

Key Elements In City Formation

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الملخص

يعد تطور المدن الذكية موضوعًا شائعًا بين المهندسين المعماريين والمخططين. لقد تم تبني مفهوم المدن الذكية عالميًا من قبل العديد من المدن لتعزيز الذكاء الحضري في مختلف المجالات. إن مصطلح "المدينة الذكية" جذاب ومرغوب فيه، ويجذب المهندسين ذوي التخصصات المتنوعة.

إن النظر في جميع العناصر التي تساهم في إنشاء مدينة واقعية تلبي احتياجات السكان أمر بالغ الأهمية، عليه عدم القيام بذلك يمكن أن يكون له عواقب سلبية وخيمة على المجتمع المحلي والبيئة المبنية. التحدي الحالي الذي يواجهنا في التصميم والتخطيط هو بناء أنظمة أصبحنا نقبلها على أنها ذات قيمة ولكنها في الواقع تخل بالتوازن الطبيعي. لتحقيق الانسجام بين البيئتين الطبيعية والمادية ينبغي عند تخطيط المدن الذكية التأكيد على هذا التوازن، باعتباره أمراً حيوياً للبيئة الاجتماعية. يتمتع كل مكان بجوانب طبيعية واجتماعية فريدة تمنحه هوية وشخصية مميزة.

تهدف الأنظمة التكنولوجية إلى زيادة الكفاءة بأي ثمن، وغالباً ما يتم قياسها من الناحية الاقتصادية والعائد من تحويل المواد المادية. يجب أن تلبي الأنظمة المعمارية والتخطيطية احتياجات البشر الأحياء. يكون الشخص حكيمًا وعقلانيًا إذا نجح في التكيف مع بيئته. ومن خلال اتباع العقلانية والمنطق، يتصل الأفراد بالأنظمة التي تمكنهم من التكيف الأمثل مع بيئتهم المحلية ومجتمعهم. لقد أصبح مفهوم "المدينة الذكية" سمة مؤسسية للتحويل إلى مجتمع المعلومات، ومن هنا تكمن المشكلة في تحديد دور الهوية في تحول المدينة إلى الدولة الذكية.

تتطرق هذه الورقة إلى بعض العناصر الأساسية التي تؤثر بشكل مباشر على تكوين المدينة، بما في ذلك العقلانية والتكنولوجيا وهوية البيئة المبنية بما في ذلك هوية المدينة وهوية البيئات الطبيعية. إن فهم هذه العوامل أمر بالغ الأهمية لتطوير المدن ليس فقط مدن ذكية بل متناغمة ومستدامة أيضاً.

الكلمات الرئيسية

الهوية، البيئة المبنية، المدينة الذكية، الطبيعة، العقلانية، التكنولوجيا، الاجتماعية، الأبعاد. العمارة والتخطيط والتشكيل.

Abstract

The evolution of smart cities is a popular topic among architects and planners. The concept of smart cities has been embraced globally by many cities to enhance urban intelligence across various fields. The term "smart city" is appealing and desirable, attracting engineers with diverse specializations.

Considering all elements that contribute to creating a realistic city that meets residents' needs is crucial. Failing to do so could have severe negative consequences for the local community and the built environment. Our current challenge in design and planning is to build systems we have come to accept as valuable but in fact disturb the natural balance. To achieve harmony between natural and physical environments, smart city

planning should emphasize this balance, as it is vital for the social environment. Each place has unique natural aspects that give it a distinct identity and character.

Technological systems aim to increase efficiency at any cost, often measured in economic terms and the return from transforming physical materials. Architectural and planning systems should meet the needs of living humans. A person is wise and rational if they successfully adapt to their environment. By following rationality and logic, individuals connect to systems that enable optimal adaptation to their local environment and community. The concept of the “smart city” has become an institutional feature of the transition to the information society, and hence the problem lies in determining the role of identity in the city’s transition to an intelligent state.

This paper will explore key elements that directly influence city formation, including rationality, technology, and the identity of the built environment including the city’s identity and natural environments identity. Understanding these factors is crucial for developing cities that are not only smart but also harmonious and sustainable.

Key words

Identity, built environment, city, smart, nature, rationality, technology, social, dimensions. architecture, planning, formation.

Introduction

To develop a conceptual framework for a rational and sustainable smart city, it is crucial to understand the relationship between the smart city concept and the built environment, social identity, and natural environment. A clear understanding of these relationships is essential for forming a sustainable smart city. This study focuses on three key elements that significantly impact the city’s form: rationality, technology, and built environment identity. It aims to identify the essential functions, meanings, and aspects associated with the concept of a sustainable smart city.

While the term “smart cities” is widely used, it does not necessarily mean that cities labeled as such are truly smart. A city is more than just a collection of buildings, and the mere application of advanced technology does not ensure optimal functionality. Engineers, planners, and political decision-makers must conduct comprehensive studies of all elements that contribute to creating a smart city with minimal negative impacts. Each region, with its unique identity, retains its social character and global significance.

The outcome of this study provides a vital conceptual foundation for understanding changes within the built environment identity. It discusses crucial elements that contribute to the sense of a sustainable smart city and addresses the definition of built environment identity, including the city’s identity.

The Identity of the Built Environment

Identity is always evolving and changing. It is viewed as a dynamic concept of construction and transformation from one stage to another (Agnew, 1981, p.88). Identity can also be seen as a source of historical construction. The sense of identity is

determined by maintaining a series of basic bonds, beliefs, principles, and commitments. These variables are connected to important issues such as uniqueness, dignity, and reputation. The term identity may also relate to significant qualities and values such as religion and beliefs. Therefore, any attempt to develop the city's structure or change the built environment should emphasize making cities and the built environment more inclusive, safe, resilient, and sustainable to improve people's lives.

Identity requires control at all levels. In any context, identity needs a stable social foundation. As White (1992, p. 312) notes, identity involves both fury and fear, as well as sweetness and light, because it seeks control. Identity is urgent, and its expression is equally urgent. While smart cities offer many benefits, they also come with risks and dangers that could overshadow social dimensions such as privacy and commitment. Therefore, control is necessary during the planning or alteration of the natural and built environment.

Control is crucial in any context to develop a balance between different identities and to maintain continuity and development. White suggests that identity and control are rooted in the older concepts of social organization and social structure. Thus, identity and a sustainable built environment can be seen as sources of social achievement.

The concept of identity can also be linked to an object, such as a place or a building. This object has specific characteristics that define its unique identity, distinguishing it from others. Therefore, the importance of identity within architectural production is essential for architects. The sustainability of smart buildings is vital for the long-term well-being of a smart city. A smart building uses digital-based automatic procedures to manage its systems, such as lighting and control systems. These buildings must be climate-flexible and resilient to adverse climate conditions.

Identity and the City

The city can be seen as a physical biography, representing both the built environment and national identity. Smart cities should play a crucial role in promoting sustainable development. Therefore, the goals of architects, planners, and decision-makers in smart planning should focus on creating sustainable cities and communities.

A city is a hub of diverse cultural and economic activities. Its meaning is tied to the social events, interactions, and associations that occur within it, reflecting the image and culture of its society. Successful smart city planning should be a key factor in developing a sustainable built environment. It involves a compilation of urban planning strategies with far-reaching benefits, including natural, built environment, and social dimensions.

The unity and interaction between people and the city can foster sustainability and influence the development of the built environment. Unfortunately, these developments have not always been positive.

The landscape, open spaces, streets, private places, and public areas are all integral parts of the city. As planning and urbanization progress, many cities face challenges such as environmental degradation. To achieve sustainable cities and communities, city planning must ensure the creation of sustainable places with clean technology, parks, streets, pathways, and urban sustainability principles.

The role and meaning of a city and its neighborhoods are deeply connected to the memories, attachments, and histories of its people. These characteristics express both individual and group identities. The visual impact of a city's identity partly relies on its unity. Doxiadis (1968) emphasizes the importance of perception, noting that better quality and performance are often achieved through it. He also suggests that the beauty of any object depends on perception. By using visual stimuli, we can gather information that helps us work positively.

In old cities, the concepts of place and community are well-defined. However, modern developments, such as those in Tripoli, Libya, often suffer from confusion and a lack of unity and harmony. Rapid urban expansion in countries like Libya has disrupted the balance between social needs and physical characteristics. Addressing both quantitative and qualitative issues is essential to maintain cities in good working order.

The transition from traditional cities to smart cities is a strategic initiative of modern economic systems, embraced by an increasing number of cities worldwide. For national governments, developing smart cities supports the national strategy for the digital economy's growth.

Today, cities are more a product of industrial rather than social construction. The creation of a unique identity is always a societal product and is preserved by society. The primary goal of smart cities must be to provide advantages for their residents, ensuring an improved quality of life.

Identity and the natural environment

The qualities of natural environment are crucial in defining the identity and sustainability of the built environment. The people in different parts of the world live in different natural environments, which have a direct impact on their sense of place (Lawrence, 1987). The climatic conditions have a major impact on the formation of many cities over the world. Natural environment must be at the heart of our cities: the places we work, play and engage. Urban nature-based solutions address multiple challenges, including climate change and biodiversity loss, security, missing of social interactions, human health and socio-economic development.

Thus, the value, quality, unity, symbolism, meaning, and history of a city are partly found in the quality of its physical structure. However, these values and the connection between the past and the future have been eroded in the modern era (Rossi, 1982). Traditional cities exemplify the integration of social and physical contexts. In contrast, many modern cities lack this integration due to insufficient public participation and responsibility in decisions about their built environment. The sense of value and quality in towns is built on a solid foundation and image, as we see today.

The concept of smart cities is flourishing in many countries worldwide, evolving and transforming the structural fabric of existing cities. McHarg (1992) argues that throughout all stages and environments of human life, ties to the natural environment are crucial for enhancing the quality of life. Both people and nature benefit when the natural environment in and around cities is enhanced and protected.

Sustainable urban development can only be achieved by meeting climate adaptation and mitigation goals. The close relationship between a city and its natural context enriches the identity of the built environment. Therefore, efforts must focus on developing the unique qualities of each place and maintaining and protecting natural environments. It is now widely recognized that undermining nature can lead to significant environmental changes and potentially large-scale, even global, disasters for humanity.

To achieve a harmonious relationship between natural and physical environments, it is essential to emphasize this harmony as an advantage to the social environment. This can be achieved through a deep understanding of the natural environment by architects and planners when designing and transforming buildings and cities.

Landscape plays a crucial role in strengthening the physical character of a city. Harmonizing and integrating the natural fabric and order of a place are essential for creating a sustainable physical environment. Each location has unique natural aspects that contribute to its distinct character. Therefore, architects and planners should consider the character of the place in their designs. As Morris (1971, p. 35) states, "Whatever magnitude or form is required in these designs, the architect must take nature for his guide, let the spot direct him to the dress and ornaments, and in a great measure to the use and conveniences requisite for the proprietor."

The relationship between cities and the natural environment has always been significant, yet often strained. The expansion of metropolitan populations and urban land use has reshaped and sometimes destroyed natural landscapes and environments. This tension arises because cities can have massive negative effects on the natural environment.

A city should reflect the harmonious interplay between human activity and nature. The identity of a city in relation to the natural environment should not be about dominating

nature but rather interplaying with it and taking care of it (Kutcher, 1973). Therefore, the natural environment should be considered a vital feature when investigating the sustainability and identity of the built environment.

The next step was to identify elements of the built environment that directly represent its sustainability and identity. This study found that certain elements of the physical environment are crucial for constructing a sustainable and identifiable built environment. Natural environments, such as the countryside and the sea, are essential for maintaining this sustainability and identity. Additionally, other physical elements in the city, such as homes, streets, open spaces, markets, and mosques, are directly related to the built environment's identity. Each of these elements plays a significant role in shaping people's sense of identity. Any transformation and development in these elements can alter the identity and sustainability of the built environment. Protecting the natural environment through the formation of new cities or the development of existing ones is key to a sustainable built environment.

Policies for new urban developments should include nature as a fundamental component of local climate and sustainability plans, which are even more effective when combined with commitments to end deforestation. The creation of new cities should support biodiversity and make human habitats more adaptable. Incorporating nature into cities enhances their livability, especially for vulnerable populations, by reducing temperatures, filtering water, and cleaning the air.

Rationality and Technology

The crisis of validity standards is fundamentally a crisis of rationality, which extends beyond any single field. Architecture and planning are not alone in facing this challenge; the crisis of rationality permeates all areas of life. Every civilization's crisis is invariably accompanied by a crisis in its rationality. In architecture and planning, the relationship between rationality, validity, and meaning is often ambiguous. Therefore, comprehensive studies and increased attention across entire cities are essential to enhance and improve various public services and functions.

"Smart cities" should be designed to facilitate easier navigation of traffic, access to essential services, efficient energy use, and more for both citizens and visitors. Urban sustainability is a crucial component of smart cities. Achieving this requires significant investment in efficient and environmentally-friendly energy management. Technological systems should enable the transmission of decentralized, clean, and sustainable energy throughout urban areas via intelligent, digital-based networks.

The rationality of values and goals is established during the decision-making stage of any situation. In the phases of value design, planning, and operation, the rationality of these values and goals should be evident and driven by local orientation.

Technology operates according to its own rules and overarching plan. When we analyze technology historically and consider the entirety of its development, we see that the technological system possesses its own independence. The prevailing trend within this system, evident through its various branches, is a continuous increase in efficiency. The rationality of technology lies in this constant and relentless drive for improvement.

Smart cities leverage digital technology and data to enhance decision-making and improve the quality of social life. Therefore, in planning or developing cities, it is crucial to select appropriate smart technologies and solutions that provide a better understanding of current conditions, forecast future changes, optimize city functions, and offer effective solutions. The use of evolving technologies, including artificial intelligence, the Internet of Things, and block chain, has the potential to significantly transform urban living for the better.

The issue with the technological system is its relentless pursuit of increased efficiency at any cost. Efficiency in this context is often measured in economic terms, focusing on the returns from transforming physical materials. However, this drive for efficiency comes with significant costs. In human terms, the impact has been and continues to be very negative. The environmental destruction and the ongoing environmental crisis are largely consequences of the technological system.

This system prioritizes efficiency on a global scale, driven by fierce competition among industrially advanced countries, all seeking economic profit through increased efficiency. The result is a significant imbalance in nature. This is not about emotional posturing or romantic gestures; blaming individuals, especially politicians and decision-makers, for the environmental crisis is misguided. There is an irreversible logic in technological development, as the rationality of technology demands ever-increasing efficiency, making it a dominant force.

However, modern technology also provides cities with the capability to monitor, control, and manage urban facilities and devices remotely. It creates new insights and actionable information from real-time data streams, offering potential solutions to some of the challenges it has created.

The expansive reach of technological systems significantly impacts architects, designers, and planners, as these systems permeate numerous aspects of our experience. While the importance of other disciplines may be even more evident than that of technological or physical systems, it is crucial to recognize that the three formal systems—logic, physical, and technological—play vital roles.

In the context of smart cities, intelligent urban mobility and transportation networks are essential. Urban needs such as multi-modal transportation, smart traffic management, street lighting, and smart parking must be integral to smart city concepts.

The challenge lies in our tendency to prioritize logic, science, and technology, often overlooking the nature and personality of the designed object and the end user. There are no universal standards applicable to all places, city formations, or architectural and planning systems at all times.

Rationality in urban contexts is primarily related to architectural, planning, and transportation systems. This concept of rationality extends beyond these fields, always linked to the system it governs, regardless of its appearance or application.

Our current dilemma in design and planning is the construction of systems we deem valuable but that ultimately hold us back. Under the influence of the physical sciences, we unconsciously attempt to shape our architectural systems and other physical environment elements—such as streets, open spaces, and markets—to mimic the perceived perfection of physical systems. However, despite our efforts to integrate science and technology into architectural and planning systems, these systems transcend science and technology and cannot be reduced to them. They serve different functions, have different reasons for existence, and therefore embody a different rationality.

When developing cities, it is crucial to consider not only technological factors but also physical and social factors. This holistic approach can minimize the contradictions and negative consequences of development. In fact, smart cities pose significant challenges to culture, human psychology, and social structures. Addressing these challenges requires serious adaptation of social dimensions to ensure social acceptance and support for smart cities. Without considering these risks, the concept of smart cities cannot be effectively planned and implemented. Maintaining social responsibility is essential for fostering a sustainable built environment (figure 1).

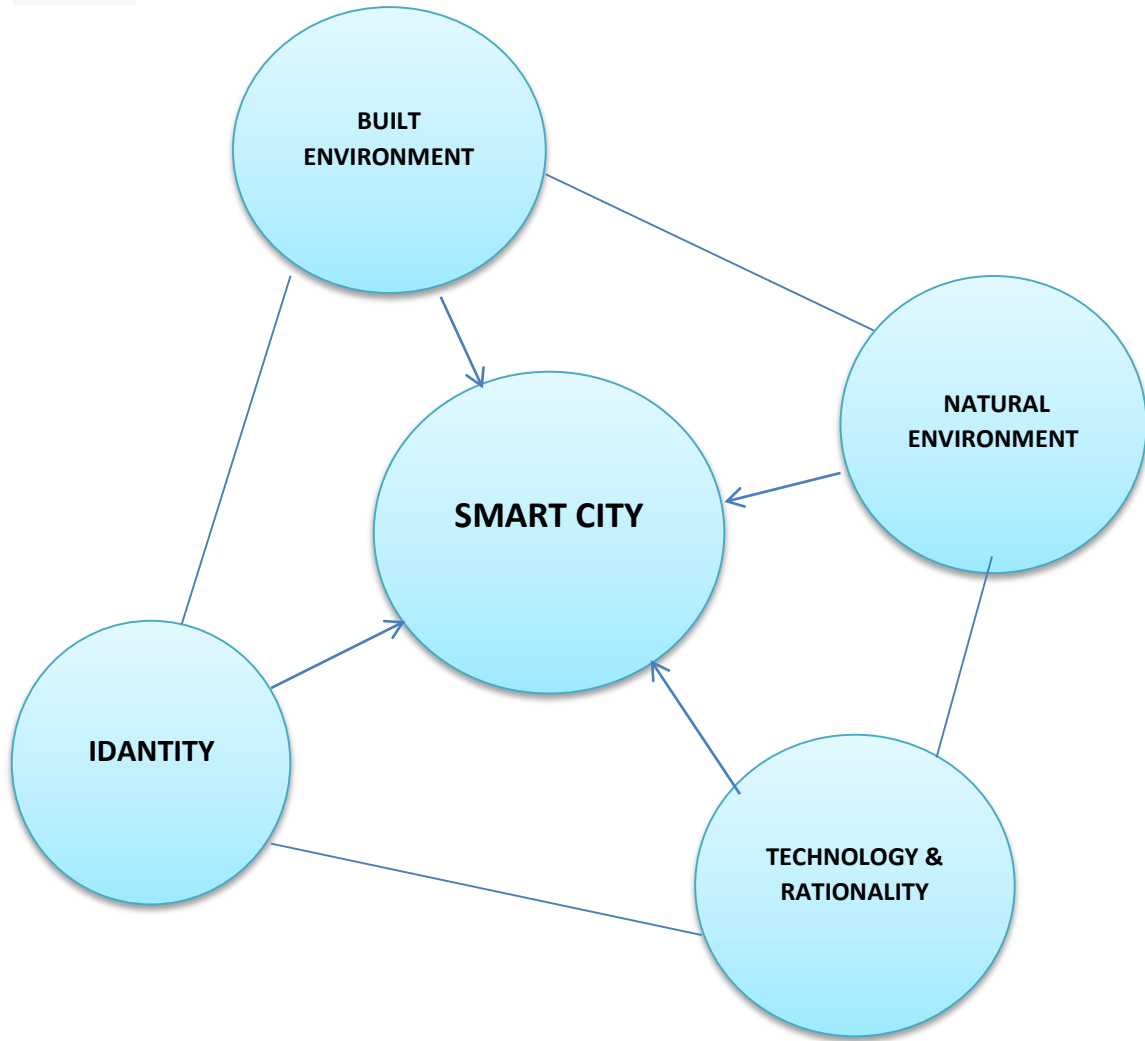


Figure 1: Interrelation between Technology and Rationality, Identity, Natural Environment In Smart Cities

Figure 1: visualizes the complex relationships between key elements in smart city formation. Each factor plays a critical role in shaping urban environment.

- 1-Smart city (Central Node): The core concept that integrates all elements.
- 2- Identity: Represents cultural heritage, social values, and architectural uniqueness. Directly influences the Built Environment, ensuring urban planning aligns with cultural and historical contexts.
- 3- Technology: The driver of efficiency and innovation in cities. Enhances urban efficiency by optimizing transportation, infrastructure, and city management.
 - Impacts of the Built Environment through smart infrastructure and digital solutions.
 - Interacts with the Natural Environment by implementing green energy, smart grids, and waste management solutions.
- 4- Natural Environment: The foundation for sustainability and ecological balance.

- Directly linked to Sustainability, ensuring cities are climate –resilient and eco-friendly.
- Affects of the Built Environment by influencing green architecture and land-use Planning.

5- Built Environment: The physical representation of identity and technology.

- Bridges the gap between cultural identity, Sustainability and urban development.
- Must incorporate elements from Identity, Technology, and the Natural Environment to achieve balanced growth.

Key Insights:

- Smart cities require a balance between innovation, identity preservation, and sustainability.
- Technology should not overshadow cultural heritage but enhance its integration into modern urban planning.
- The natural environment should remain at the core of smart city designs to ensure long-term livability.
- Cities that successfully integrate these elements create livable, sustainable, and efficient urban spaces.

Mutual Impact of Technology, Natural Environment, and Identity in Smart Cities

The importance of three key elements in relation to sustainable smart cities:

- Technology drives Urban Efficiency, enhancing transport, infrastructure, and smart services.
- Natural Environment ensures Sustainability , supporting green policies and climate resilience.
- Built Environment is influenced by all three factors, balancing culture, technology, and nature.

Mutual Impact of Technology, Natural Environment, and Identity in Smart Cities

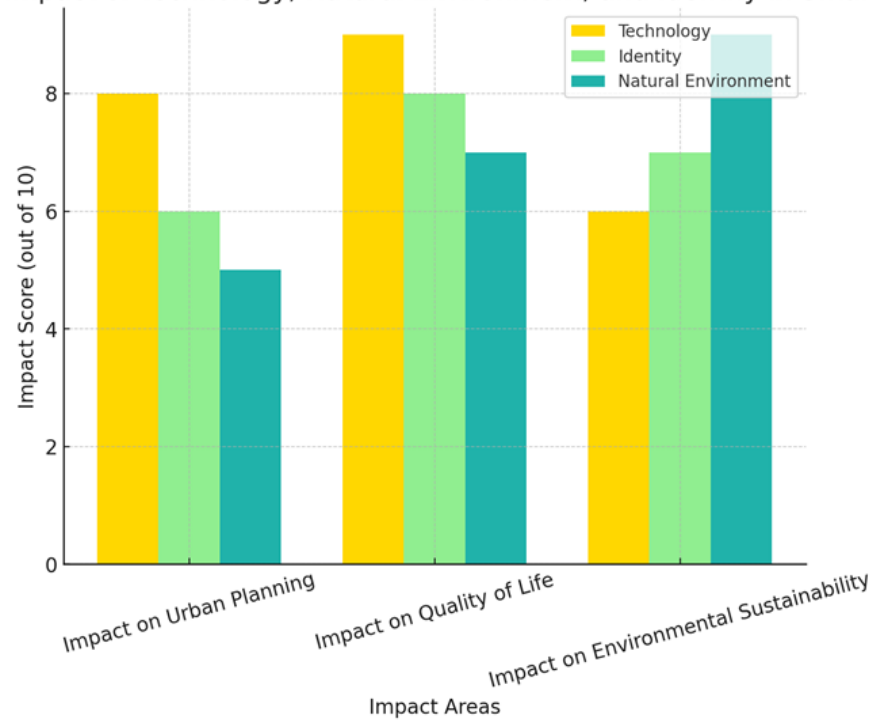


Figure 2: Mutual Impact of Technology, Natural Environment, and Identity in Smart Cities

The above chart highlights how these three elements impact key urban aspects:

- Urban Planning: Technology plays the biggest role, while nature and identity provide secondary influences..
- Quality of Life: Technology is dominant, but identity and environment also contribute to well-being.
- Environmental Sustainability: The natural environment has the highest influence, followed by identity and technology.

Proportional Influence of key Elements in Smart Cities:

- Smart cities require a balance between technological advancement, environmental sustainability, and identity preservation.
- Technology enhances efficiency, but should not overshadow local culture or ecological health.
- The natural environment is crucial for long-term urban resilience.
- Cities that successfully integrate these three factors create livable, unsuitable, and efficient spaces.

Proportional Influence of Key Elements in Smart Cities

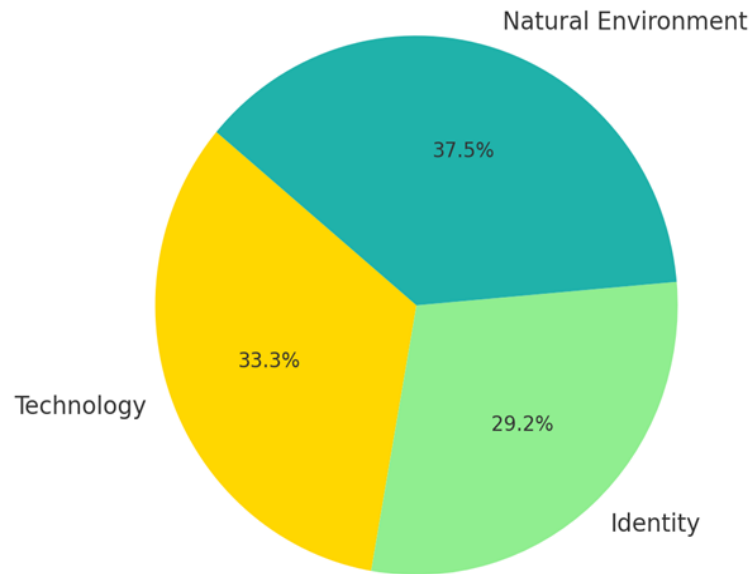


Figure 3: Proportional Influence of key Elements in Smart Cities

This pie chart visually represents the relative importance of each factor:

- Technology (33.3 %) – Drives innovation, automation , and smart city function.
- Identity (29.2 %) – Ensures cultural uniqueness and urban character.
- Natural environment (37.5 %) – plays the largest role in sustainability and climate adaptation.

Conclusion

This study aimed to explore the relationship between sustainable smart cities, their identity, rationality, and technology, to guide the development of a sustainable built environment, social fabric, and natural environment. It included definitions of identity as a whole, the identity of the built environment, the city, and the natural environment, as well as the role of rationality and technology in creating a sustainable and healthy built environment. These essential elements are crucial for improving people's lives and leading to positive transformations that will produce smart, sustainable built environments and smart city formations for local residents.

The application of smart technology must be directly related to human welfare without compromising identity, the natural environment, or locality. Assessing a city's progress towards greater smartness should focus on human-centric criteria, emphasizing the

potential impact on the quality of life, communities, and the built environment as a whole.

In the future, our living and working conditions, as well as our understanding of quality of life, may change. However, our desire to create sustainable smart built environments must continue to prioritize social dimensions such as harmony, continuity, memory, privacy, and safety.

The formation of smart cities requires social willingness and support. The quality of daily life is not only a function of smart cities but also a condition for their formation and development. In turn, smart cities are influenced by the quality of life and social factors, which determine the risks associated with their formation and development.

Addressing the main problems encountered in cities through a science and technology approach leads us to the concept of sustainable smart cities. Today, it has become essential to offer citizens effective solutions to urban problems to ensure a sustainable environment, high living standards, and the efficient use of new city technologies and resources.

This study highlights the importance of four key elements in relation to sustainable smart cities, which require further research: rationality and technology, identity and the natural environment, identity and the city, and the identity of the built environment.

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