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The impact of novel environment trends and intelligent systems in creating sustainable interior architecture

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Abstract

The information revolution and the development of technology have contributed to the advancement of all research fields. Sustainability standards have affected the internal spheres through the application of LEED standards, as well as the application of WELL principles developed in internal spaces. These applications have been studied through research and study. Zero energy buildings and green buildings, as well as studying how to employ modern and smart technology and applications of Internet of Things (IoT) technology in the interior spaces, and the research followed the descriptive and analytical approach to solve some environmental problems such as depletion of nonrenewable natural resources and the high levels of various pollution resulting from the activity The humanist in the interior spaces using the applications of modern environmental trends.

Keywords

Novel Environmental, Intelligent Systems, Sustainable, Interior Architecture



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Introduction

The world has begun to acknowledge the close connection between economic development and the environment, and specialists have warned that the traditional forms of economic development are limited to the overexploitation of natural resources and at the same time cause great pressure on the environment as a result of the harmful pollutants and wastes they secrete, hence the concept of sustainable development emerged. Development), which is defined as "meeting the needs of current generations without compromising the ability of future generations to meet their needs." In the last decade of this century, most of the world's countries have given special attention and wide attention to issues of environmental protection and sustainable development. As the environmental control of urban projects will be one of the most important competitive criteria in these sectors in the twenty-first century.

As a result, innovative systems in environmental design and architecture, such as LEED systems and WELL standards, have appeared in construction and have significantly contributed to reducing environmental pollutants resulting from building consumption.

The development in the patterns and systems of living contributed to the rise in energy consumption of buildings, as buildings consume energy by being satisfied with energy production, but rather contribute to strengthening the main energy network by supplying it with non-renewable resources. In doing so, it contributes to enhancing sustainability and adapting

Sustainable architecture and ecosystems in design are divided into four main branches:

- **1.** Green Architecture
- 2. Smart Architecture
- 3. Zero Energy Buildings
- 4. The Internet of Things



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It enhanced these attributes to integrate technology and network connectivity into its infrastructure, enabling smart buildings to become part of the building mainstream. They also take advantage of the Internet, smart tools and possible integration platforms on the Internet and devices that support Internet Protocol in their daily lives.

Green and Sustainable Architecture: Green Architecture

Green design or sustainable design is a philosophy that addresses the global environmental crisis, and it includes many disciplines that work together to eliminate the negative environmental impact of air and water pollution and the depletion of natural resources in the creation of physical objects, including architectural buildings.

In the field of architecture, green design includes the scope of site selection, layout formation, procurement up to project implementation, as well as the choice of materials.

The Belgian architect Vincent Callebaut in Shenzhen, China, has introduced a natural ecosystem with a design for skyscrapers in order to achieve the green city principle that green buildings provide its users with optimal conditions for comfort in interior spaces through the efficient use of all low-level resources of various emissions, as well as the use of compatible materials. With locally sourced ecology which can guarantee reuse and recycling of building components.

Principles of sustainable architecture and interior design:

They are design solutions that aim to reduce the consumption of resources, and one of the most important principles that have been developed to preserve the internal environment and people in design are the Leadership in Energy and Environmental Design (LEED) principles of the American Green Building Foundation as well as the WELL Foundation that cares about human health in built environments and administrative spaces.





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The most important goals of sustainability in providing environmental solutions based on a minimum of materials, energy consumption, maximum use of local and renewable materials, and recycling of natural environmental resources in relation to trends, intellectual ideologies and new technologies in the field of design.

Green or more specifically sustainable buildings are buildings that have a lower environmentalimpact compared to a similar building of origin. Where it is evaluated through the life cycle of the building from the primary resources since their extraction, transport, manufacture, construction and administration and maintenance.

The result of the unlimited use of resources has greatly contributed to harm to the natural environments in which we live, as this has led to the emergence of many problems with the disappearance of natural resources, causing global warming and desertification. These phenomena led to the emergence of sustainability as a suitable solution to the negative impact of consumption on the earth, as it greatly contributes to preserving the environment, reducing the carbon footprint of humanity, and supporting economic growth in order to contribute to the preservation of human resources.

Contemporary sustainable trends:

LEAD Standards:

In 1993, the US Green Building Council (USGBC) registered nearly 10 billion square meters of building space in the United States of America and many foreign countries. Accreditation certificates are divided into several levels based on the different evaluation of the buildings and the obtaining based on the previous requirements for the evaluation. These levels are based on a system of accredited points (Credits), some points are prerequisites (basic) and are required to obtain the certificate at any level.





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The LEED system includes several types of different environmental standards, including:

1. LEED standards for building and construction design.

2. LEED standards for construction and maintenance operations.

- **3.** Lead standards for homes.
- 4. LEAD standards for developing neighborhoods.
- 5. Lead standards for interior design and constructions.

WELL criteria:

The Yale standards are administered by the International Well Building and are based on improving human health through the internal environment. And it was merged with the same organization that grants and manages the LEED certificates, as those standards are the result of specialized study and research and cooperation with leading doctors, scientists and professionals in the fields of construction. The Weal criteria were developed by integrating these research, factors and behaviors that affect human health within internal environments.

Whereas, each standard at Weal is designed to address a problem that has an impact on the health, comfort, or information occupants of that void through design, processes and human behavior. The Yale Standards were published in October 2014 after completing three major phases with expert review of scientists, professionals and clinicians. Whereas, the Weal system is a performance-based system for measuring and approving the characteristics of the built environment that affect human health.





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And that is through seven basic criteria:

(Air - Water - Nutrition - Lighting - Fitness - Comfort - Mind)

Promote clean air by minimizing or minimizing sources of indoor air pollution, requiring optimal indoor air quality to support the healthy well-being of building occupants. Strategies include removal of airborne pollutants, prevention and purification promoting safe and clean water by implementing appropriate filtration techniques and regular testing in order for building occupants to obtain optimum water quality for various uses. Strategies include removing pollutants through filtration and remediation, and strategic employment. Availability of fresh and healthy foods, limits unhealthy ingredients and encourages better eating habits and food culture. Encouraging healthy eating habits by providing occupants of space / space with more healthy choices in foods, behavioral cues, and knowledge about nutrient quality Guidelines for illumination aimed at reducing disruptions in the body's rhythmic system, enhancing productivity and providing appropriate visual acuity when needed. It also requires specialized lighting systems designed to increase vigilance and enhance the user experience. Physical Inclusion of physical activity into daily life by providing opportunities and support for an active lifestyle and discouraging sedentary behaviors. It sets requirements designed to create distraction-free, productive and comfortable indoor environments. Solutions include design standards and recommendations, thermal and acoustic control, and implementation policies that cover acoustic and thermal parameters that are known sources of discomfort. It requires design, technology and treatment strategies aimed at providing a physical environment that improves cognitive and emotional health.



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Smart architecture:

Smart systems used in the design:

Aspects of smart building:

The mutual relationship between them meets the needs of its occupants with an emphasis on technological solutions. The European Smart Buildings Group showed a clear denial indicating that smart building is based on a design environment that increases the effectiveness of buildings while enabling efficient management of resources that leads to lowering people's lifecosts and highlighting the needs of their occupants to be served by technology.

The original definition coined by the Smart Building Institute defines smart building that provides a productive and efficient environment in terms of

Cost by optimization of four basic elements are:

- 1. The structure
- 2. Systems
- **3. Services**

4. Administration

Architectural societies across Asia have generated many definitions as smart buildings are designed and built on adequate mapping of quality technological units with construction facilities to meet user requirements. The last definition is based on the emergence of IOT technologies, meaning that smart design will overlay the Internet, Internet platforms and databases that collect and analyze all building services data without human intervention.



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Based on the previous definitions, smart interior design can be interpreted as one in which creative and technical solutions should be combined with smart materials, furniture and sensors, while controlling all functions should respond quickly to the demands of its occupants and decide the most efficient way to provide comfort, safety and productive environment to enhance the quality of the space for its users. .

The Internet of Things (IoT)

The Internet of Things (IoT), a term that has emerged recently, and refers to the new generation of the network.

The Internet that allows understanding between interconnected devices (via Internet Protocol). These devices include tools, sensors, sensors, various artificial intelligence tools, and others. The Internet of Things: Internet of Things is a sophisticated concept of the Internet where you have everything in it our lives the ability to connect to the Internet or to each other to send and receive data to perform specific functions through the network "What distinguishes the Internet of Things is that it helps a person not be restricted to a specific place in order to perform his functions, that is, that a person can control the tools without the need to be in a specific place to deal with a specific device, and recently many applications that use IoT technology have appeared to be tired of the jobs And the needs to be controlled.

Sustainable construction using robots:

Building darkness has emerged, using robots and plants, and the communication between them to build plant walls and create new architectural spaces that are smart to achieve the concept of sustainability. Scientists in the Flora Robotics Project have combined the disciplines of biology, computer science, architects and researchers in the field of robotics to build advanced architectural structures that rely on robots and plants in construction.



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As buildings will not depend solely on bricks or concrete, but will be built through cooperation between plants and robots, through lights and various sensors. It takes about 40 years to build this house using traditional methods.

Natural plants grow toward the light, as robots make an effect to replicate this behavior. Where it contributes to communication and self-coordination among themselves, to adopt structures directed towards light. "As architects are looking for ways to transform this hybrid structure of robots and plants into places of living.

Emerging Technology and Architecture (ETA).

The development into a "smart nation" of the future requires smart and sustainable technologies to use resources more efficiently and achieve increased productivity. The merger between companies with unique solutions for the smart and sustainable use of energy and water in the urban and industrial environment and modern societies emerged, which led to the realization of a large part of their sustainability concept. Areas of interest in these technologies include efficient energy applications, the Internet of Things (IoT), robotics and water technologies as they integrate our modern infrastructure.

The information revolution has led to the rapid development of various technologies and industries, including the construction industry and construction. This explosive development has also fostered advances in integrated computer systems and electronic vacuum control solutions. The resulting innovation has opened up new opportunities and unique solutions for smart building technology, and is an essential step towards the start of the creation of smart cities.



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Economic Resources and Sustainability:

• The development of sustainable technological sectors is based on several

- aspects of the most important
- Energy efficiency
- Energy storage
- Renewable energy generation
- The transfer of energy
- Biofuels
- Purification of water, soil and air
- Sustainable materials and chemicals
- waste recycling management
- Which posed technological challenges in the future

Challenges of sustainable technologies:

There are many obstacles towards a sustainable future, including:

Hidden Production Costs

The production of many modern technologies, such as biofuels and bio plastics, still requires large amounts of energy and resources, which has resulted in high production costs.

status: trends in investment Investment in renewable technologies are generally positive. However, events such as economic crises and the current boom in natural gas (natural gas) that have caused electricity prices to plummet could stop savvy emerging sector. Funding investors in this problems: Significant public funding is often required to support emerging technologies. Additionally, some private sector companies may need significant legislative pressure before they convert to sustainable practices.



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Public Perception: Renewable technologies in the twentieth century are very costly. Despite advances in affordable technologies, widespread public acceptance remains.

Results:

1. Modern technology has a clear impact on establishing and activating sustainable interior architecture applications.

2. Smart technology in the field of energy use.

3. The applications of sustainable thinking contributed to meeting the basic needs in terms of various resources without harming the environment.

4. The smart systems used in interior design have a clear impact on achieving the principle of zero energy buildings.

5. The integration of Internet of things technology in the internal architecture has a clear effect on the ability to control the internal spaces to meet the needs of the users of the space and to preserve the various environmental resources.

6. Experimental technology for using robots in construction will contribute to promoting sustainable construction.

7. The merging of technology and architecture will lead to the creation of interior designs that have the ability to learn, which leads to flexibility for the user, raising the efficiency of the building and reducing consumption to achieve a sustainable environment.



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Recommendations:

1- Specialized laboratories must be established for sustainable applications in the field of architecture and interior architecture.

2- Sustainable future thinking should be encouraged and applied in the various design processes.

3- Modern sustainable design theories and approaches and their various and varied techniques must be applied to keep pace with the sustainable digital technological development.

4- The interior designer should develop his idea and use digital technologies to reach a sustainable interior design that keeps pace with the times.

5- The different disciplines must be linked to reach a sustainable interior design that relies on sound foundations to integrate with the environment and keep pace with the continuous technical development to apply leading environmental trends such as green architecture, zero-energy buildings and smart architecture.

6- Cooperation and interdependence between the various disciplines must be achieved to achieve the desired goals.

7- Smart cities' ecosystems must be linked with Internet of things technology to create internal environments characterized by a balanced use of resources, as well as linking them with the city's information network.

8- The orientation to create smart cities as modern urban societies that are sustainable in different thinking and functions. The state must go to finance experimental projects in this field, to benefit from it in saving energy and monitoring consumption.



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References:

1- Saad Al-Shaathan, (2018), Sustainable Development | Environment Message MagazineRetrieved 28 April 2018, From https://env

m.com/category

2- Amy Frearson. (2013). Asian Cairns by Vincent Callebaut. Retrieved 28 April 2018, fromhttps://www.dezeen.com/2013/03/21/asian-cairns-by-vincent-callebaut/

3- Muhammad Osama (2017) a contemporary vision of advanced raw materials technology in interior architecture finishes - University of Alexandria.

4- https://www.academia.edu

5- WELL Presentation (English) | International WELL Building Institute. (n.d.). Retrieved 28 April2018, from <u>https://www.wellcertified.com/en/resources/well-presentation-</u> english.

6- Ghaffarianhoseini, A., Berardi, U., AlWaer, H., Chang, S., Halawa, E., Ghaffarianhoseini, A., &Clements-Croome, D. (2016). What is an intelligent building? Analysis of recent interpretationsfrom an international perspective. Architectural Science Review, 59(5), 338–357.

7- So, A. T., & Chan, W. L. (1999). Intelligent building systems. Springer US. Retrieved from<u>https://books.google.com.eg/books?id=5BXpBwAAQBAJ&</u>
dq=22%Intellient+buildi

ng+systems",+(2012)+Springer:+NY.&lr=&source=gbs_navlink s_s.





V

8- <u>https://www.postscapes.com/universalsmart-home-controller</u>cube/

9- Wireless and smart lighting by Philips | Meet Hue. (n.d.). Retrieved 28 April 2018, from https://www2.meethue.com/en-us

10- Sartori, I., Napolitano, A., & Voss, K. (2018). ARTICLE IN PRESS G Model Net zero energybuildings: A consistent definition framework. Energy & Buildings.

11- Casini, M. (2016). Smart buildings: advanced materials and nanotechnology to improve nergy-efficiency and environmental performance. Woodhead Publishing is an imprint of Elsevier.

12- Home for life. (2009). Retrieved 28 April 2018, from https://www.archdaily.com/889593/homefor-life-aart-architects

13- https://www.tech-wd.com/wd/04/03/2015/internet-of-things/

14- https://ar.wikipedia.org/wiki

15- Casini, M. (n.d.). Internet of things for Energy efficiency of buildings. Retrieved

from<u>https://www.researchgate.net/profile/Marco_Casini3/publica</u> tion/28059738_Internet_

of things for Energy efficiency of buildings/links/55bc99480 8aec0e5f441b012/Internet

-of-things-for-Energy-efficiency-of-buildings.pdf

16- Euronews. (2018). Flora Robotica: The team of European scientists putting plants andmachines together to construct the buildings of the future | Euronews. Retrieved 28 April 2018, from http://www.euronews.com/22/01/2018/flora-robotica-the-team-of-european-scientists-puttingplants-and-machines





www.egyptfuture.org/ojs/

17- FloraRobotica. (2016). Towards growing a robotic plant YouTube. Retrieved 28 April 2018, from https://www.youtube.com/watch?v=4Edm8H9SPIw

18- FloraRobotica. (n.d.). FloraRobotica | Societies of Symbiotic
Robot-Plant Bio-Hybrids as SocialArchitectural Artifacts.
Retrieved 28 April 2018, from <u>http://www.florarobotica.eu/</u>

19- Rashdan, W. (2016). The impact of innovative smart design solutions on achievingsustainable interior design. In WIT Transactions on Ecology and the Environment(Vol. 204, pp.623–634). WIT Press.

20- EDBI Pte. (2018). Emerging Technology (ET) | EDBI. Retrieved 28 April 2018, from<u>http://www.edbi.com/investment-focus/investment-et</u>

21- Sustainable technologies - Population Matters. (n.d.).Retrieved28April2018,

fromhttps://www.populationmatters.org/sustainable-

technologies/

22- Sustainable Technology Capital LP. (n.d.). Retrieved 28 April 2018, from<u>http://www.stechcapital.com/SectorFocus.htm</u>

23- What is Sustainability? Sustainable Technology and Development. (n.d.). Retrieved 28 April2018, from <u>https://www.sustainabilitydegrees.com/what-is-</u>

sustainability/sustainable-technologydevelopment/

24- Unemaisonintelligente capable de tweeter son statut -Forums HM/AVHD. (n.d.). Retrieved28 April 2018, from http://forum.homemedia.fr/index.php?showtopic=23777





www.egyptfuture.org/ojs/

25- Sustainable Smart ÉTS Residence testbed | Synchromedia.
(n.d.). Retrieved 28 April 2018,from
http://www.synchromedia.ca/node/877

26- Wookjin Lee. (2016). When IoT Meets Home Decoration |

LG CNS Blog | Creative & amp; Smart. Retrieved 28 April 2018,

from<u>http://www.lgcnsblog.com/features/when-iot-</u>meets-

homedecoration/#sthash.tRVJ7fOr.dpbs

27- <u>http://www.businesskorea.co.kr/news/articleView.html?idxn</u> o=10733

28- Megan Anderle. (2015). How the Internet of Things could redefine green workspaces

|GreenBiz.Retrieved30April2018,fromhttps://www.greenbiz.com/article/how-internet-thingscould-overhaul-office-sustainability.

29- RAENG,(2013) Smart buildings – people and performance report , Royal Academy of Engineering: London.

30- Jeff Wehl. (2016). RE IOT - Renewable Energy Internet of Things. Retrieved 30 April 2018,from https://www.ecoelectric.com.au/re-iot-renewable-energy-internet-things/

31- Abella, A., Ortiz-de-Urbina-Criado, M., & De-Pablos-Heredero, C. (2017). A model for theanalysis of data-driven innovation and value generation in smart cities' ecosystems. Cities, 64,47–53. https://doi.org/10.1016/J.CITIES.2017.01.011

32- Vanolo, A. (2016). Is there anybody out there? The place and role of citizens in tomorrow'ssmart cities. Futures (Vol. 82). https://doi.org/10.1016/j.futures.2016.05.010





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33- Hosam El-Din Sabry Mahmoud Hegazy, Muhammad Atef Muhammad Abu Ashour, A Comparative Study Of The Influence Of Modernity Theory And Unified Architectural Theory On The Reality Of Contemporary Egyptian Architectural Design, International Journal of Architectural Engineering and Urban Research, Vol. 3, No. 1, 2020, pp. 1-11.

34- Rania Raouf Sedky, The Influence Of Human Movement On The Formation Of Adaptive Architecture, International Journal of Architectural Engineering and Urban Research, Vol.3, No. 1, 2020, pp. 37-42.

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