/story/robot-dogs-therapy-pets-seniors/

Making everything work together seamlessly

The future client will have access to a lot of affordable technology that will allow for vastly improved lifestyles never seen in the history of mankind. These technologies will be from different industries, countries, and vendors and would need to be properly integrated for the consumer to be able to get the best out of the gamut.

Think of a system that will remind you your self-driving electric car is due for service via an automated phone call, and at your prompting would automatically pre-inform the service workshop of the impending visit, open the garage door and send necessary commands to the car to proceed to its designated service point-

Perhaps you will like the car to pick up the kids from the school on its way back while you deploy an aerial electric drone from a third-party provider to watch the car along the way and send you a live visual feed; or maybe you have advanced image processing sensor that can watch the temperature of everybody in the house and their body language (coughing, sneezing) while you are away and tell you who is catching flu or perhaps watch the pool with similar technology to determine if a swimmer is drowning, drain the pool and activate a CPR robot to administer lifesaving first aid.

Services engineering would no doubt in the future be saddled with the responsibility of making everything work together seamlessly

What will be the core competence of Services Engineers in the future?

The art and science of services engineering design itself will continue to evolve, the bulk of the design process, calculation, simulation, and modeling will be done by software needing simple prompts. As the computational power of PCs/servers continues to multiply, and hardware becomes more affordable, more capable and automated software will continually emerge with each iteration possessing a multiplicated capacity compared to the preceding one.

A time will come when the bulk of the physical labor of the Architect and Building services engineers will be simple giving of verbal instructions to design interfaces backed up by super servers with billions of software codes and data that will allow complete life design cycles that would have taken several weeks to be pulled off in a few days. The competence of building services professionals necessary for achieving today's result would be knowing the right things to say to the design interface as opposed to really undertaking design in the present. While it has been argued that creativity cannot be modeled suggesting building industry professional creativity would be forever relevant; modern AI is expected to be creative and surpass the ability of humans to be creative within half a century putting AI on at least an equal pedestal as the regular human designer. While one is not expected to replace the other, it is envisaged that the combination of AI creativity guided by human creativity will yield fantastic results when compared to the creativity of either one of them.

Picture this, you are looking at a piece of land with a client that wants a 50-floor office, you could simply ask an electronic design assistant to pull off the layout from satellite pictures calculate that land area, and include spot height and necessary survey information pulled from third party provider-Voila! The site survey is ready.

You could proceed to ask the assistant to suggest building footprints based on local regulations and after a few hours you could settle on a 2-level rectangular basement with 5-level car park space and 42 office floors and a single equipment floor, by telling the design assistant what you think concerning every floor and watching it advise like a 100 years veteran while you watch the result of the modeling in 3d real time, in a few days you will have a fully designed 50-floor office, rendered with all structural detailed calculated, MEP services fully designed to latest codes and total building cost generated to meet your intended budget.

The primary competence of MEP services engineers will be largely dependent on the ability to interface and collaborate with modern technology as opposed to knowing the codes, the design process, and how to follow the process without breaking the codes and still be creative.

The implementation stage is expected to have a less brutal fate as human interactions would always be necessary to keep the project and site running-how else would a Services Consultant constrain a contractor to do the needful?

It is expected that supervision robots either bi-pedal or otherwise, with advanced image processing capacity and will surface something deep into the future to crawl through the site and check for details; however, this should still take a few decades

The future services engineer will also be tech-savvy to stay relevant and not become a simple "machine talker", he must be versatile because he will be at the center of selecting from thousands of technologies and integrating them to give the client the desired outcome.