Smart Cities and Digital Transformation

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Smart Cities and Digital Transformation: Empowering Communities, Limitless Innovation, Sustainable Development and the Next Generation

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INVESTOR IN PEOPLE

To our kids, the next generation with the hope and the wish to live in a better world full of happiness

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Preface

Smart Cities and Digital Transformation: Empowering Communities, Limitless Innovation and Sustainable Development is a Smart Cities Handbook putting together on a single volume a three-tier approach to smart cities: Limitless Innovation, Sustainable Development and Empowering Communities. The active learning approach that is adopted helps the reader to exploit comprehensive social sciences and computer science knowledge into real-world problems, building critical thinking skills and competencies. The exploratory journey to the Smart Cities and Digital Transformation research domain compensates the reader with a significant enhancement of intellectual skills and problem-solving capability.

The book is about putting together the diverse communities of researchers, academics, practitioners, industrial managers, and policy-makers to promote progressive applied research, best practices and lessons learnt related to the phenomenon of smart cities, digital transformation and sustainable development.

A unique characteristic of the book is that has a social sciences' core component aiming to discuss and cover the soft issues of Smart Cities and Digital Transformation research. Thus, topics related to the knowledge, soft skills, communication, ethical issues, participation, and motivation are important in our discussion. In parallel, the quest of limitless innovation and sustainable development is another key dimension of our publishing strategy. The exploitation of computer science and information systems research with a key emphasis on emerging technologies such as Artificial Intelligence, Internet of Things, Cloud Computing, Edge Computing, Open sources Platforms, Virtual Reality, etc., will bring to the reader unique value related to the new generation of transparent technologies aiming to improve the well-being, the quality of life in modern cities.

This book also targets diverse communities:

- Social scientists and researchers aiming to understand the social dynamics of socio-technical platforms and systems within modern smart cities, toward promoting value-based services, models, and frameworks.
- Computer Scientists, Information Systems Specialists, Data Scientists, aiming to contribute sophisticated algorithms, applications, and services toward an integrated ecosystem of Smart Cities Platform.
- Policy Makers and Digital Transformation experts, aiming to set the foundations and the value-based strategies for the next generation Smart Cities research with an emphasis on innovation and the promotion of sustainable development goals with a unified approach.

- Students from social sciences, computer science and information systems areas that are willing to get up-to-data, knowledge, know-how and expertise on the Smart Cities phenomenon.
- Industry stakeholders that are interested in exploiting new ideas for start-up companies and technology-driven innovation for value-based modern smart cities' services.
- Government officers that need to understand the latest developments on a fast-changing new scientific domain with significant applied dimensions and impact in the new forms of government and citizens' participation toward bold responses to critical social challenges.

Overall the book serves a diverse ecosystem of scientists, practitioners, business people, innovators, investors, government officers that jointly mobilize a new form of economy directly linked to the developments, impact and value of Smart Cities and Digital Transformation context.

The edited volume has the following features and benefits:

- *Value-based approach*: The overall discussion of the complementary aspects of Smart Cities and Digital Transformation research are organized around a strategic framework that integrated Limitless Innovation, Sustainable Growth/Development and Empowerment of Communities. This allows readers to benefit from the strategic alignment of each layer to a value-based framework.
- *Integration of Research/Academia/Industry*: The overall publication strategy aims to bring together the diverse communities with a developmental focus. The scientific knowledge and the industry services are integrated with significant social sciences research in order to provide an end-to-end understanding for the value components of any real-world smart city application and service.
- *Social Impact and Value*: The edition, promotes the debate for the social impact and the value of socio-technical smart cities platforms. Also, the discussion of Digital Transformation is delivered through the lenses of social participation and transformation.
- *Timely Knowledge Dissemination*: The agenda and the covered topics deliver the most recent knowledge and best practices related to the phenomenon of Smart Cities and Digital Transformation serving diverse communities that need timely, trusted and applied knowledge.

The main problem the book addresses is the unification and integration of the diverse communities of stakeholders in the Smart Cities and Digital Transformation area. Below we summarize the key problem solution structure of our book:

- *Untrusted Content* – Timely trusted knowledge. In an era where the debate on Smart Cities is full of inconsistencies and untrusted contributions our edition delivers timely content from trusted sources that represent the most influential stakeholders in the contexts.
- *Monolithic Approach* – Active learning and engagement. In an era where readers have access to thousands of sources of information and textbooks or

academic editions deploy the monolithic static approach, in our book all the chapters and contributions are accompanied with interactive active learning components, aiming to improve the learning/knowledge acquisition experience.
- *Myopic Views/Integrated Approach* – In the debate of smart cities, most of the approached deploy monolithic views of a single community, for example, computer scientists or social scientists. In our approach, we develop the context for synergetic understanding and contribution among diverse communities.
- *Lack of Strategy/Well-defined Strategy* – In most book series, the published volumes have no sequence and no integration. In our book, we have a well-defined publication strategy and almost three more volumes are ready in terms of contributors and publication priorities as they are aligned to the overall strategy.

The book is organized in 15 chapters with excellent contributors and top quality scholars. We are obliged to their intellectual work and to their contribution.

Below is a summary of the abstracts of the chapters.

Chapter 1: Future Smart Cities Research: Identifying the Next Generation Challenges

Miltiadis D. Lytras

The recent debate on smart cities research is challenged by the arrival of brand-new technologies and new ideas on their social impact. Beyond the hype and the expectations, the next generation smart cities research has to be grounded on the lessons learnt and the experience of the current extensive implementations of smart cities projects worldwide. Additionally, it is required to revisit the basic assumptions for the added value of smart cities research to the strategic blueprints around the world. This chapter is aiming to communicate a new agenda for future smart cities research including social, economic, technological, and community factors. The main contribution is organized around a framework that intends to integrate the technology sophistication, the human and social dynamics, and the strategy orientation of smart cities.

Chapter 2: Accelerating the Digital Transformation of Smart Cities in Covid-19 Pandemic Context

Laura-Diana Radu and Ana Iolanda Vodă

The recent pandemic of Covid-19 has substantially changed people's daily lives. They work and interact even more based on information and communication technologies (ICT). The use of new technologies and the interconnectivity specific to smart cities have intensified in the context of the pandemic. A significant part of the population works from home, participates in concerts and other remote social activities, organizes online parties, communicates virtually with friends and family, etc. These transformations required an extended and more stable

infrastructure, significant investments in the development of software applications dedicated to remote activities (streaming, contact tracing, security, online ordering and delivery, telemedicine, etc.), in specific services (data storage and applications, electronic signature services, etc.) and the integration of subsystems used in smart cities. This chapter examines the role of SARS-CoV-2 pandemic in the acceleration of digital transformations in smart cities due to the need and desire to digitize communities and public administrations. It has become a top priority for both private and public companies from smart cities in the context created by the pandemic.

Chapter 3: Smart City 5.0 as Digital Ecosystem of Smart Services. Basic Concept

Miroslav Svitek and Sergei Kozhevnikov

Cities evolved into quite complex urban systems. The rigid management process must reflect the complexity of the current political, social, and economic environment. With the vast city growth, citizens experience new difficulties – traffic congestion, pollution, immigration, overcrowding, and inadequate services.

In our research, we analyze problems and benefits that occur with the growing complexity and offer a new concept considering every city as a live and constantly developing complex adaptive system of many participants and actors that operate in an uncertain environment. These actors (residents, businesses, transport, energy, water supply providers, entertainment, and others) are the main elements of city life.

The new concept of "Smart City 5.0" is based on a previously developed model of Smart City 4.0 (compared with Industry 4.0) and implements the Urban Digital Ecosystem, where every element can be represented by a smart agent operating on its behalf. It is shown that smart services can interact vertically and horizontally in the proposed ecosystem, supporting competition and cooperation behavior based on specialized network protocols for balancing the conflicting interests of different city actors.

The chapter describes the design principles and the general architecture of the Urban Digital Ecosystem, including the basic agent of smart service, protocols of the agent's negotiation, the architecture, and basic principles Smart City knowledge base.

The developed evolutionary methodology of implementation will ensure a minimum of disruptions to city services during its transformation into an urban ecosystem to harmoniously balance all spheres of life and the contradictory interests of different city actors.

Chapter 4: Digital Transformation: Management of Smart Cities

Andreia De Bem Machado, João Rodrigues Dos Santos, António Sacavém, and Maria Jose Sousa

Cities are becoming smarter and more optimized because of digital transformation, reducing costs, increasing safety, attracting investment, ensuring sustainability, and increasing viability. As a result of this optimization, they are becoming smart cities. Smart cities use the Internet of Things' devices, such as connected sensors, lights, and smart meters, to improve infrastructure and design by gathering and analyzing real-time citizen data. In this research, different conceptions of smart cities and their interconnections with digital transformation are presented. Therefore, the purpose of this chapter is to analyze how digital transformation may help manage smart cities. As a result, a thorough and integrated evaluation of the SCOPUS database will be conducted in order to address the following questions: (1) What are smart cities? (2) What is digital transformation? (3) How does digital transformation help to manage smart cities? The results point out that technologies and digital abundance, which include artificial intelligence, blockchain, and Internet of Things, play a crucial role in managing a controlled and automated infrastructure in smart cities. These favor the development of suitable places to live, work, and have fun, with a better quality of life for everyone.

Chapter 5: Smart Citizen in Smart City

Weronika Dopierała-Kalińska and Szymon Ossowski

This article discusses issues related to the use of new technologies in local communication on the example of selected Polish cities. It will discuss the tools used by local authorities in the process of local communication with residents and entrepreneurs, aimed at increasing their participation in the local decision-making process. The study will focus on tools for empowering residents and increasing civic participation in cities. Based on an analysis of documents, interviews with representatives of city authorities (officials, councilors) and residents, using the IDI method, an attempt will be made to analyze the effectiveness of particular tools used by officials. On this basis, the authors formulate conclusions and recommendations for the future on the selection of the most effective tools used in local communication with residents. The aim of this paper is not only to diagnose the current use of the smart city concept in Poland, but also to create a forecast of its use in the coming years.

Chapter 6: Mobility and Health in the Smart City 3.0: Trends and Innovations in Italian Context

Chiara Garau, Giulia Desogus, Alfonso Annunziata, and Francesca Mighela

The smart city paradigm has evolved from a perspective focused on technological infrastructures to an approach in which the effects of the technological apparatus improve the quality of life of people, urban resilience, urban sustainability, and health, by introducing the concept of smart and sustainable city 3.0. In this chapter, the authors evaluate mobility as a key aspect of improving the environmental, social, and economic well-being of communities under the central concept of smart and sustainable city 3.0. To this end, the authors underline the

link between mobility, the Sustainable Urban Mobility Plans (SUMP), and environmental health. Then, the authors outline (i) the mobility requirements to be met from a smart perspective on environmental health and how (ii) the SUMPs can be considered as the basic tool for connecting smartness with mobility and environmental health. Finally, the results obtained will be discussed, and future directions of this research will be illustrated.

Chapter 7: Future Mobility – Digital Transformation of Automotive Companies as a Question of Organizational Identity

Angela Graf, Thomas Hess, Lea Müller, and Fabian Zimmer

Talking about smart cities also entails talking about new ways of mobility. Various concepts compete for reimagining future mobility, most prominently connected cars, robo taxis, and other forms of shared mobility. New digital technologies, changing customer requirements, but also new competitors are dynamically affecting previous market logics. To stay future-proof in this new world of mobility, the automotive sector, which is an important nucleus for developing such mobility solutions, is currently undergoing fundamental digital transformation processes. Established car manufacturers have to find their path to choose out of the many possibilities on the rise. Against this backdrop, they face the major challenge to find an answer to the question: Who are we and who do we want to be in the future? Therefore, we argue that organizations' digital transformation is highly entangled with questions on organizational identity and discuss digital transformation as a potential identity threat for established organizations.

We begin this chapter by introducing the concept of organizational identity. Afterward, we continue with applying it to the practical context of car manufacturers: After depicting the major trends of digitalization in the mobility and automotive sector, we will focus on the digital transformation processes of established automotive companies and discuss their impact on organizational identity. Empirical illustrations of the Volkswagen case depict our theoretical considerations.

We provide theoretical ideas for better understanding the impact of digital transformation on organizational identity, as well as suggestions for practitioners concerned with organizations' digital transformation processes.

Chapter 8: Digital Transformation of City Branding: Comparison of the Role of Digital Communication in Branding of Selected Cities in Europe and Slovakia

Darina Rojíková, Kamila Borseková, Katarína Vitálišová, and Anna Vaňová

The present chapter aims to assess how digital transformation impacts current trends in city branding, to analyze the role of digital communication in the branding of selected cities, and to compare the level of exploitation of digital

communication for city branding between European and Slovak cities. We conducted empirical research in several phases, and the overall sample consists of 155 cities in Europe and Slovakia. The results of our research showed that European and Slovak cities use to some extent all the investigated tools of digital marketing communication in city branding with a dominant position of social media, both in terms of exploitation and importance for city branding in European and Slovak cities. European cities score significantly better than Slovak cities in all elements of the City Brand Hexagon, as well as in the overall city brand index. Therefore, city branding strategies in the best European cities can serve as a good practice example or inspiration for Slovak cities. Cities with lower rankings and scores on city branding should focus on strengthening their city branding or strengthening their digital communication. The possible trajectory is also the concerted strategy for the branding of the city and its digital communication.

Chapter 9: Designing Policy for Smart Cities

Marianna Cavada

This position chapter explains the importance of designing policies for smart cities. This chapter aims to provoke discussions that will allow further understanding of the smart cities policy agenda. It is inevitable for various smart cities actors to agree on ways to implement change in smartness. This is because of the different views on developing smart cities (or smart cities initiatives) that will ensure shared benefits for everyone. To achieve a wider understanding of how this might be achieved, the chapter raises the points of designing policy for smartness and the influence of governance on policy design. It explains what we mean by policy and governance and the link between them. Overall, the policy needs to be supported by a governance system, which is widely accepted – for example for truly smart cities, a governance system needs to evaluate the benefits through livability; these are the environmental, societal, governance, and economic lenses. A liveability approach to the governance system can promote open and democratic processes to smartness.

Chapter 10: The Role of Commons in Smart Sustainable Development: A Hybrid Approach for the Recovery of Settlement Systems

Martina Bosone and Anna Onesti

The research is based on the analysis of recent experiences of participative processes in the reuse and maintenance of contexts considered as "urban waste," focusing their role in smart sustainable development processes. The recognition of discarded urban spaces/buildings as regeneration opportunities opens up new perspectives on the communities' commitments and responsibilities, in new governance models. These experiences, better known as "commons," highlight the active role of communities in establishing new unconventional forms

of value creation and production based on circular processes and interdependences between city and communities. Circularization and synergies are the fundamental precondition for smart sustainable development. Assuming the Historic Urban Landscape approach as general framework, the phenomenon of commons represents an opportunity to make it operational through an integrated methodology based on the recovery of the environment built according to an inclusive and hybrid approach, configured by culture and shared with local communities. In this perspective, this contribution proposes an evaluation framework not only to monitor the results and impacts produced by these experiences, but also to stimulate and improve awareness, self-learning and self-evaluation processes of the actors involved in regeneration processes toward a smart sustainable development.

Chapter 11: The Role of Open Data in the Transformation to Society 5.0: A Resource or a Tool for SDG-Compliant Smart Living?

Anastasija Nikiforova, Miguel Angel Alor Flores, and Miltiadis D. Lytras

Open data are characterized by a number of economic, technological, innovative, and social benefits. They are seen as a significant contributor to the city's transformation into Smart City. This is all the more so when the society is on the border of Society 5.0, that is, shift from the information society to a super smart society or society of imagination takes place. However, the question constantly asked by open data experts is, what are the key factors to be met and satisfied in order to achieve promised benefits? The current trend of openness suggests that the principle of openness should be followed not only by data but also research, education, software, standard, hardware, etc., it should become a philosophy to be followed at different levels, in different domains. This should ensure greater transparency, eliminating inequalities, promoting, and achieving sustainable development goals. Therefore, many agendas now have openness as a prerequisite. This chapter deals with concepts of open (government) data and Society 5.0 pointing to their common objectives, providing some success stories of open data use in smart cities or transformation of cities toward smart cities, mapping them to the features of the Society 5.0. We believe that this trend develops a new form of society, which we refer to as "open data-driven society." It forms a bridge from Society 4.0 to Society 5.0. This chapter attempts to identify the role of openness in promoting human-centric Smart Society, Smart City, and Smart Living.

Chapter 12: AI and Employability: Challenges and Solutions from This Technology Transfer

Regina Negri Pagani, Clayton Pereira De Sá, Alana Corsi, and Fabiane Florêncio De Souza

Smart scenarios related to industries or cities, characterized by intensive technology transfer and use of innovative and disruptive technologies, have been in

the spotlight either on academic or organizational discussions, especially those with a technocentric focus. Among these technologies, artificial intelligence (AI) emerges as one of the most challenging one due to its complexity. Therefore, this chapter aims to address AI in particular the future of the labor market, exploring the challenges regarding the skills required in the context of AI technology, addressing its uses, challenges, and benefits. To achieve this goal, a systematic review was conducted on the extant literature using the methodology Methodi Ordinatio. The results show that the current literature is gradually changing from a more critical and negative view of AI to a more optimistic one, with more positive approaches and expectations regarding its benefits. As practical implications, the findings can be used as a guide for governments to develop strategies aiming to deal with upcoming challenges, especially regarding future jobs and employability.

Chapter 13: The Use of IOT Technology and Big Data in Smart Cities: Examples from Slovenia

Simona Stojanova, Jure Verhovnik, Andrej Kos, and Emilija Stojmenova Duh

With the ever-growing population in the urban areas, the concept of smart cities started to be more present in the literature. Smart cities are seen as a solution that will respond to the needs of providing a sustainable place for living, and at the same time improving residents' lives. To achieve this, various information and communication technologies (ICTs) are exploited, making the digitalization in the modern world of an immense importance. Advanced digital technologies enable the transformation of existing and the creation of new business models, the development of new products and services, increase the efficiency and competitiveness of the economy, and contribute to wider socio-economic development. Digitization of society and the economy through innovative and intensive use of ICTs has great potential for growth and is the basis for further development and competitiveness. This all generates an enormous amounts of data sets from which useful information are generated and used again the decision support systems. This chapter presents two examples from Slovenia where big data is used for improving residents' lives, as part of the strategies for smart cities.

Chapter 14: Cost–Benefit Analysis of Advanced Metering Infrastructure Implementation for Strengthening Smart City in Indonesia

Zainal Arifin, Rudy Setyobudi, and Kartika Asri Elnur

On its way to develop a smart grid in Indonesia, one key enabler in the early stage of implementation is advanced metering infrastructure (AMI). Thus, PLN as the only electricity utility company servicing customers from upstream to downstream in Indonesia, has started AMI program at some main cities. With AMI, real-time energy consumption profile, energy meter status and condition, and customer power quality can be acquired. Subsequently, these data collected

by AMI can be used for further smart grid implementation by such IT systems and big data analysis. Instead of its function for smart grid backbone, AMI also significantly support smart energy on the city as a part of smart city initiatives. Nevertheless, its implementation requires more investment than the conventional metering system. This investment needs to be evaluated to define whether AMI is feasible and viable or not. This chapter is intended to observe the feasibility of AMI implementation in Indonesia using cost-benefit analysis. Two schemes were used as study objects, one scheme in which the communication infrastructure was managed by PLN itself, and the other one in which the communication infrastructure was managed by a third party. From the analysis, it appears that both schemes are proven to be feasible.

Chapter 15: Digital Transformation and Smart Cities: Insights from the Healthcare Domain

Miltiadis D. Lytras, Basim Alsaywid, and Abdulrahman Housawi

Digital transformation is one of the key concepts attached to the smart cities' domain. The requirement to enhance strategically the way that business is delivered around different areas is a critical milestone for the digital transformation agenda and also for business performance management. In this short position chapter, we are focusing on the area of healthcare and we are providing key insights and lessons learned from Saudi Arabia. The main contribution of the chapter is a structured discussion on a digital healthcare strategy in the context of smart cities.

Chapter 16: Smart City 5.0 as the Digital Ecosystem of Smart Services. Practical Applications

Miroslav Svitek, Sergei Kozhevnikov, Jiri Tencar, Sagnik Bhattacharjee, and Viktor Benes

Cities' population growth goes in hand with the development of new technologies that are becoming the key factor of the Smart City (SC) concept. It allows the implementation of efficient management solutions, operation, and sustainable development of a city to face the challenges of urbanization and improve the services for the citizens and visitors.

The concept of the SC 5.0 was first presented in Svítek, Skobelev, and Kozhevnikov (2020), where the problems of the complexity of current cities due to rigid management processes, variety of infrastructure, and SC modules, systems, subsystems, and applications were described.

To prove the concept, several practical examples were developed to cover the topics: modeling in SCs, practical implementation of multiagent technologies, the approach of creating city ontology and the city knowledge base as the instrument of semantic interoperability, and visualization possibilities of Smart Evropská as a SC Testbed used for teaching purposes.

The new organizational structure is proposed based on knowledge graphs, and practical examples are shown. The applicability of knowledge graphs to be used in combination with data management platforms for monitoring SC key performance indicators and providing interoperability of services are presented.

Smart Cities and Digital Transformation: Empowering Communities, Limitless Innovation and Sustainable Development is a collective, synergetic journey to knowledge exploration and scientific debate for a better world for all. We do owe this to the current and the next generations. We do hope that readers will value the hard work of all of us. We want to thank the great team of Emerald Publishing for their professionalism and the great work.

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With heartfelt thank you to the exceptional colleagues, contributors of this volume for their intellectual work and their commitment to Smart Cities vision for a better world for all, with opportunities for the next generation.

Chapter 1

Future Smart Cities Research: Identifying the Next Generation Challenges

Miltiadis D. Lytras

Abstract

The recent debate on smart cities research is challenged by the arrival of brand-new technologies and new ideas on their social impact. Beyond the hype and the expectations, the next generation smart cities research has to be grounded on the lessons learnt and the experience of the current extensive implementations of smart cities projects worldwide. Additionally, it is required to revisit the basic assumptions for the added value of smart cities research to the strategic blueprints around the world. This chapter is aiming to communicate a new agenda for future smart cities research including social, economic, technological, and community factors. The main contribution is organized around a framework that intends to integrate the technology sophistication, the human and social dynamics, and the strategy orientation of smart cities.

Keywords: Future smart cities research; next generation smart cities; artificial intelligence; metaverse; internet of everything; cloud computing; community engagement; participation; civic engagement; sustainable development goal

1. Introduction

The evolution of smart cities overtime proves a continuous intersection of Social Sciences, Computer Sciences, and Urban Design domains (Lytras, Visivizi, Chopdar, Sarirete, & Alhalabi 2020; Lytras, Visvizi, Torres-Ruiz, Damiani, & Jin, 2020; Visvizi, Jussila, Lytras, & Ijäs, 2020). The scientific and industrial contributions from each domain are in a continuous interaction and integration with the value proposition of smart cities (Lytras & Visvizi, 2019; Lytras, Visvizi, & Sarirete,

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2019; Visvizi & Lytras, 2019). Within the sophisticated socio-technical context of the smart cities the debate on future smart cities has to be updated and to respond effectively to three different challenges namely: The dynamics of future smart cities; the human and social dimension; the strategic footprint (see Fig. 1.1).

The dynamics of future smart cities is an amalgamation of diverse factors aiming to promote the unique value proposition of smart cities and to address the emerging new era challenges (Lytras & Visvizi, 2018; Visvizi & Lytras, 2018a, 2018b, 2018c). These factors include but are not limited to the following core value components

- Technology sophistication.
- Human connectivity.
- Hub of everything.
- Enhanced well-being.

The human and the social dimension of future smart cities is related to the core human and social challenges for the future urban and rural space where social interaction will address current limitations and problems including social inclusivity, promote of democracy as a core component of smart cities, human connectivity and technology enhanced digital transformation of human and social experience. Significant considerations for the human and the social dimension include the following factors.

- Social coherence.
- Social dynamics.
- Democratic forum and co-design of policies.
- Social challenges.
- Inclusiveness.

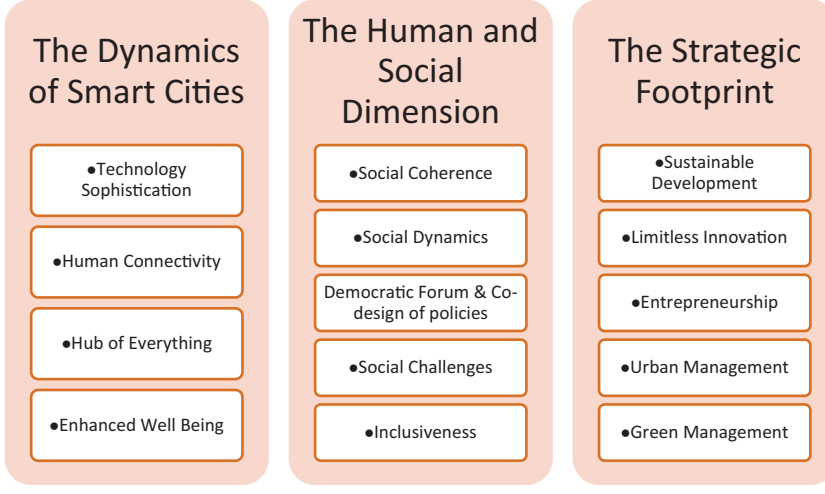

Fig. 1.1. The Dynamics of the Future Smart Cities.

The strategic footprint is related to the high-level strategic objectives that are serving as the overarching pillars for the implementation of smart cities projects. The future smart cities have to be grounded on objectives that among others promote the following significant goals:

- Sustainable development.
- Limitless innovation.
- Entrepreneurship.
- Urban management.
- Green management

The purpose of this chapter is to provide an introductory discussion on the three-tier approach to future smart cities. In Section 2, we elaborate on the dynamics pillar, in Section 3, we are providing key insights for the human and the social dimension while in Section 4, we are elaborating with the determinants and the impact of the strategic footprint of future smart cities. In Section 5, we are summarizing the discussion around indicative initiatives toward the implementation of the three-tier approach to smart cities.

2. The Dynamics of Future Smart Cities

The fast evolution of technologies in the last years and the promising new technological arrivals, provide unforeseen opportunities for the design, implementation, and integration of smart cities services and applications. A huge, interconnected backbone of networks, data streams, and applications requires governance, standardization, and efficient co-existence.

Artificial Intelligence, Cloud Computing, 6G Networks, Blockchain Networks, Fog Computing, Virtual and Augmented Reality, Metaverse, Recommendation Systems, Location Aware Services, Crowdsourcing and Crowdfunding Platforms, Free and Open Source, sophisticated image processing tools, and other fully customizable technologies compose a very powerful technological capability that can be customized and synthesized for innovative smart cities services (Alkmanash, Jussila, Lytras, & Visvizi 2019; Chui, Lytras, & Visvizi, 2018; Lytras, Aljohani, Visvizi, Ordonez De Pablos, & Gasevic, 2018; Lytras, Damiani, & Mathkour, 2016; Lytras & Mathkour, 2017; Lytras, Raghavan, & Damiani, 2017; Lytras & Visvizi, 2020; Lytras, Visvizi, Damiani, & Mthkour, 2018; Lytras, Visvizi, Daniela, Sarirete, & Ordonez De Pablos, 2018; Visvizi & Lytras, 2020; Zhang Jiang Ordonez de Pablos Lytras & Sun, 2017; Zhang, Zhang, Sun, Lytras, Ordonez de Pablos, & He, 2017). The quality of smart cities services is directly linked to the quality of the enabling technologies and the human talent that can conceptualize, design, and implement new applications. Furthermore, enormous effort will be required on the redesign of workflows and the systematic business process management that will lead to a new era of digital transformation of future smart cities. The technology sophistication of future smart cities also stresses the need for a well-defined and integrated data governance strategy. The complex data, services, and application ecosystem of future smart cities has to be seen as

a strategic resource that must generate added value for all the stakeholders and mostly for the citizens.

The human connectivity is another critical determinant for the dynamics of the future smart cities. The quest of new forms of social connectivity promotes the context-aware character of smart cities of the future. The modes for collaboration, the enhanced collaborative content filtering of content authored and consumed in the smart cities context, the utilization of recommendation systems, the social ratings, and the dynamic composition of human-sensitive services on demand, are only few of the aspects of a new era of human wisdom and capability. Services related to human and social development must be also considered as bold responses to the new requirement of social evolution. Learning services, systems that promote the collaborative capability and the social responsibility against critical social problems and challenges are included in the dynamics. The evolution of emerging technologies such as the Metaverse and the Augmented and Enriched Reality define new creative spaces for new forms of connectivity that currently are perceived from the majority of smart cities users as futuristic. There is an ongoing developmental process that defines new spheres of exploitation of new services under metaverse that in the near future will replace traditional or standards modes of connectivity and social interaction. A lot has to be done also on the psychological and ethical aspects of these new developments.

This path to the future forms of human and social connectivity enabled by a next generation technology sophistication brings also forward another dimension of the dynamics of the smart cities. The evolution of technologies like internet of things or the internet of qnything, potentially promote the role of future smart cities as hubs of everything. A global umbrella of numerous, diverse, complementary services has to be facilitated from humans, business users, and professionals with different social, educational, political, psychological, and other backgrounds. Thus, the future smart cities, can be seen as extended value networks. The discussion for the more detailed aspects of this dimension goes beyond the purposes of this chapter, but to our opinion this metaphor of the future smart cities will have an impact on the perceived value of the smart cities.

Last but not least, the enhanced auality of life and well-being is the absolute determinant for the value-based impact of the smart cities research and implementation. There is a critical need for the adoption of the UN Sustainable Development Goals (https://sdgs.un.org/goals) and the interpretation toward the composition of updated quality of life and well-being indexes. The 17 sustainable development goals (SDGs) to transform our world:

Goal 1: No poverty.
Goal 2: Zero hunger.
Goal 3: Good health and well-being.
Goal 4: Quality education.
Goal 5: Gender equality.
Goal 6: Clean water and sanitation.

Goal 7: Affordable and clean energy.
Goal 8: Decent work and economic growth.
Goal 9: Industry, innovation, and infrastructure.
Goal 10: Reduced inequality.
Goal 11: Sustainable cities and communities.
Goal 12: Responsible consumption and production.
Goal 13: Climate action.
Goal 14: Life below water.
Goal 15: Life on land.
Goal 16: Peace and justice strong institutions.
Goal 17: Partnerships to achieve the goal.

Toward this direction, future smart cities as living organization should have the capacity to maintain and to exploit analytical reporting for enhanced decision-making including dashboards and visual analytics aiming to document overtime the measurement and the evolution of metrics that reflect citizens' well-being and quality of life (Table 1.1).

Table 1.1. Key Determinants of the Dynamics of the Future Smart Cities.

Dynamics of Future Smart Cities Services	**Challenges**
Technology Sophistication	• Data governance • Standardization • Technologies management • Digital transformation • Workflow management • Business process management
Human and social connectivity	• Context-awareness (social ratings, new collaboration modes, recommendation systems, social ratings, etc.) • Social inclusiveness • New forms of connectivity • Growth and development
Hub of everything	• A hub of diverse, complementary services • Users with different social, educational, political, psychological and other backgrounds • An extended value networks of shared perceptions
Enhanced quality of life and well-being	• Quality of life index (KPIs, analytics) • Systematic standardization based on SDGs priorities and strategies • Collaborative response to well defined challenges • Policy-making and regulation

3. The Human and Social Dimension of Smart Cities Revisited

The social agenda in the future smart cities research has to deal with diverse social challenges of our times. Addressing bold social issues like social coherence, social inclusion and social responsibility must be a pivotal strategic priority for future smart cities. The utilization of smart cities services related to opinion sharing for the cultivation of a democratic sphere of exchanging of ideas and creative initiatives should be seen as a collaborative co-design process of social policies and bottom-up social inclusive regulations. Top personal privacy and security should be also considered as overarching principles within execution of regulations for the self-organization of measurement that will secure the sustainable and unforced utilization of democratic principles.

Inclusiveness and social challenges must be also realized in the future smart cities as key components of a dual context for the social-centric and the human-centric response to bold social problems. Diversity has to be exploited in the direction of social inclusive policies that will utilize human capital with respect (Table 1.2).

4. The Strategic Footprint of Smart Cities Revisited

The ongoing discussion on the impact of smart cities projects and initiatives worldwide brings forward the necessity to design effective, long-term, integrated strategies for the integration of smart cities research within broader governmental or other strategic frameworks. On the quest of the core components of the strategic footprint of the future smart cities, the discussion is accumulated around bold

Table 1.2. Social Dimension of Future Smart Cities Revisited.

Social Dimension of Smart Cities Revisited	**Challenges**
Social coherence and inclusion	• Social responsibility • Social justice
Democratic forum & co-design of policies	• Opinion sharing • Democratic sphere for exchanging ideas • Bottom-up policy-making • Privacy and Security
Social challenges	• Poverty • Access to education • Access to high quality health • Access
Inclusiveness	• Social inclusive policies • Human-centric participatory decision-making • SDG's based inclusive strategies for all aspects of social activity

strategic objectives of our times. Future smart cities can serve as the vehicles and the enablers for the implementation of bold strategic objectives that mobilize a variety of resources. The following list is not exclusive but summarizes complementary core pillars for the future strategic footprint of smart cities.

4.1. Sustainable Development

The sustainable development is not a high-level abstract vision. The sustainable development is not a high-level abstract vision. It refers to a set of well-defined objectives, strategies and initiatives with a positive social impact. The key determinants of sustainable development in the context of future smart cities should focus on educated citizens, justified use of all the kind of resources within a long-term strategy for the social value of programs and activities.

4.2. Limitless Innovation

Limitless innovation, is a bold response of the future smart cities' ecosystem toward the exploitation of the human talent, and the people's skills and competencies, toward novel solutions to given problems. The integration of innovation capability in future smart cities must be seen not only in the context of urban spaces available for the gathering and co-working of talented people, but also as a transparent, ubiquitous backbone of services, and technological capabilities for shortening the time from idea generation to innovation launching. Know-how transfer, best practices adoption and a continuous developmental effort for empowering human capital are bold actions to this direction.

4.3. Entrepreneurship

Future smart cities should enhance any form 0 entrepreneurship including social entrepreneurship as well as entrepreneurship enhanced by all forms of technology including metaverse, artificial intelligence, robotics, automation, 5.0 Industry etc. The internet of everything and the expansion of a technology-driven business ecosystem can set future smart cities as mature entrepreneurship hubs.

4.4. Urban Management

The management of the urban space in future smart cities will be challenged by a new era of augmented and enhanced reality. Metaverse will enrich physical urban space and enhanced reality will provide numerous reference and value layers for the exploitation of all the components of the physical space including humans, environment, buildings, smart devices, networks, vehicles, processes, digital twins of everything, and many other traditional or futuristic objects of the physical environment.

4.5. Green Management

The protection of the environment and a full agenda with green footprint is another strategic footprint for the future smart cities research. Actions related to

clean energy management, investments on recycling and strategies to resist to climate change, large scale actions for enhancing the environmental consciousness.

5. Indicative Initiatives and Use Cases for Future Smart Cities

In the previous section we elaborated from a philosophical point of view on the dynamics and the core determinants of future smart cities. We adopted a high-level abstract approach trying to summarize a broad agenda for the domain.

In this section, we provide a complementary approach. We summarize a very selective quite focused overview of high impact initiatives for future smart cities. We deploy the dimensions we discussed and for the shake of the discussion, we integrate only three use cases for the various dimensions while the options are unlimited. The following is the list of recommended or indicative use cases and initiatives:

Use Case 1. A contextual data governance strategy for future smart cities (per case).
Use Case 2. A roadmap for digital transformation and maturity assessment.
Use Case 3. An artificial intelligence and machine learning workflow for optimization of core areas of smart cities, for example, healthcare.
Use Case 4. A collaborative space for co-design of social inclusive policies and strategies.
Use Case 5. Metaverse innovation space.
Use Case 6. A machine learning enabled recommendation platform for team-based development and skills building.
Use Case 7. An internet of vehicles smart transportation system.
Use Case 8. Shared economy e-marketplaces.
Use Case 9. Climate change observatory.
Use Case 10. Happiness and well-being indexes and KPIs
Use Case 11. Citizen's visual analytics and dashboards.
Use Case 12. Artificial intelligence services for managing requests of citizens.

Each use case has three bold components as discussed in the previous section. It utilizes a data and technology infrastructure that has multiple layers of sophistication and reflects a holistic data governance strategy. Several implementations of smart cities projects unfortunately are built without a bold data governance framework and this will cause critical issues related to integration and interoperability in a greater future smart cities' infrastructure. The second core component is related to human and social dynamics. The use cases serve as unique value carriers for the utilization of human capital and asset through a progressive knowledge management approach. This dimension and several times underestimated in current smart cities implementations. Different types of smart cities users require different considerations and also the different personality features should be taken into consideration. Last but not least each use case is aligned to an overarching strategy promoting goals and objective with social and developmental footprint (Table 1.3).