The Technology of Architecture

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Introduction:

The application of science, engineering, and technology serves as the foundation for the profession of architectural technology, which is closely allied with industry. Additionally, Architecture Technology operates in an undercapitalized, resource-intensive, risk-averse, and contentious sector. Due to its emphasis on empirically based design, the industry is now recognizing the value of architectural technology as essential in the digital period. Building information modeling, which digitalizes design and construction, is related to production, performance, environmental sustainability, economic efficiency, and efficacy.

The advancement of technology in the last 100 years was fascinating for everyone. Flying high to reach the moon and far beyond, moving fast to compete with sound, to communicate face-to-face across the globe like previously seen in science fiction, as well as to build taller and taller reaching the cloudy sky in the atmosphere.

One of the most salient features of technology is change, or in a more enthusiastic tone is progress.

Architectural technology has been defined as the technology of architecture and encompasses knowledge and understanding that underpins the design of buildings and structures, as both a product and a process (CIAT, 2015). The profession is considered a specialization, with technologists contributing to construction teams as specialist designers with unique strengths in building performance, production, and process. Architectural Technology is the broad class of technology useful for constructing buildings and other structures. This includes materials, structural elements, equipment, system, and components.

The followings are common types of Architectural Technology.

1- Daylighting is the practice of using windows, light transport techniques and reflective surfaces to illuminate interiors with sunlight. Architectural techniques designed to maximize sunlight that reaches interior spaces were historically common but many fell out of use with the advent of electric light. In recent years, there is renewed interest in using passive architectural features that make use of sunlight to improve quality of life and reduce energy consumption.

Modern daylighting systems are often paired with adaptive electronic lights that dim when natural light is available and take over when sunlight fades. Daylighting tends to heat rooms and is intimately related to passive heating techniques. As such, it has fewer energy advantages in warm climates when cooling is a significant source of energy consumption. People commonly describe a preference for natural light over artificial light sources. As such, daylighting may improve factors such as quality of life or worker productivity. Daylighting is also important for growing plants indoors with techniques such as green walls.

2-Green Walls and Green Facades

Green wall: an architecture and gardening technique that places soil and water delivery mechanisms into a wall to grow vegetation. A green facade is a wall covered in climbing vegetation with soil at the base of the wall.

Both techniques have a stunning visual effect and serve to increase a city’s green space. Green facades are typically outdoors and are limited to species of plants that can climb a wall such as a hedera, commonly known as ivy.

Green walls can be indoors or outdoors and support a wide range of vegetation. As such, green walls can be used as a type of vertical farming that produces food, and it may reduce urban heat islands, insulate buildings, absorb stormwater runoff, and clean air. There is interest in the effect of interior green walls on human health and cognitive factors such as happiness and motivation.

Benefits of Green Wall:

AESTHETIC IMPROVEMENTS: Green walls can reclaim disregarded space by providing aesthetic stimulation where it would not otherwise be found. They can also serve to create privacy and a sense of enclosure while limiting the negative psychological effects associated with property demarcation.

REDUCTION OF THE URBAN HEAT ISLAND EFFECT: The reintroduction of vegetation into urban environments promotes the occurrence of natural cooling processes, such as photosynthesis and evapotranspiration.

With the strategic placement of green walls, plants can create enough turbulence to break vertical airflow, which slows and cools down the air (Peck et al. 1999).

IMPROVED EXTERIOR AIR QUALITY: Green walls mitigate air pollution levels by lowering extreme summer temperatures through photosynthesis, trapping particulate matter, and capturing gases.

The ability of green walls to provide thermal insulation for buildings means less demand for power, and as a result, fewer polluting by-products are released into the air.

Green facades: are systems in which vines and climbing plants or cascading ground covers grow into supporting structures that are purposely designed for their location. Plants growing on green facades are generally rooted in soil beds at the base of the structure, in elevated planters at intermediate levels, or on rooftops. Green facades may take several seasons before achieving maturity depending on the climate, choice of species, depth of soil bed, orientation, nutrition, and irrigation regime. Green facades can be attached to existing walls or built as freestanding structures. They are used to shade glazed facades and walkways and are built as arbores, trellis structures, baffles, or fences.

Benefits of Green Facades:

The green facades and living walls of vertical greenery systems are gaining increasing importance as sustainable building design elements because they can improve the environmental impact of a building. The field could benefit from a comprehensive mapping out of green facade types, an improved classification and nomenclature system, and from linking the benefits to a specific construction. Improvements in air quality, reduction of noise, positive effects on hydrology, and visual benefits need much further empirical testing, as the current supporting data is mostly descriptive and based on the similarities with green roofs. The educational benefits of the green facade have no supporting empirical evidence, while the social benefits have only been empirically evaluated through one identified study. Future progress of the field depends on the adoption of a clear green facade nomenclature system and further qualitative and quantitative empirical testing of VGS benefits, which should be clearly linked to a specific green facade construction type so that cross-comparison of studies is enabled.

3- Green Roof:

A green roof is the practice of growing vegetation directly on a roof over a waterproof membrane. A roof garden is a similar technique that places container gardens on a roof. Both techniques may partially or completely cover a roof. Both may feature recreational facilities or commercial facilities such as a rooftop cafe.

A green roof comes in two varieties: intensive and extensive. Intensive includes a thick layer of soil that can support large vegetation such as small trees. An extensive green roof is characterized by a thinner layer of soil and smaller plants.

Benefits of green roofs:

green roofs may make a city more beautiful, clean the air, moderate urban heat islands, produce local food, reduce stormwater runoff, increase biodiversity, and improve the efficiency of a building by acting as insulation.

Rooftop gardens have many of the same benefits but generally aren't as effective at capturing water or insulating a building potential, air quality, urban heat moderation, food production, biodiversity, and reducing runoff are other useful features of green roofs.

The benefits of green roof show that it plays an important role in making cities safe, sustainable, and resilient to climate change. Therefore, many countries are giving incentives to house owners for the application of green roofs. However, initial high construction costs, high maintenance costs, and roof leakage problems are the main challenges associated with the application of green roofs. These challenges can be overcome with the new cost-effective green roof design that can work more effectively and efficiently in any area.

4-Blue roof:

A blue roof is a roof that is designed to retain rainfall. This is typically done to conserve resources, reduce costs and improve quality of life. The following are common types of blue roofs.

Active Systems: Systems that use power to store and use water collected from the roof such as a water tank and pump system.

Passive Systems: Systems that make use of water without electrical components, typically using gravity.

Stormwater Harvesting: Collecting water for use in the building or its grounds. For example, using rainwater from the roof in toilets.

Cooling: Using water to cool a building. These are often passive systems that use a combination of water and materials on a roof as insulation in a hot climate or season.

Solar Water Heating: It is possible to use solar energy to heat rainwater which can then be used in swimming pools.

Benefits of blue roof:

Conventional green roofs have often been criticized for their limited water buffer capacity during extreme rainfall events and for their susceptibility to droughts when additional irrigation is unavailable. One solution to these challenges is to create an extra blue water retention layer underneath the green layer. Blue-green roofs allow more stormwater to be stored, and the reservoir can act as a water source for the green layer throughout capillary rises. An automated valve regulates the water level of the system. It can be opened to drain water when extreme precipitation is expected. Therefore, the water buffer capacity of the system during extreme rainfall events can be maximized by integrating precipitation forecasts as triggers for the operation of the valve.

5-Smart glass:

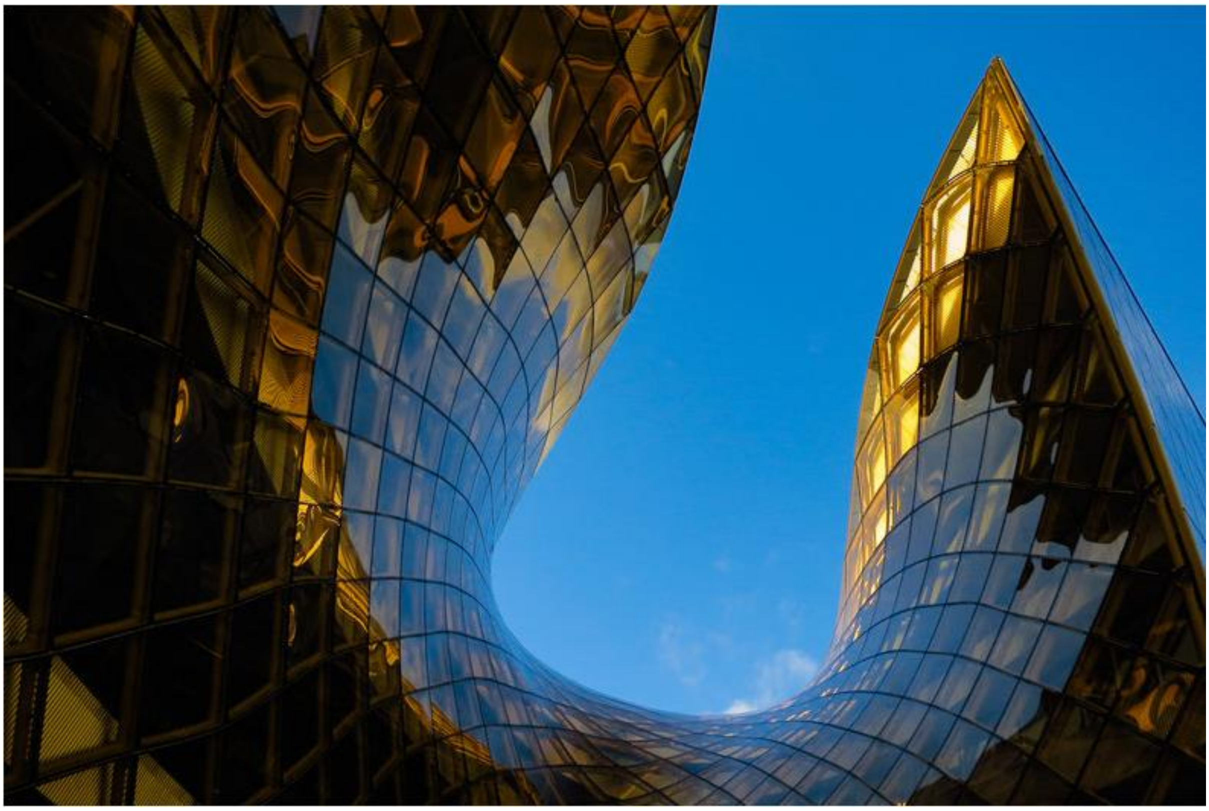
Smart glass is architectural glass that changes its light transmission properties in response to commands or factors such as temperature. Smart glass that responds to external commands is known as switchable glass. Such glass may be used by a climate control system to achieve passive heating or minimize the sun's heating effects depending on internal conditions. Smart glass may also be controlled by users for lighting preferences and privacy.

Benefits of Smart glass:

The increasing attention to issues of visual comfort and energy efficiency that characterize the architecture to the development of innovative, high-performance dynamic glazing systems, aimed not only at reducing heat loss but also at controlling incoming solar radiation, in order to maximize solar gain in winter and minimize it in summer, as well as ensuring the best natural lighting conditions with no glare. Such systems, called smart windows, enable varying the amount of heat and light that penetrate through the glass surfaces as needed while maintaining outwards vision. These new dynamic windows, the electrochromic ones in particular, are proving to be more effective than traditional static systems - low selective glazing and automatic shading devices - at reducing energy consumption for lighting and air conditioning and providing greater comfort to users.

Its Values are Heating, Cooling, Lighting, Privacy, Health considerations such as blocking UV, Night architecture, and Safety such as aircraft cockpit windows that automatically block distracting glare. Its Energy efficiency and sustainability are Protecting interiors and objects such as art from fading.

Common Features of smart glass are Infinite tints, Near complete blackout of external light, Switch ability, and Integration with heating and cooling systems.



6-Building automation:

Building automation is the incorporation of information technology into the architecture and interior of a building to improve efficiency, reduce risk and provide services to occupants. Intelligent building and building automation systems play an essential role in most sophisticated modern buildings. Monitoring and automatic control of building services systems are important to ensure that the design objectives are met in operation. Graduates and engineers associated with building systems need adequate knowledge and understanding of building automation systems, the associated technologies, and their features as well as their implementation.

The following are illustrative examples of building automation:

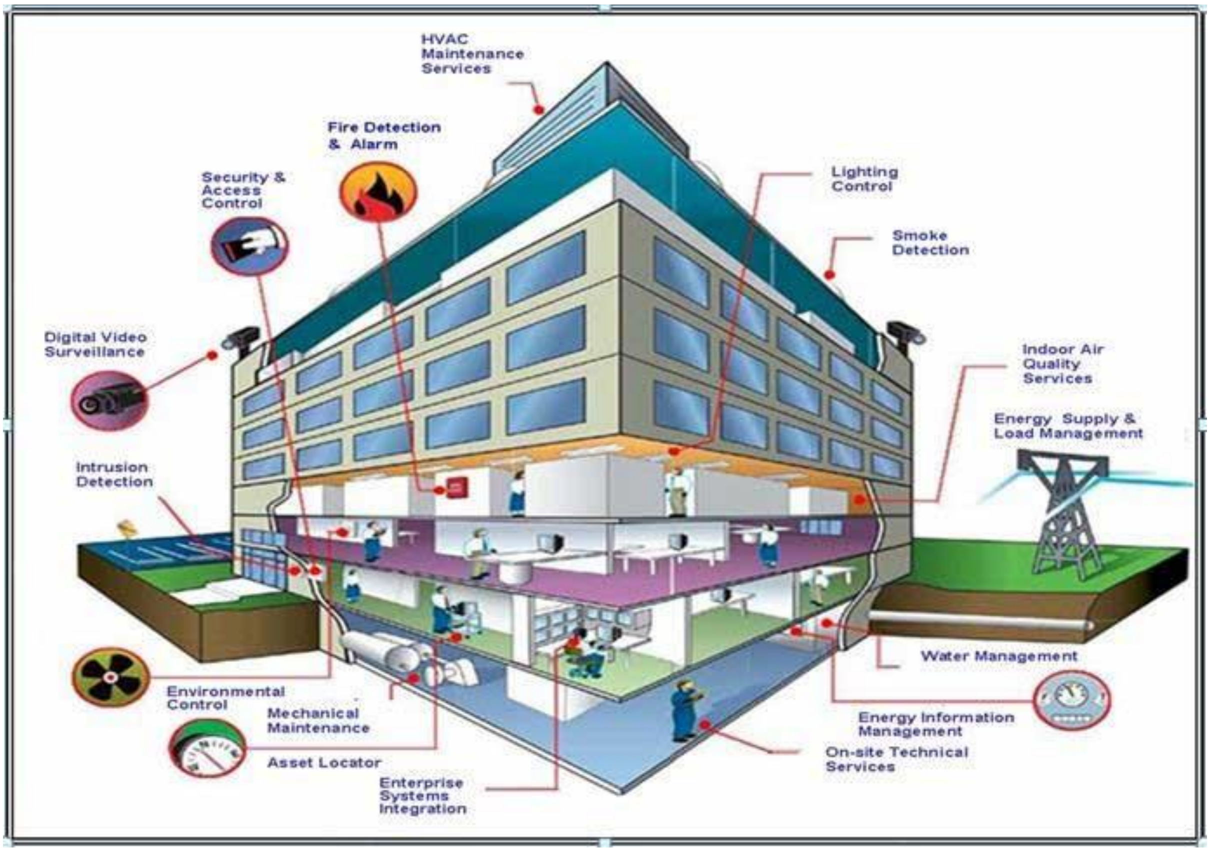
- **Heating, Ventilation & Air Conditioning:** It has been common for heating, ventilation & air conditioning to be fully automated for more than a century. Modern systems may be highly efficient with techniques such as deep-water cooling or passive design.

- **Smart Windows:** windows adapt to achieve objectives such as passive heating, passive cooling, light levels, and privacy.
- **Lighting:** Automated systems for lighting are nothing new but modern systems may adapt to individual preferences and use as much natural light as possible with techniques such as sunlight transport and elevators that were fully automated as early as 1895. Newer models are potentially more efficient with algorithms to predict traffic patterns.

Its Safety systems such as automated fire detection and sprinkler systems. Modern safety systems may have advanced features such as an elevator connected to an earthquake early warning system that can stop at the nearest floor and ask passengers to exit and take cover.

- **Occupant Tracking**

A building that knows where its occupants are at all times for purposes such as security, rescue or to provide services. For example, a building that sets light levels according to each person's preferences as they walk into rooms.



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