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Towards Formulating Design Standards for Smart Urban Space

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ABSTRACT: Urban spaces are an important component of any urban structure, in order to embrace the various activities of the population, and it is one of the most elements in which the relationship between man and the environment in which he lives is evident, and it reflects the general image of any city. It was necessary to study the impact of recent developments, especially the applications of smart cities on Our urban space to keep pace with the times. The research aims to study the impact of smart city applications on the design of urban space, and the extent of the impact of these applications on the formulation and design of public spaces, with the analysis of theoretical backgrounds and analysis of global experiences that use technological applications and to come up with a set of proposed design criteria for smart urban spaces that are subsequently applied to every smart urban space.

KEYWORDS: Sustainable urban spaces , Resilience urban spaces , smart urban spaces , smart cities , technological applications , smart design standards.

I. INTRODUCTION

In 1992, the concept of "smart growth" emerged as a concept aimed at proposing an alternative model of urban sprawl, and detached housing. It was primarily driven by planners, architects, and community activists. It has been defined that growth in a city occurs in its integrated design, such as mixed land uses and walkable urban centers (a range of transportation and housing options), all the way to community participation in making development decisions that are fair, predictable and cost-effective (a sense of community life). Innovative methods of urban planning and design emerged during this time. This concept gained immense popularity in the 1990s but gradually faded away, and a new concept called "Smart Cities" emerged in which data and information technology can influence the way cities work. From this literature on smart growth and smart cities, the idea of a "smart city" emerged, which affects, in one way or another, every part of the city, especially the urban spaces covered by the study¹.

II. RELATED WORK

The study belongs to the field of (urban development and community design), specifically (designing public urban spaces), which is concerned with developing and improving the quality of human life and changing or reforming the economic and social field by introducing a technological system in Egyptian cities, and the fourth generation cities were chosen for the study to be the nucleus of urban development .

"Jane Jacobs" states in her book that public urban spaces affect physical, behavioral, and emotional well-being in a book called Death and Life in Great American Cities. Voids affect our physical, mental and emotional prosperity. In general, there are specific criteria for determining public space. A public space is a place accessible to the public at any time of the day, such as parks, beaches, squares, roads, sidewalks, etc. These public spaces are supposed to perform different functions. The importance of public spaces is due to Social importance, Physiological importance and Economic importance.

III. METHODOLOGY

The descriptive and applied approach was used through case studies, which is the study of urban spaces in Boston and Singapore as projects that have smart specifications for the purpose of measuring the availability of the proposed smart design criteria for measuring urban spaces.

The research includes three main axes:

The first axis: includes the theoretical framework for research (The concept of smart cities)¹ (the concept of urban space)² (and modern trends of urban spaces)³.

The second axis: access to the proposed design matrix for the design of the smart urban space.

The third axis: the analytical study of a group of urban spaces for global cities, which is based on the application of smart design standards for urban spaces and the application of the proposed smart design standards that were deduced from the theoretical study on analytical models.

The first axis: (The concept of smart cities)²³⁴⁵: There are many definitions of smart cities, there are definitions by planners and architects, and others by leading cities in the field of smart cities, all of which revolve around the meaning (in order for the city to be smart in the first place, it is necessary to apply ICT in all aspects of life and improve the city's infrastructure. Then work on making the city more sustainable and able to resist, and the city will also be able to create a society capable of creativity and innovation, all in order to provide a more comfortable life and service for all its citizens. It depends on six main dimensions which are (smart environment - smart economy - smart living - Smart Governance - Smart People - Smart Mobility).

(The concept of urban space)⁶: It is a three-dimensional framework that has the character of containment, it contains things, people and activities through its three dimensions, which is every space between the buildings in the city, and it also has the character of development over time, whether urban development or human development, and urban spaces are also those Built or non-built spaces surrounded by buildings in the city, and each space has a use and a distinct personality, shape, size, dimensions, material, color, texture and other properties and elements with features that fit the function for which this space was prepared, and these spaces are called green spaces, pedestrian paths, places To play, lively places, places to gather. as shows figure 1.



Figures 1 shows one of the forms of urban spaces.

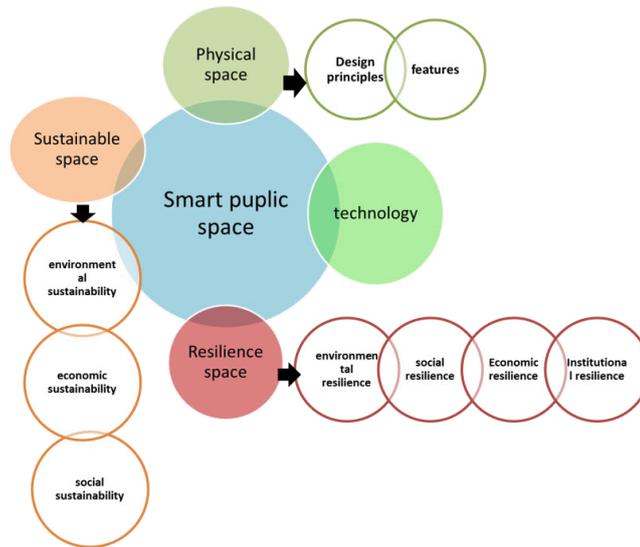
(Modern trends of urban space):⁷ divided into three directions: a) The concept of sustainable urban space: It is the space that considers the economic, environmental, social, and cultural factors. society to achieve quality of life. Its general framework is based on three aspects: the environmental aspect, the economic aspect, and the social aspect. b)

The concept of the resistive urban space:^{9 10 11 12} It is the general vacuum that can adapt to the changes that occur to it, and to respond quickly to those changes. Its general framework is based on four aspects: the environmental aspect, the economic aspect, and the social aspect.

c) The concept of smart urban space: it is a vacuum that must achieve the principles of sustainability, as it takes into account the economic, social and environmental factors of the society in order to achieve the quality of life, and thus a vacuum that achieves the principle of flexibility, so it is able to change and adapt to the changes that occur to it and respond to them simultaneously, in addition to The use of communication and information technology and harnessing it



in order to achieve these principles in addition to eliminating the problems of void, improving community services and making the void more efficient, enjoyable and comfortable for users to reach the quality of life.



Figures 2The general framework of the smart urban space

The second axis:From the theoretical study, a proposed design matrix was reached to design the smart urban space. It is a relationship between the characteristics of the general urban space (belonging and sense of place – accessibility – comfort – safety – enjoyment – environmental suitability for the space – and the economic suitability of the space) and the principles on which it is based Smart Space (Environmental Sustainability - Social Sustainability - Economic Sustainability - Environmental resilience- Social resilience - Economic resilience - Technology) as shown I table (1)

the design criteria suggested for smart public urban space							
The standard of intelligent space design	A sense to the place	Accessibility ¹	Safety ¹	Comfort ¹	Enjoyment ¹	Quality of the environment	the quality of economy of space
Sustainability in urban space	Providing some historical signs for the place	Providing a walkway for pedestrians	Providing safe borders ((for example, a fence	Provide a plant identification plate	Providing relaxation elements such as water sources and digitally controlling it	Providing places for garbage collection and sorting	Taking into account the needs of the street seller
	Provide a well-known instructor	Providing an electronic door for entry	Provide an officer inside the space ¹⁶	Provide a bathroom inside the space	Providing elements that bring happiness, such as digital games, screens, and celebration squares	Preservation of vegetation	Take into account the cost of furniture in the space
	Preserving the character and identity of the place ¹⁵	Provide a map for easy access	Providing indoor lamps based on LED and digital lighting poles	Using trees for shade	Provide a space for the arts ¹⁷	Wildlife Conservation	Using moles of wind energy in a space
		Providing smart car parking					
Providing smart bike parking							
The use of technology to increase the degree of comfort to obtain traffic information							
the resilience in urban space	The sense of belonging to the place should not conflict with environmental sustainability, such as putting green elements Economic flexibility was not available in the sense of	The cost of used furniture and the cost of its maintenance must be taken into account The use of green elements in determining places of access, such as using them in parking lots or islands in the streets Economic flexibility in accessibility is not clear	Providing a diversified economic structure for recovery during a disaster Choose a location and avoid danger areas Use good design to reach basic needs in the event of a disaster	Providing preventive health preparations in time of disaster	Providing places for pets	Using plants that are not used to absorb water in water-poor places and vice versa during a disaster Provide plans to protect the environment in the event of disasters	Use of solar energy
			Providing a permeable sidewalk for pedestrians and containing some digital elements	Providing communications infrastructure in the event of disasters	Providing colorful crops and landscaping	Convertng motion into energy	
technology	The use of technology elements in the distinctive signs of the space	Providing a permeable sidewalk for pedestrians and containing some digital elements	Providing communications infrastructure in the event of disasters	All billboards, banners and information boards designed using digital furniture The management should be digitally	Provide digital motion lights	Using technology to control pollution	The use of technological elements that act as a source of income for the space, such as digital games
				The management must be digitally controlled and intelligent, such as electronic payment and geographic information system	Use of Wi-Fi networks	Smart control of carbon emissions	
				Using cameras to monitor the space		Providing smart waste containers	
				Providing digital seats			

The third axis: the analytical study of a group of urban spaces for smart global countries

An analysis of a group of study models whose spaces are based on the application of smart standards for urban spaces:

The general urban space of the city of Boston (Bullston Street and Plazas, Boston, Massachusetts, United States).

- **Definition of the project:**

Location: Paulston Street, Boston, Massachusetts

Population: 673,184 in 2016 census

Context: Residential, commercial use

- **About the project:**

Boylston Street in Boston begins at the intersection of Park Drive and Brooklyn Street as a six-lane, two-way road in Boston's Fenway neighborhood. It passes through mixed-use buildings, where Boylston becomes one of Boston's main streets. It is a large, distinct, crowded commercial artery that ends in Boston Public Park. The street is divided into a pedestrian sidewalk and a motorway. And a bike path. Paulston Street is one of the streets that enjoys the application of sustainability and modern technology, like most Boston streets¹⁸. As shown in the figure (3)



Figures 3 shows the urban space of Boston

The extent to which smart standards are achieved on the urban space of Boston:

Environmental sustainability has been achieved in the vacuum through the use of green elements in the vacuum in a sustainable manner and the use of smart garbage containers that work through a metaphor that empties the containers in a timely manner.¹⁹

The social and economic sustainability in the space was achieved by achieving comfort and safety inside the street for all users of the space, whether children, the elderly or adults, in addition to those with special needs. Economic sustainability has been achieved through the use of solar cells on the roofs of houses and their exploitation in the street or bicycle parking, and the use of LED lighting that saves energy²⁰.

Environmental Resilience was achieved by designing the sidewalks to avoid rainwater accumulation or snowmelt, in addition to maintaining the vegetation cover within the space.²¹

Institutional Resilience has been achieved through the use and association of street cameras

Central government to control streets and investigate traffic congestion locates accidents, safety of persons with disabilities, illegal parking, road works, as well as assist police in emergency situations.

The use of technology was achieved through the use of environmentally friendly electric vehicles and bicycles and the use of smart meters that

In its operation, it depends on solar energy, in addition to smart car parks that operate through a program that uses kiosks that accept credit cards, and the use of smart advertising boards²².

The result of applying the proposed smart design matrix to the urban space of Boston.

After applying the matrix of smart design criteria on Boston Street and verifying the extent to which the design principles of (belonging and feeling of place - accessibility - comfort - safety - enjoyment - environmental quality - economic suitability of space) have been achieved, it was found that Boston Street achieved the principles of comfort, accessibility and safety While the quality of the environment and the economic suitability have been achieved to a moderate degree, the enjoyment, belonging and feeling of the place are at a low degree, so Boston Street is considered



one of the smart streets in a medium degree in the place with a weak degree, so Boston Street is considered one of the smart streets of a medium degree. As shown in table (2)

The proposed design criteria for the smart public urban space for Paulston Street (Boston)						
The Standard of intelligent public urban space design	Feeling of belonging to the place		Accessibility		Safety	
social sustainability	Providing some historical signs of belonging	×	Providing a walkway for pedestrians	√	Providing safe borders (for example, a fence)	√
			Providing an electronic portal for entry	×		
	Providing a well-known teacher	×	Provide a map for easy access	√		
			Providing smart parking	√		
	Preserving the character and identity of the place	×	Providing smart bike parking	√		
			The use of technology to increase the degree of comfort to obtain traffic information	√		
blank clarity			√			
economic sustainability	The cost of items placed in the space that verify identity must be taken into account	×	The cost of used furniture and the cost of its maintenance must be taken into account	√	Providing indoor lamps based on LED and digital lighting poles	√
environmental sustainability	The sense of belonging to the place should not conflict with environmental sustainability, such as putting green element	×	The use of green elements in determining places of access, such as using them in parking lots or islands in the streets	√	Ensure the durability of the green elements used so as not to harm users, such as the use of green roofs and green walls	√
Economic resilience	Economic flexibility was not available in the sense of belonging to the place		Economic flexibility in accessibility is not clear as it is difficult to measure	-	Providing a diversified economic structure for recovery during a disaster	√
environmental resilience	Environmental flexibility was not available in the sense of belonging to the place	-	Providing sidewalks with permeable water drainage	√	Choose a location and avoid danger areas	√
Social resilience	Involve residents in disaster recovery plans	×	Taking into account accessibility, suitable for all users, children, adults and youth	√		



				Provide plans for response and redevelopment during a disaster	-	
technology	The use of technology elements in the distinctive signs of the space	×	Providing a permeable sidewalk for pedestrians and containing some digital elements	√	Providing communications infrastructure in the event of disasters	√
total	0%		75%		75%	

The Standard of intelligent public urban space design	Comforts		enjoy		environmental quality		Economic suitability for space	
social sustainability	Provide a plant identification plate	×	Providing relaxation elements such as water sources and digitally controlling it	×	People must deal with the environment in a sustainable way, that is, in ways that do not harm the environment	√	Taking into account the needs of the street vendor	×
	Provide a bathroom inside the space	×	Providing elements that bring happiness, such as digital games, screens, and celebration squares	×				
			Provide a space for the arts	×				
economic sustainability	The cost of the technological elements used in defining the elements of the space must be taken into account	√	Providing elements that attract the local and non-local visitor	×	The cost of the materials used in maintaining the environmental side of the vacuum must be taken into account	×	Taking into account the cost of furniture in the void	√
environmental sustainability	Using trees for shade	√	Providing colorful crops	×	Providing places for garbage collection and sorting	×	Using the energy of moles of wind in a vacuum	×
					Preservation of vegetation	√	Use of solar energy	√



	Use of green roof and green wall	×			Wildlife Conservation	×	Converting motion into energy	×
					Water recycling and reuse	√		
Economic resilience	Taking into account the needs of the street vendor and housing them in a manner that fits the job limits, if possible	√	Providing elements that achieve enjoyment to benefit from during the disaster	×	Using plants that are not used to absorb water in water-poor places and vice versa during a disaster	×	Provide investment in green jobs and green economy (self-sufficiency, urban agriculture, etc.)	×
environmental resilience	Providing colorful crops and landscaping	√	Providing places for pets	×	Provide plans to protect the environment in the event of disasters	×	Environmental flexibility was not available in the economic suitability of the space	-
			Providing colorful crops and landscaping	√				
Social resilience	Providing preventive health preparations in time of disaster	√	Providing elements of enjoyment that are suitable for all types of residents, children, adults and youth	×	There is no social resilience in the quality of the environment	-	Social flexibility was not available in the economic suitability of the vacuum	-
technology	All billboards, banners and information boards designed using digital furniture	√	Provide digital motion lights	×	Using technology to control pollution	-	The use of technological elements that act as a source of income for the space, such as digital games	×
	Digital management should be controlled and intelligent like electronic payment and GIS	√			Smart control of carbon emissions	-		
	Using cameras to monitor the vacuum	√	Use of Wi-Fi networks	√	Providing smart waste containers	√		



	Providing digital seats	×				
total	66%		28%		50%	40%

The urban space of Singapore (Gardens by the Bay, Singapore, Southeast Asia):

Project definition:

Location: 101 hectares (250 acres) near the city of Singapore

Population: 5.5 million - City of Singapore

Context: Picnic gardens - nature reserve

About the project:

Gardens by the Bay is Singapore's newest green heritage as it seeks to transform into a city in a garden. It is a nature reserve spanning over 100 hectares (250 acres) of reclaimed land in downtown Singapore. It consists of three gardens on the waterfront: South Bay Garden, East Bay Park, and Central Bay Park. The largest of these parks is South Bay Park, which occupies an area of 54 hectares. Bay Gardens is part of the Singapore government's strategy to transform Singapore from a garden city into a city in a garden. The garden includes a range of innovative applications that put it primarily from smart sustainable gardens²³. As shown in the figure (4)



Figure 4 Singapore garden

The extent to which smart standards are achieved on the urban space of the city of Singapore:

Environmental sustainability: achieved through the use of filter ponds, reducing nutrient load, using waste and utilizing it safely, maintaining an aquatic ecosystem.

Economic sustainability: achieved through the use of solar cells to illuminate the entire garden at night, generating energy and harnessing waste heat. Electricity is generated through the use of a combined thermal energy steam turbine (CHP), which is fed by wood waste²⁴.

Social sustainability: achieved by providing comfort and relaxation inside the garden, and achieving attractiveness through enjoying the art of flowers, as the garden collected more than 15,000 types of flowers. In addition to providing various activities for different groups.

Social and Economic Resilience: The economic resilience has been achieved through the two main winter buildings among the largest climate-controlled greenhouses in the world, covering an area of more than 20,000 square meters in addition to the large area of the garden makes it safe for the country in case of disaster, it is a refuge for individuals in case of danger. And economic by considering the park a center of attraction for tourists from all over the world makes it rich and able to renew the park in case of disasters.

Environmental and Institutional Resilience: Creating a website for the park that transmits information about the park to the public regarding presence in each area, congestion time, closing time, maintenance time, everything related to park services on this site. In addition to Put cameras in all parts of the garden to monitor and control the garden.²⁵

Environmental resilience: Gardens next to the bay by making underground water tanks under the glass structures to collect rainwater and use it to irrigate the plants in the garden. This makes the garden flexible and able to adapt to the threats of the environment.²⁶

Technological applications: Using technology in gardens next to the Gulf in command and control centers for every part of the garden, using smart lighting, smart parking, sensors in garbage containers, using sensors and controlling pump pressure to reduce or prevent water leakage, early warning systems for disasters.²⁷



as a result of applying the proposed design matrix to the smart urban space of the city of Singapore.

After applying the proposed matrix of smart design criteria to the Gulf Gardens in Singapore and verifying the extent to which the design principles of (belonging and sense of place - accessibility - comfort - safety - enjoyment - environmental quality - economic suitability for space) have been achieved, it was found that Gulf gardens achieved all the principles to a degree High, so the Gulf gardens are considered a smart urban space to a high degree. As shown in tab13 (3)

The proposed design criteria for the smart public urban space for Gulf Gardens (Singapore)						
The Standard of intelligent public urban space design	Feeling of belonging to the place		Accessibility		Safety	
social sustainability	Providing some historical signs of belonging	√	Providing a walkway for pedestrians	√	Providing safe borders (for example, a fence)	√
			Providing an electronic portal for entry	√		
	Providing a well-known teacher	√	Provide a map for easy access	√		
			Providing smart parking	√		
	Preserving the character and identity of the place	√	Providing smart bike parking	√	Provide an officer inside the space	√
			The use of technology to increase the degree of comfort to obtain traffic information	√		
blank clarity			√			
economic sustainability	The cost of items placed in the space that verify identity must be taken into account	√	The cost of used furniture and the cost of its maintenance must be taken into account	√	Providing indoor lamps based on LED and digital lighting poles	√
environmental sustainability	The sense of belonging to the place should not conflict with environmental sustainability, such as putting green element	√	The use of green elements in determining places of access, such as using them in parking lots or islands in the streets	√	Ensure the durability of the green elements used so as not to harm users, such as the use of green roofs and green walls	√
Economic resilience	Economic flexibility was not available in the sense of belonging to the place	-	Economic flexibility in accessibility is not clear as it is difficult to measure	-	Providing a diversified economic structure for recovery during a disaster	√
environmental resilience	Environmental flexibility was not available in the sense of belonging to the place	-	Providing sidewalks with permeable water drainage	√	Choose a location and avoid danger areas	√



Social resilience	Involve residents in disaster recovery plans	×	Taking into account accessibility, suitable for all users, children, adults and youth	√	Use good design to reach basic needs in the event of disasters	-
					Provide plans for response and redevelopment during a disaster	-
technology	The use of technology elements in the distinctive signs of the space	√	Providing a permeable sidewalk for pedestrians and containing some digital elements	√	Providing communications infrastructure in the event of disasters	√
total	%100		%100		%100	

The Standard of intelligent public urban space design	Comforts		enjoy		environmental quality		Economic suitability for space	
social sustainability	Provide a plant identification plate	√	Providing relaxation elements such as water sources and digitally controlling it	×	People must deal with the environment in a sustainable way, that is, in ways that do not harm the environment	√	Taking into account the needs of the street vendor	×
	Provide a bathroom inside the space	√	Providing elements that bring happiness, such as digital games, screens, and celebration squares	×				
			Provide a space for the arts	×				
economic sustainability	The cost of the technological elements used in defining the elements of the space must be taken into account	√	Providing elements that attract the local and non-local visitor	×	The cost of the materials used in maintaining the environmental side of the vacuum must be taken into account	√	Taking into account the cost of furniture in the void	√
environmental sustainability	Using trees for shade	√	Providing colorful	√	Providing places for garbage collection	×	Using the energy of moles of wind	√



			crops		and sorting		in a vacuum	
					Preservation of vegetation	√	Use of solar energy	√
	Use of green roof and green wall	√			Wildlife Conservation	√	Converting motion into energy	×
					Water recycling and reuse	√		
Economic resilience	Taking into account the needs of the street vendor and housing them in a manner that fits the job limits, if possible	√	Providing elements that achieve enjoyment to benefit from during the disaster	×	Using plants that are not used to absorb water in water-poor places and vice versa during a disaster	√	Provide investment in green jobs and green economy (self-sufficiency, urban agriculture, etc.)	√
environmental resilience	Providing colorful crops and landscaping	√	Providing places for pets	×	Provide plans to protect the environment in the event of disasters	-	Environmental flexibility was not available in the economic suitability of the space	-
			Providing colorful crops and landscaping	√				
Social resilience	Providing preventive health preparations in time of disaster	√	Providing elements of enjoyment that are suitable for all types of residents, children, adults and youth	×	There is no social resilience in the quality of the environmen	-	Social flexibility was not available in the economic suitability of the vacuum	-
Technology	All billboards, banners and information boards designed using digital furniture	√	Provide digital motion lights	×	Using technology to control pollution	√	The use of technological elements that act as a source of income for the space, such as digital games	√
	Digital management should be controlled and intelligent like	√			Smart control of carbon emissions	√		



	electronic payment and GIS					
	Using cameras to monitor the vacuum	√	Use of Wi-Fi networks	√	Providing smart waste containers	√
	Providing digital seats	√				
Total	100		%25		%70	%80

IV. EXPERIMENTAL RESULTS

- Urban spaces are primarily sustainable and resilient spaces that use technology to facilitate the implementation of sustainability and resilience. Sustainability and Resilience are a prerequisite for achieving intelligence alongside technology, not the other way around.
- Intelligence in urban spaces does not mean the use of technology only, but rather solving the problem in a better and easier way is considered intelligent.
- The smart urban space is the product of the impact of smart city applications on the spaces.
- Sustainability and Resilience are achieved by specific needs, such as achieving social and economic needs, as well as environmental and institutional needs.
- The smart urban space is part of the smart city. It is the formation of the urban space in its physical form and special features, in addition to the applications of smart cities.
- After applying the proposed design criteria matrix to the different models of the analyzed spaces, which is the urban space of Boston and Singapore, it was found that each type of urban space has its own smart design criteria.
- Achieving the principle of enjoyment in the streets and squares is weakly present, and the principle of a sense of belonging is almost non-existent in all spaces except for gardens, but this does not indicate that this principle does not require its presence in this type of spaces, but from the researcher’s point of view that this principle must be achieved in all types of spaces While the principle of enjoyment does not require its presence in all types, especially the streets, it does not require that because the street is more functional than it is for enjoyment.

V. CONCLUSION

After studying the analytical study of a group of urban spaces for smart global countries An analysis of a group of study models whose spaces are based on the application of smart standards for urban spaces. we was reached to Intelligence in urban spaces does not mean the use of technology only, but rather solving the problem in a better and easier way is considered intelligent, The smart urban space is the product of the impact of smart city applications on the spaces, After applying the proposed design criteria matrix to the different models of the analyzed spaces, which is the urban space of Boston and Singapore, it was found that each type of urban space has its own smart design criteria, and Achieving the principle of enjoyment in the streets and squares is weakly present, and the principle of a sense of belonging is almost non-existent in all spaces except for gardens, but this does not indicate that this principle does not require its presence in this type of spaces, but from the researcher’s point of view that this principle must be achieved in all types of spaces While the principle of enjoyment does not require its presence in all types, especially the streets, it does not require that because the street is more functional than it is for enjoyment. and we was reached to some recommendations :

, recommendations:

- Urban spaces are an indispensable part of the urban system, as it reflects the identity of the community and its cultural background.



- What is more important than applying technology is to achieve the actual needs of the user and adapt them by using technology so that the void is an expression of society.
- The integration of the application of Resilience with sustainability with technology inside the space well contributes to the success of the smart space
 - Encouraging the use of technology in all types of urban spaces to organize and preserve these spaces.
 - The importance of the designer's awareness of the cultural characteristics of the target group in order to succeed in developing the necessary technology to serve the space.
 - The community must be involved in decision-making for the design of the space to succeed.
 - At the level of graduate students, attention should be paid to increasing research that discusses the modern trends of urban spaces to keep pace with development.
 - Urban spaces should be child-friendly, providing accessible, safe, inclusive and vibrant spaces.
 - Urban spaces must be multi-media and zero-visibility.
 - The urban areas must be intertwined with nature and green in order to care for a flexible, clean and healthy environment
 - Paying attention to the use of technology in vacuum brushes is one of the important elements that facilitate the use of vacuum. The following are some elements of vacuum brushes that depend on technology and facilitate its use and affect it functionally, aesthetically and designly. Sustainability and Resilience are achieved by specific needs, such as achieving social and economic needs, as well as environmental and institutional needs

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