



جامعة الإسكندرية  
كلية الفنون الجميلة  
قسم الديكور

اثر كفاءة تطبيق العمارة الذكية علي فاعلية جوده البيئه الداخلية لمراكز الابتكار

**“The Efficiency Impact of smart architecture  
implementation on the effectiveness of the internal  
environment quality of innovation centers”**

رسالة مقدمة لقسم الديكور  
لنيل درجة الدكتوراه في الفنون الجميلة  
تخصص الديكور - شعبة العمارة الداخلية

مقدمة من الباحثه  
ندي سمير محمد شاهين

موافقه

لجنة الإشراف

إ.د/ عبد الحميد عبد المالك علي  
أستاذ متفرغ بقسم الديكور - شعبة العمارة الداخلية  
كلية الفنون الجميلة - جامعة الإسكندرية

إ.د / هبه سامي منصور  
أستاذ العمارة الداخليه ورئيس مجلس قسم الديكور سابقاً  
شعبة العمارة الداخليه - كلية الفنون الجميله  
جامعة الإسكندرية

التاريخ 2023 / 7 / 15

### **The Research Summary:**

"The digital revolution and technological advancement have provided a wide scope for the development of interior design, with the aim of providing comfort and luxury for users of interior spaces, applying digital life, providing the foundations and requirements of security and safety, rationalizing energy consumption, and electronic control of all parts of the building internally such as doors, windows, and internal service networks (lighting, air conditioning, ventilation, energy systems...).". With the increasing development in technology and artificial intelligence, interior designers have had to develop integrated design concepts that combine creativity and solutions in order to achieve a good environment for interior spaces and create functional solutions aimed at improving the quality of life for occupants of interior spaces and enhancing their productivity.

This research aims to study the elements of smart architecture (smart materials/systems/interfaces) and how to employ them to achieve quality standards for the indoor environment, increase performance efficiency for occupants psychologically and physiologically, and the importance of applying them to interior design for innovation centers, to provide a comfortable environment that contributes to the ability of space users to generate ideas and innovations.

This is to address the research problem, which revolves around the inadequate use of smart architecture elements in interior spaces of innovation centers to create a high-quality, responsive, and effective indoor environment. There is also a lack of attention from interior designers toward improving indoor environmental quality indicators and a lack of design solutions and methods for energy consumption reduction based on sustainability concepts.

- Choosing innovation centers as the applied project for the research is important to link research with Egypt's Vision 2030 regarding knowledge, innovation, improving quality of life, and contributing to achieving sustainable development. Therefore, research studies have a role in enhancing participation in implementing Egypt's Vision 2030.

The research is titled "The Efficiency Impact of smart architecture implementation on the effectiveness of the internal environment quality of innovation centers". The research covers this topic through five chapters:

- **The first chapter** is titled 'Smart Architecture (Conceptual Framework) and its Relationship with Indoor Environmental Quality'. The first chapter begins with a description of innovation centers and a description of their internal functional spaces. Then, we clarified the concepts related to smart architecture through several definitions and the chronological stages that the development of smart architecture has gone through. We also addressed the role of technology in developing the interior design to achieve the concept of indoor environmental quality as one of the determinants of LEED and GPRS standards.

**The second chapter** is titled "Smart Materials Used in Innovation Centers' Spaces". This chapter discusses the impact of technological development on traditional materials with limited properties used in interior design<sup>1\*</sup>. It also sheds light on the characteristics and types of smart materials to improve the functional performance of indoor spaces, especially innovation centers, by achieving indoor environmental quality (functionally and aesthetically).

---

<sup>1</sup> \* Materials have become capable of sensing and responding when exposed to an environmental factor or influence



- represented in the well-being and comfort of users of indoor spaces. As a result, smart materials have contributed to fulfilling the interior designer's ideas due to the unavailability of suitable raw materials. The second chapter focuses on reviewing some applications of smart materials, represented in interactive smart furniture as one of the elements of interior design, and the importance of employing it in innovation center spaces. We also discussed interactive smart flooring and smart glass that allows users to control the amount of light and helps conserve energy.
- **The third chapter**, titled "Smart Systems Used in Innovation Centers," discusses the second element of smart architecture, which is smart systems that rely primarily on sensor devices connected to the building's central control system. This chapter focuses on enriching interior design with innovative and intelligent methods to achieve comfort for users by providing physiological comfort, a healthy environment, improving the indoor environment to maximize user performance, supporting maintenance processes, facilitating operation, enhancing security and safety, as well as energy conservation.
- **The fourth chapter**, titled "Smart Facades," is the third and final element of smart architecture, which is the result of the rapid development of technologies used to achieve functional, aesthetic, and beneficial properties for the building. Smart facades are efficient in using renewable energy and promoting mutual response between the indoor and outdoor environment. This chapter focuses on reviewing the classification of smart facades and their role in achieving the quality of the indoor environment to provide a comfortable working environment, such as innovation centers, according to the concept of ergonomics that is of interest to interior designers.