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The role of sustainable digital communities in accelerating urban recovery

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Abstract

Today's cities are witnessing an acceleration in the pace of changes accompanying their urban fabrics resulting from the time stages they have gone through, starting with their constant need for development and reaching their rapid response to emergency conditions such as wars and pandemics and the resulting emergency interventions put pressure on urban fabrics with services. that worked to quickly solve emergency problems in the short term, but were the main reason for the accumulation of spatial problems in the long term; With the development of the time factor and the increasing need of cities to achieve sustainable development goals and raise their ability to keep pace with the global trend in digitization processes and artificial intelligence applications, it was necessary to provide a supportive tool that is mainly based on burdening the pillars of local communities with the basic pillars of digitization processes specific to digital communities and working to interrupt each of them to achieve flexible local communities that have the ability to raise the efficiency of their urban links and enhance their acceptance of various emerging changes in the city and keep pace with various emerging developments in it, which in turn is the supporting basis for accelerating urban recovery processes. As a result of the above, the research aims to find a research tool that identifies the basic pillars that local communities need to increase their ability to accept digitalization processes and artificial intelligence applications in preparation for accelerating urban recovery processes in the city.

Keywords: Urban Fabric, Local Community, Urban Links, Urban Recovery.

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دور المجتمعات الرقمية المستدامة في تسريع تحقيق التعافي الحضري

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الملخص:

تشهد مدن اليوم تسارع في وتيرة التغيرات المرافقة لأنسجتها الحضرية والناتجة عن المراحل الزمنية التي مرت عليها ابتداءً من حاجتها الدائمة للتطور وصولاً الى استجابتها السريعة للظروف الطارئة من حروب وجوائح وما نتج عنها من تدخلات طارئة عملت على ضغط الانسجة الحضرية بخدمات جديدة أدَّت الى حل الإشكاليات الطارئة بسرعة على المدى القصير ولكن كانت السبب الرئيسي في تراكم الإشكاليات المكانية على المدى البعيد؛ ومع تطور عامل الزمن وازدياد حاجة المدن لتحقيق أهداف التنمية المستدامة ورفع قدرتها على مواكبة الاتجاه العالمي في عمليات الرقمنة وتطبيقات الذكاء الاصطناعي كان لابدَّ من توفير أداة داعمة ترتكز بشكل رئيسي على تثقيل ركائز المجتمعات المحلية بالدعائم الأساسية لعمليات الرقمنة الخاصة بالمجتمعات الرقمية والعمل على مقاطعة كلا منهما وصولاً الى تحقيق مجتمعات محلية مرنة تملك القدرة على الرفع من كفاءة روابطها الحضرية وتعزيز تقبلها لمختلف التغيرات الناشئة في المدينة وفي مواكبة مختلف التطورات الناشئة فيها والتي بدورها تعد الأساس الداعم لتسريع عمليات التعافي الحضري. نتيجة لما سبق يهدف البحث الى إيجاد أداة بحثية تحدد الركائز الأساسية التي تحتاجها المجتمعات المحلية للرفع من قدرتها على تقبل عمليات الرقمنة وتطبيقات الذكاء الاصطناعي تمهيداً لتسريع عمليات التعافي الحضري في المدينة.

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الكلمات المفتاحية: النسيج الحضري، المجتمع المحلي، الروابط الحضرية، التعافي الحضري.

Introduction:

Local communities are the fundamental pillars that cities need to advance in any development process related to their urban fabric. However, as time has progressed, the increasing demand for societal needs and the emergency conditions faced by cities have led to various behaviors that have fostered the emergence of different spatial problems. This, in turn, has necessitated the integration of intelligent applications. Artificial intelligence and supporting digitization processes have become essential for keeping pace with development and enhancing the efficiency of local communities. All these factors are directly related to cities' need to expedite urban recovery, improve the effectiveness of their urban fabric in addressing spatial issues, fill existing gaps, and accelerate the implementation of new urban approaches and ideas that contribute to urban development.

Research Problem:

The transformations of cities accelerate with the passage of time and the increase in spatial problems accompanying the urban fabric, as a result of the development of the city on the one hand and the emergency circumstances that have occurred in it, such as crises and pandemics, on the other hand. City researchers and planners continue to search for a supportive tool that is based on the foundations of local communities and works to balance the requirements of digital societies to achieve sustainable digital societies that accelerate urban recovery processes and keep pace with various future developments

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Theoretical framework:

First, the local community:

A local community is defined as a group of individuals who live in a specific geographical area and share many diverse life practices and activities. Such as political, economic, social, and other activities (Kabar, 2023). It is a social system based in a specific place that is based on the processes of interaction and integration between individuals to maintain its stability. Talcott Parsons (defined) the stable social system as the system in which societal behavior is organized [in the city]; It is a major reference point for social analysis of the dynamics of social systems, and a working system [based on creating] relatively stable interactions between individuals around common norms... and processes through which individuals are motivated to act by [developing and strengthening the social structure and maintaining the effectiveness of social dynamics within the city] (Wood, 2014). Local communities are densely connected clusters of nodes that are discovered and evaluated based on local information and their degree of affinity and relationships with neighboring nodes (Chen, Zaïane, & Goebel, 2009, p. 1), on the other hand, Tischler addressed the definition of human society as a group of people who live and interact within a common area, and share the same culture (Roches, et al., 2020, p. 250); A local community is a community based on evolutionary social and ecological dynamics which is defined as a framework for the integration of social, ecological and evolutionary patterns and processes that emerge clearly through interactions and feedback between human society and the environment (Roches, et al., 2020, p. 250).

Local communities in the past – and until the recent past – tended to be closed systems, that is, concentrated on clear and relatively impermeable borders and with restricted and ineffective urban ties, but with the development of the time factor, communities were accompanied by the increasing movement of symbols, people, goods, and life forms of all kinds And the accompanying changes in values that push towards greater openness [i.e.the trend towards digitization and the exchange of big data] (Anderson, 1999, p. 458). French researcher and diplomat Jean-Marie Guéhenno confirmed this when he wrote, "We are entering the era of open systems, whether at the level of states or institutions, and the criteria for success are completely different from the criteria for success in the world" (Anderson, 1999, p. 458). The open system is the system that is interchangeable with the external environment (neighborhoods), whether in energy or mass (matter).

By projecting open systems onto local communities, it will be realized that the effectiveness of the local community increases further when it strengthens its urban ties in a way capable of achieving integration and interaction with the neighborhood, that is, interaction. With other supporting local communities, as the effectiveness of these links develops and their ability to exchange materials and energy as a first level, one moves to the level The highest is data exchange; But the main point in this context lies in the effectiveness of these links for transferring data and openness towards digitization processes and the integration of artificial intelligence applications.

As a result of the above, the basic pillars that the local community needs to introduce at the digital level were deduced.

Local community pillars for digital introduction:

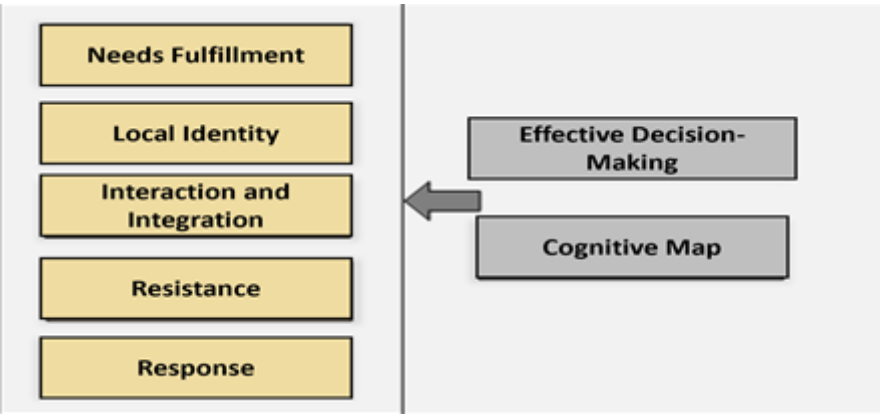

Figure (1): Local community pillars

Source: Prepared by the researcher

The main pillars that the local community needs to increase its efficiency and ability to accept the urban project begin with needs fulfillment and strengthening local identity while achieving interaction, integration, and the ability to resist and respond. These pillars do not achieve the desired goal unless

Second: The digital society:

The digital community is defined as a space for social and technical innovation that works to integrate new forms of digital social interactions and work to reshape old social interactions and mediate them through the introduction of various new technologies (Yoo, Bryant, & Wigand, 2010). The digital society is based on the extent to which the physical connections and physical connections that make up the urban fabric accept digital data, which in turn raises the most prominent question, which is how information technology can work to reshape the approaches and methods by which space and place are experienced (Yoo, Bryant, & Wigand, 2010). Based on this point, digital societies were defined as digital layers that are added to the basic layers of local society (economic, social, cultural, and other layers), and the extent to which these layers interact and integrate and their effective management to the extent that they are reflected in a way that creates new social dynamics that work to Connect and separate at the same time, that is, simply feeling the place, and creating a framework for a cohesive set of processes that branch out Or deviate, resume, or change [depending on its condition in the city] to achieve more open and effective civic participation to address the social, economic and cultural pressures and challenges that many cities face today.

Third: Local community, digital society, and sustainability:

Digital cities integrate urban information, create public spaces for people living in cities, and provide an opportunity for people to create a new information space for their daily lives. Based on this point, it was necessary to know how digital cities connect with physical cities [the urban fabric] to become an imaginable city, that is, adding a new digital level to the basic levels that make up the urban fabric. Interestingly, most

studies of cyberspace and digital cities are influenced by the spatial knowledge of cognitive mapping[(1)]... Which was developed by Kevin Lynch[(2)] (1960) in his study of the city, through which he relied on five different elements to build a digital city in a physical city: paths, edges, landmarks, nodes, and regions, to depict the shape of the physical city as a mental map. Lynch also provided a theoretical framework for studying cognitive maps, urban form, and spatial relationships of cities... And how ordinary citizens use their abilities to visualize city spaces and help them better orient themselves spatially (Chang, 2002, p. 110).

Table 1: Requirements for connecting digital cities to physical cities

Yu-Tung Liu	Martin Dodge	Manuel Castells	Kevin Lynch	متطلبات ارتباط المدن الرقمية بالمدن المادية
Movements ▪ Interactions ▪ Sound Effects ▪	Physical Infrastructure ▪ Traffic Flows ▪ Demographics of Cyberspace Communities ▪	Digital level efficiency ▪ Data transfer and processing speed ▪ Efficiency of network nodes and hubs ▪ Spatial organization [of vertical links, i.e., management] ▪	Paths ▪ Edges ▪ Features ▪ Nodes ▪ Regions ▪	

Source: Prepared by the researcher

From another point of view, Manuel Castells (in turn) focused on the social level and how to prepare physical links to introduce digital levels into the city, relying on three layers of materials: The first layer depends on the efficiency of the digital level that is introduced into the city, which depends on the speed of data transfer and processing. The second layer depends on the effectiveness of nodes and network hubs. The third layer depends on the spatial organization [of vertical links, management].

As for Martin Dodge [(3)], he worked to introduce the digital level and focus it on the physical infrastructure, on traffic flows, and the demographics of the new [digital] cyberspace communities with the ability to perceive and visualize these new digital spaces. As for the research conducted by Yu-Tung Liu [(4)] on digital space, he based his study directly on three main pillars of the city: movements, interactions, and sound effects. (Chang, 2002, p. 111).

By comparing the previous theories and as a result of the above, it was realized that the social level is the basic rule that must be adopted with the aim of introducing various new levels, including digital ones, that is, focusing on the effectiveness of local communities and their ability to accept any new change or addition, which in turn is built on the cognitive maps formed by individuals, visitors, residents, and passers-by. Inplace, that is, the process of spatial awareness of the urban fabric. (Chang, 2002, p. 114)

[1] **Cognitive map**: It is a spatial representation of the external world that is maintained within the mind until an actual manifestation (usually, a drawing) of this perceived knowledge is created, called a mental map. When the following definition and its link to cities are dropped, it is defined as the residents' knowledge of their city.

[2] **Lynch**: Kevin Andrew Lynch, American city planner and book author. He made important contributions to the field of city planning through empirical research on how individuals perceive the urban landscape and navigate the city, and explored the presence of the time factor in the urban environment.

[3] **Martin Dodge**: Researcher and computer technician at the Center for Advanced Spatial Analysis, University College London.

4 **Yu-Tung Liu**: An architect from National Chiao Tung University, whose works relate to digital space and its relationship with place.

As a result of the above, it is concluded that the relationship between the digital city and the physical city is not a division, but rather an expansion of the definition and boundaries of the city space through interaction and construction between the existing physical links at the physical level in the city and the digital level added to the city, which in turn works to enhance and understand the place When understanding and realizing the nature of place and then interrupting it with the social level, the way of thinking in society is involuntarily transformed from consumption to production and to promoting the optimal use of resources and by working to achieve a balanced framework that combines all the links that make up the urban fabric in the city, that is, moving forward seriously in the approach Sustainability.

Fourth: The urban recovery phase in the city:

The urban recovery phase is an important stage that is not limited to cities exposed to risks and emergency crises such as earthquakes, pandemics, or wars. Rather, it is an important stage that must be adopted by any city with a rapid flow of people, money, and services that is constantly threatened by spatial complexities and challenges, in addition to the rapid spread of negative impacts on its connections. Urban; This is what was shown by the data on the spread of the disease in the most urbanized areas around the world, which was published by the Coronavirus Research Center at Johns Hopkins University, which included recommendations, the most prominent of which was that cities are not only on the front lines of responding to any emergency or danger, but they are also called upon to radically change their approach to dealing with This type of crisis (Barbarossa, 2020, p.1). In this context, emphasis must be placed on the fact that a new right to the city is being identified that must be clarified, especially in light of emergencies, which is called the "new right to the city." Which includes basic services that must be achieved on a regular and permanent basis (daily life) in addition to the presence of a different lifestyle that adapts directly and intersectingly to any emergency (i.e.the right to reinvent and strengthen the links of the city and the urban environment according to new needs), From this point, it must be realized that the first loophole or defect point that affects the city's tissues is the loss of balance and the transition from a relatively stable situation in the city to a state of chaos and heterogeneous disturbances.

1_ Moving beyond crises:

A. Relief phase:

The relief phase is the first stage of direct exit from the crisis, and the focus is on quickly responding to basic needs and providing them through thoughtful activities that can be used as a basis for enhancing the production process, rehabilitating infrastructure, and estimating losses and damages to limit their effects, in addition to accelerating the process of collecting information to develop and modify policies. And plans to be compatible with new data on the ground.

This stage is considered to have continuity and overlap with other subsequent stages because the need for it remains in the various circumstances and changes that accompany the spatial structure. Here, attention must be paid to the fact that the rapid response may be either physical or functional, that is, with clear (perceptible) spatial intervention.

B - The urban recovery phase:

The basic stage, during which the superstructures and the damage that occurred to them are rehabilitated, starting with light damage and ending with major damage. At this stage, the necessary needs are initiated, where possible, based on the extent of the damage caused to them, in particular to economic and social ties, and this stage aims to "restore balance", using all available external and internal financing means (quantitative easing or deficit financing).

At this stage, work is gradually underway to restore production chains, starting with the least expensive and most urgent, towards the most expensive and least urgent, with a focus on strengthening the social level further and highlighting the role of community participation more clearly. In the previous stage (the relief stage), emergency interventions are provided that contribute as much as possible. In reducing the loss of social balance resulting from either migration (wars) or lockdown (epidemics), in the recovery phase, work begins on the new urban intervention in the place, and meeting the demands of the local community directly. Here, the priorities emerge from the local community's knowledge of the place it occupies, and the priorities of vertical ties in this context fall under the intensification of dialogue and public discussion sessions with the local community. According to the most prominent studies of city researchers and planners after crises, eight principles were found that must be permanently based in the stages of preparing cities, especially in the recovery phase, and they are as follows

_ Community participation (the most important and effective starting point).

_ Mobility (accessibility) At this point, thinking begins towards strengthening social levels and the necessity of having a new spatial knowledge map concerned with the human-social scale (in particular during crises of pandemics and closures and the resulting decline in the efficiency of physical links such as roads).

_ Service links (enhancing the added services and placing them in the correct and well-studied location so that it helps to overcome the emergency on the one hand and benefit as much as possible from its positive impact in the future; because any urban intervention for a project in the emergency phase as much as it can help reduce disruption; as much as It will lead to future accumulations and complications that will burden the urban fabric with its challenges and negative effects if it is not placed appropriately.

_ Providing urban space: Most urban fabrics suffer from a lack of multi-use spaces that can be activated under any circumstances or emergency situation.

_ Flexibility of production and supply chains: The emergency creates awareness of urban vulnerabilities, thus shifting towards greater self-sufficiency and localism.

_ Multi-level governance: It is the effective management of vertical ties that can only be achieved by the local community, because multi-level governance alone cannot work to define urban strategies or manage cities alone without knowledge... It has credibility and the ability to exchange information at the local level (Parnell, 2020, p.1144).

_ Fairness and justice: which means effectively finding the gaps and weaknesses that have the greatest impact on the urban fabric and working with complete transparency to raise and improve its efficiency.

_ ICT infrastructure (digital level):

Applications of smart city concepts have proven useful during emergencies. The reason for this is that the digital level, when introduced into any local community, works to direct social behaviors towards a safe context (retrieving cognitive maps and spatial memory of local communities) and thus reducing the spread of challenges as much as possible (such as epidemics) At this point, there is a need for the importance of data sharing to enable the exchange of information, generate patterns of behavior, and openness towards new, more effective ways based on sharing data with the local community through nodes and interactive digital spaces that are inserted within the urban fabric.

In summary of the above, all the principles mentioned intersect with each other - even if each one of them is not completely accomplished - but the intersection of their results with each other leads to better results (the whole is always greater than the sum of the parts).

C- The urban recovery phase

This stage aims to begin by showing the initial results resulting from the changes that occurred in the urban fabric and the resulting disturbances that work to achieve a process of integration and interaction between urban links. These operations will lead to greater effectiveness in solving urgent problems on the one hand, and enhancing the efficiency of the work of urban tissues on the other hand.

D. Development sustainability phase

It is the stage of establishing the foundations of flexibility, sustainability, and the ability to resist the local identity and economy. In this stage, a city is reached with a flexible urban fabric capable of accepting any emergency event and working directly to take appropriate measures with ease, the process of transition from a state of turmoil and chaos to a state of stability. And balance.

As a result of the above, the ambition of a post-crisis city should not be to return to "normal" but rather to build a better, more sustainable, and resilient society. By planning for a fair and sustainable environment for people with spatial structures that support the required transition to a more sustainable economy. Crises are only a gateway and a starting point towards profound change in urban systems, with the urban connections they contain, which must be understood and understood first, and then changes must be brought about that contribute as much as possible to reducing the negative impact accompanying crises, that is, effectively establishing the foundations of urban vitality and as an important step towards Achieving better cities.

V. Conclusion of the research tool:

As a result of what was mentioned above, a state of integration was observed between each of the pillars of local communities and the corresponding requirements of digital communities. The ability to meet the needs of the local community in a balanced and effective manner directly affects the effectiveness of the nodes and links that make up city systems, which are already among the requirements of digital communities On the other hand, the presence of a clear cognitive map among individuals that affects the social behavior of the local community enhances the image of the city with the nodes, paths, edges, areas and landmarks on which it is based, which are among the pillars that digital communities need to establish their bases properly and effectively in the city. On the other hand, the presence of a local identity A clear statement within local communities enhances the contribution of population structures at various levels, which is one of the requirements of digital societies As for increasing the amount of response in cities, it is not framed and proves its effectiveness more deeply, especially when adding the digital level to the city, except by focusing on both traffic flows, movements, and visual effects, which are among the requirements of digital societies. Moving on to enhancing the impedance in the spatial structure, which is one of the features that contribute to accepting changes that increase the efficiency of the spatial structure on the one hand and undermining unwanted changes within the city on the other hand; This support, when applied effectively in the city, will increase the efficiency of the digital level that will be added and the speed of transferring and processing data related to the requirements of digital societies.

As for the degree of interaction and integration that exists between the physical (horizontal) and vertical links within the spatial structure, which is one of the pillars of the local community, it will directly affect the efficiency of the infrastructure and the degree of interactions existing within its structure, especially since it is one of the basic requirements that digital societies need to establish their rules.

All that has been mentioned previously opens the researchers to the broader question of inquiring about the stage of urban recovery within the city and its relationship with the integration process that has been inferred from the props and requirements؟

The state of integration that has arisen between each of the pillars and requirements primarily enhances the efficiency of the spatial structure and its ability to accept any change that occurs in its spatial structure and affects the behavior and dynamics arising between the various types of links existing within it. As a result of the above, we note that the pillars and requirements when they are achieved in the city and work to increase Their efficiency will be directly reflected in the eight principles that make up the recovery phase At this point, it will be noted that the stage of urban recovery is not considered a watershed stage as much as it is the result of the repercussions that affect the city resulting from the details that are raised cumulatively and hierarchically in each of the pillars and requirements, for example when enhancing the knowledge map of individuals in their local communities and raising its efficiency by adding The digital level and focusing its flows in nodes, paths, edges, landmarks and regions That is, intersecting directly with the second principle, which is mobility (accessibility), which is one of the principles of urban recovery.

As a result of the above, it was noted that the eight principles of the urban recovery phase are essentially emerging principles in the city and live within the city and the characteristics of the city, and any change that affects the city directly affects these principles, but when negative effects accumulate and the accompanying emergency changes that affect the spatial structure; The city needs to frame these principles and include them as an important stage that must be paid attention to and focused on achieving.

Figure 2 shows the number of the research tool that was concluded by the researcher, which consists of three levels: the first level is specific to the pillars of the local community, and each pillar corresponds to a requirement of the digital society, which is located at the second level, while the third level is a reflection of both the first and second levels at the level. Specific to urban recovery.

Results and discussion:

1 Reading cities properly and effectively only requires understanding the place and activating the role of the local community in a better and more efficient way, directly through optimal localization at the digital level.

2_ The recovery phase is primarily based on achieving integration and interaction between horizontal and vertical ties (management) on the one hand and the extent of their ability to achieve actual participation with the local community on the other hand.

3_Digital intervention and the process of sharing smart data, especially in urban fabrics, only requires making the social level the basic basis from which to always move towards any change.

4_ The relationship between the digital city and the physical city is not a division, but rather an expansion of the definition and boundaries of the city's space through interaction and construction between the existing physical links at the physical level in the city and the digital level added to the city.

5- There is no closed system in the city because cities with their various components are based on local communities characterized by open systems that exchange materials and energy with neighboring areas.

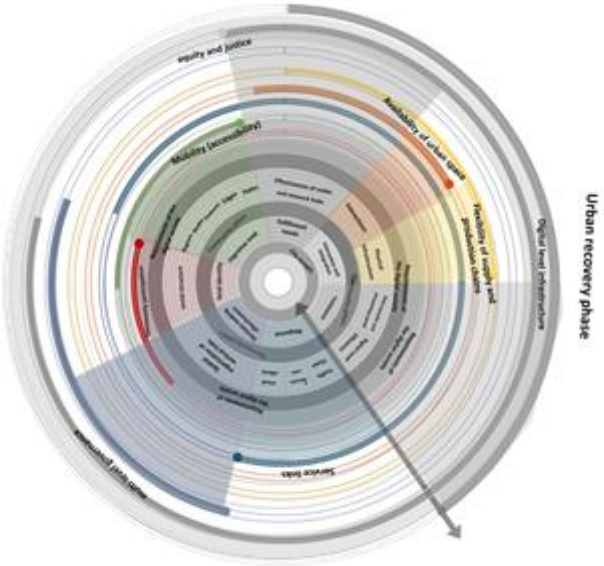

Figure (2): Research tool

Source: Prepared by the researcher

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he research tool was built on three levels, which are as follows:

The central circle contains the pillars of the local community. The second circle contains the requirements of the digital society (noting that the first and second circles are complementary to each other). Both the first and second circles consist of 1-7 levels (Level 1 is the weakest and unrealized, Level 7 is the best and realized). The third circle consists of 8 paths, and each path is a principle of urban recovery and the starting point of each path directly intersects the supports in the first and second circles

6-Cognitive maps are the basic plans that any planner needs when they intend to introduce any smart technology, level, or digital application, because these maps summarize the three most important components, which are time, space, and interactions .

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