Preface

INTRODUCTION

Unquestionably, the realm of architecture today should benefit from the new ways that achieve more realistic results, principally given that the areas of this research focus on their closely related fields. Not only are the physical dimensions of the traditional and new cities addressed, but the authors also discuss the non-physical aspects and applied models that are currently under development in new settlements, such as sustainable cities, smart cities, creative cities, and intercultural cities are covered.

This book proposes to investigate and promote conventional and new digital methods concerning the impacts of contemporary digital technology in the field of architecture, mainly in urban planning and design disciplines. The efficient usage of these methods is becoming more critical in the present day (Mossberger, Tolbert, & Franko, 2013; Silva, 2018). This book explains how these methods can represent an innovative approach that exists side by side with the traditional research methods that are still predominant in the fields of social and human sciences.

The concepts of cities of singularity and cities of hardships are the critical two terms in this book. These terms are emerging in literature in relation to how an urban planner and designer are dealing with the problems of similarity in architectural forms that affect the city identity and inability to live in a convenient good city form (Abusaada, 2017; Abusaada & Elshater, 2019). Singularity appeared due to an acceptance of new urban design paradigms instead of the prevailing one that makes each city indistinct from the rest. Singularity means that each city, to be unparalleled (a haploid organism), should have a point of distinction that challenges ideas (Rossi, 1966). Each city should be a different entity and be able to improve itself autonomously over time. The aim of this concept is to make the city unmatched, unprecedented, and second to none. In this concept, in the preliminary stages of urban planning and design a new city. There is a need to emphasize the way of positive thinking about how this way of thinking enables one to begin a new vision before establishing of any modern city to become singular.

AIMS AND OBJECTIVES OF THE BOOK

The aim of this book is to explore and develop the new paradigms in the discipline of urban planning and design in the realm of architecture. There is a need to create prevailing traditional paradigms to achieve the real city’s story, as appropriately adapted with its inhabitants, dwellers, and visitors. It is worth investigating ways to select the relevant parts to this singularity. In some cities of Global South, the hardship seems to be found in aspects of life and emerges by using the indicators of the degrees of
inferior living. These cities of difficulties in convenient living—like cities of Global North—meet all the needs of urbanization in integrated environments. However, these cities lack the characteristics that are contrary to the requirements of the validity of life. Those cities suffer from urban chaos, which relates to the absence of order, whether in an engineering system or a behavioral setting.

The novelty of this book emerges in how the urban planner and designer use the digital method to investigate the problems of singularity and hardships. The authors provide a deep discussion of the modern and conventional methods in urban planning and design by using the digital new methods. The contribution depends on the beginning uses of the new digital methods in architecture, particularly in urban planning and design. Additionally, this book offers a theoretical and empirical viewpoint for applying the conventional and digital new methods and tools.

The proposed publication is noteworthy for three reasons: (a) It collects information about everything between the concepts and the processes of more than ten new methods in both planning and design in the field of architecture. (b) It includes the theoretical and practical works in exploring the three concepts, namely the unknown cities, hardship, and singularity. (c) It aims to explain the ways for researchers to apply these methods in their works.

TARGET AUDIENCE

The primary audience of this book consists of professionals working in the fields of architecture and urban planning and design, particularly researchers, academicians, practitioners, and advanced-level students (Master's/PhD), technology developers, and policymakers. Moreover, this book will be of interest to support executives who are concerned with recent technologies that have attracted attention for new methods and tools in scientific research, such as data analytics for sustainable and smart cities. Principally, the target audience can acquire further insight on how to use new methods in research and analytical work; they can use the various technologies contributed in this book for their research applications. This book is mainly for beginners.

ORGANIZATION OF THE BOOK

The contributed authors of the entire chapter aim to explore the potentials and limitations of “digital technology” as one of the global challenges that allow critical thinking. This book tackles several issues related to digital technology and discusses researchers’ recent attempts and findings that would help the readers understand the pros and cons of using digital methods in the field of architecture. This book includes two parts, which have been partitioned into 16 chapters.

Section 1

Section 1 of the book focuses on ten new digital methods according to its chronology of their emergence, from the 2016 until 1970s. This part includes 12 chapters. In the first chapter, Hisham Abusaada and Abeer Elshater examine the problem of excessive similarity when designing new cities. This work is based on a bibliographic review of conventional Western paradigms in urban planning and design. The authors used two conventional and digital analytical research methods; the first is content analysis and
the second is a crowdsourcing approach. This work helps unnamed stakeholders gather information on ways to make cities unique. These method and tools support the efforts of planners and designers in employing this approach professionally.

The next chapter, written by Nada Alhakkak, presents “BigGIS” as a new product that resulted from developing GIS in the “Big Data” area, which is used in storing and processing big geographical data and helping in solving its issues. This chapter describes an optimized Big GIS framework in Map Reduce Environment M2BG. The suggested framework has been integrated into the Map Reduce environment to solve its storage issues and benefit from the Hadoop environment. The authors acknowledge that M2BG should implemented with real data in the simulated environment and later in the real world.

The third chapter, written by Alshimaa Farag, Sama Badawi, and Rahma Doheim, aims to explore the potentials and limitations of the “Digital Simulation” as a method to allow for objective assessment. In this chapter, the authors examine the high possibility of digital simulation in invistagting the built environment. The authors recommend that urban designers and municipalities find in their decisions, in the initial stages of the design process. To use the simulated model and examine the thermal comfort in the outdoor space, the authors use the traditional methods in the post-occupied scene to provide socially successful open spaces in livable cities.

The fourth chapter, written by Hisham Abusaada and Abeer Elshater, focuses on the liability standard which still has not considered the chaos city can stem from or lead cities experiencing hardship. Internally displaced persons (IDPs) seem to display the characteristics of liability and the hardship of living and be the indicators of chaos city. The analytical methods used in this chapter are content analysis and internet of things (IoT) to follow the non-perceptible processes of the IDPs from outside and inside Cairo, Egypt. The outcomes provide an action plan to create cities free from hardship, displacement, and chaos. The authors use the method of IoT to analyze an example from the city of Lugano in Switzerland.

The fifth chapter, written by Mohammed Alfiky and Hans-Georg Schwarz-v Raumer, presents Geographic Information Systems (GIS) as a tool to digitalize and analyze reality in urban planning, particularly in geo design fields. In addition, this chapter includes how practitioners, urban planners, developers, designers, and scientists handle this method. The author introduces GIS-based modeling and geo design and analyzes an example of the “Filder” area in Stuttgart city, based on a set of predefined parameters. This case study demonstrates how GIS can be used to avoid the employment of sophisticated methods and tools.

The sixth chapter, written by Abdalrahman Alashi and Turgay Koramaz, presents the method Building Information Modeling (BIM), which is based on the integration and coordination of different disciplines and professions. BIM offers a platform to provide weighted combined data for reasonable assumptions, allowing all related disciplinaries to generate data of cities. These data will be coordinated and integrated under the supervision of urban planners. Many cases use to indicate how to integrate BIM with GIS-based on to comparatively analyze to show how integration between different disciplines will be illustrated.

The seventh chapter, written by Sana Layeb and Mohsen Ben Hadj Salem, discusses urban atmospheres that evoke several sensory registers that participate in our perception of singular tonalities of our daily situations, as in the case of Tunis. The authors quantify users’ feelings by objective measures of electrodermal activity, which is conducted in situ in metrological work on the sound signal. These measurements were taken using a device called “Q sensor.” This device quantifies emotional arousal by measuring electrodermal activity (EDA).

The eighth chapter, written by Ahmed Toimah and Samy Afifi, presents a conceptual framework for Spatial Decision Simulator (SD-SIM). SD-SIM is intended to be a platform that supports spatial deci-
sions taken by different stakeholders to provide the capability for integrated modeling of socio-economic, man-made, and natural environmental impacts. This framework contains four components for expressing the evolution of spatial issues and reflecting into simulator. These four components are Districts Sub-system, Property Price, and Living Cost Simulator, Interventions Sub-System, and Development Scenarios Sub-System.

The ninth chapter, written by Eda Ustaoglu and Arif Çağdaş Aydmoglu, provides a framework for the study of land-use change processes and for making projections for the future land-use/cover patterns. This chapter focuses on various modeling tools and practices that range from pattern-based methods, such as machine learning and GIS-based approaches, to process-based methods, such as structural economic or agent-based models. The authors discuss the progress that is gained by geographers and natural and economic scientists in developing these models of spatial land-use change and indicates to the necessity needed improvement in the future.

The tenth chapter, written by Ahmed M. Refaat, presents the theory of space syntax and its contributions to urban design. The author demonstrates the space syntax theory at both conceptual and methodological levels, types of space syntax, importance of space syntax, and it potential for application. The author provides links between the measurements of connectivity, integration, choice, and intelligibility to discuss and relate the traditional urban values. This chapter provides a potential mechanism for explaining how the theory succeeded in presenting statistical and concrete measures to reveal what have been intangible values of urban settlements, such as legibility and accessibility.

The eleventh chapter, written by Abdelbaseer A. Mohamed, reviews a space-people paradigm, called space syntax. This chapter defines, elaborates, and interprets the main concepts and tools of space syntax, showing how urban space is modelled and described in terms of various spatial measures including connectivity, integration, depth, choice, and Isovist properties. the author presents a detailed description of the relationship between space and society, and how people co-live in spaces and how such spaces co-live as communities. The author explains that the spatial configuration is the container of activities and that the way we construct our cities influences our social life. Therefore, the urban environment should be analyzed mathematically, using urban models to evaluate and predict future urban policies.

In the twelfth chapter, written Amany Arisha and Nancy Abd El-Moneim, the authors use a syntactic methodology as a practical approach to understand the impact of vendors’ temporal presence on the quality of urban space and social life. The authors use space syntax theory as a new digital method to analyzes the socio-spatial and temporal attributes. The authors extract criteria that interrelate socio-economic and tempo-spatial attributes of vending activity as a step towards developing a practical approach for managing public trading in public spaces and upgrading the vitality of public life. Moreover, the authors recommend using the digital methods side-by-side with traditional research tools for a more effective outcome.

**Section 2**

Section 2 of the book presents four chapters, each of which provides fresh insights and concepts on the terms related to cities of singularity and cities of hardship. As revisiting terms, cities of singularity and cities of hardship express the idea that sees the quality of the city is unmatched. These chapters discuss how to use conventional methods to explore the problems that affect cities of today through these two terms. The authors of the last three chapters deal with this problem through an integrative review of urban morphology, energy-efficient mobility, urban policies, and economic diagnosis.
The thirteenth chapter, written by Omar Galal, discusses how urban settlements are recognized as a significant energy consumer. This chapter focuses on the impacts of the transportation system. Through an integrative review, urban morphology, based on Conzen’s approach, is the critical factor to explore the relationships between energy-efficient mobility, building density, land use, and street networks. Two issues in this work have impact on energy-efficient mobility: the residents’ behavior or individuals’ choices, and morphological characteristics of urban settlements.

The fourteenth chapter, written by Heba Aggour, discusses the fact that the listed buildings in Egypt are not profitable from a financial perspective; the owners are willing to destroy it and locate an option for their monetary needs. The question explored in this chapter is how to achieve a win-win situation between listed buildings in Egypt and the economic needs of the users. The author presents an approach to raise the financial estimation of the listed villa in Alexandria until it has the same estimation or more than the building if decimated and replaced by a tall structure so that the owners are willing to keep it and safeguard it.

The fifteenth chapter, written by Ahmed Hassan Abayazed, discusses informal urban growth for exploring the radical ways of managing the city. This chapter focuses on the interactions between informal physical actions and formal policies and approaches. The author focuses on the policies and approaches for identifying reasons behind the success of the procedural actions and the failure of the formal systems. This chapter investigates how to reach the convenient path in dealing with Cairo’s informal settlements.

In the last chapter in this book, Mougbelrahman Aboamer and Dalia Abdelfattah highlight the case of Cairo’s downtown through sociopolitical transformation. The authors believes that these transformations lead to Cairo’s downtown from the singularity to the hardship. The authors focus on the core cause of the development and its influence on the social, urban, political and economic domains. Authors interpret Cairo downtown morphisms through multiple reading approaches of novels and literature to de-code the transformation from a new perception of fact and fiction.

ABOUT THE KEY CONCEPTS USED IN THE BOOK

Many of the key concepts employed in this book are innovative and convey unique meanings for the authors, publishers, and the audience. The authors have proposed interpretations that have been readjusted to their contexts. The key concepts used in this book relate to the new digital method in the fields of architecture, particularly in the fields of urban planning and design. In addition, there are various concepts highlights on singularity, hardship, and displacement to explain the situations of some traditional cities in many developing countries. Moreover, the authors present their visions of other innovative in the key concepts that follow:

1. **Aspect Ratio (H/W):** A parameter usually used to quantify a built environment’s density. Density is equivalent to the ratio between a street’s height to width.
2. **Chaos City:** A phenomenon that embraces the political, social, and economic practices and refers to the imbalance of the performance of tasks and responsibilities; a state of utter confusion; and an absence of arrangement or order.
3. **Cities of Hardship:** A term to describe the negative concept that contradicts liveability as a positive concept. Both terms represent the two aspects of explaining the living of people in the city.
4. **Cities of Singularity**: A term that expresses the idea that the quality of the city is unequalled. This singularity emerged due to an acceptance of new urban design paradigms instead of the prevailing ones that make each city indistinct from the rest.

5. **Crowdsourcing Approach**: A term that expresses the idea of an open-call publication and online collaborative for problem-solving and focuses on the building of internet research and development platforms.

6. **City as Artwork**: Results from the efforts of the previous generations. This has a beginning and does not have a single inevitable end. The urban developers puts the origins of their drawings, the people involved in the construction according to the initial plan, and the character of the individuals living in this city emerges.

7. **Cold Air Flow**: Formed at night in only slightly inclined terrain in case of general wind calm. Cold Air Flow results from the tendency of cold air to move downwards in terrain by gravity. Cold air production that feeds cold air flow is dependent on thermal behavior of land surface.

8. **Concave Space**: A space in which a line connecting two points goes outside the boundary of that space.

9. **Culture Heritage**: Includes archaeological, historical, or scientific sites, structures, or other features of historical, scientific, artistic or architectural value, and ethnological structures of past cultures still extant invalid form.

10. **Electrodermal Activity**: The physiological reaction of the human body detectable by the surface of the human skin.

11. **Energy Efficient Mobility**: A form of mobility within the urban environment that consumes no energy (walking and cycling) or relatively low amounts of energy (means of public transports).

12. **Genotype**: In space syntax literature, Genotype is defined as the abstract and generative rules underlying spatial forms and guides its transformation process.

13. **Geo-design**: The process of planning or developing a spatial entity within a geographical context. In a rather narrow definition, Geo-design describes a design and planning method that, informed by geographic context, tightly couples the creation of a design proposal with impact simulations and supports iterative, sequential, and participative planning.

14. **Geographical Information System (GIS)**: A computer program for gathering, managing, analyzing, and visualizing spatial data to make better-informed decisions. GIS analyzes geographical information regarding spatial location, co-incidence, distance, and neighborhood, and it organizes them into visualizations by maps or 3-D scenes. GIS also reveals insights into geographical patterns, relationships, and complexity of situations and configurations.

15. **Global Measure**: This considers the relationships between a space and all other spaces within a system.

16. **Graph**: A type of representation that consists of a set of nodes (vertices) and links. In space syntax theory, nodes represent axial lines or segment lines or convex spaces, while links commonly represent the intersection between pairs of spaces.

17. **Heritage Conservation (Ethnocentric)**: A series of actions undertaken to slow the rate of decay of both cultural and natural heritage. This term also aims to communicate the messages held in a cultural heritage object.

18. **Iterative**: A process in which a quick and closed planning loop is established between sketching an intervention, followed by GIS-based impact evaluation of the intervention that is the basis of alterations in a next sketch.
19. **Local Measure**: The measure that confines the syntactic analysis to only spaces that are located at a distance from the selected root space.

20. **Locational Utility**: A measure of the utility of a place or region, which is determined by the individuals’ total time spent in transportation modes to reach that place or region – in terms of cost or effort – to fulfill social, economic, or functional needs in a broader spatial system.

21. **Metapopulation**: Several distinct populations considered together with areas of suitable habitat that are unoccupied. In classical metapopulation theory, each population cycles in relative independence of the other populations and eventually goes extinct as a consequence of demographic stochasticity (fluctuations in population size due to random demographic events); the smaller the population, the more chances of inbreeding depression and the more prone the population is to extinction.

22. **Multiple Reading**: A method that consists of readings from various categories of data. By dominating all readings, one would develop a language of the city.

23. **Normalisation/Standardisation Formula**: This term aims to remove the effect of the number of lines (or segments) in the graph from the global properties’ calculations.

24. **Phenotype**: In space syntax literature, this term refers to the spatial forms of urban and architectural composition themselves.

25. **Step Depth/Point Depth**: This term reflects the extent to which each space is away from the selected root space (or spaces) in terms of topological or geometric distance.

26. **Semiotics Challenges**: Explores the study of signs and symbols as a significant part of communications.

27. **The semantic content of the city**: This phrase means that each city has a rhythm between its functional elements and its significant elements (between the significance and the non-significance). This rhythm might be based on the opposition, alternation, or juxtaposition. These are the forms of the relationship between the city’s reality and its signification that physical maps can never explain.

28. **Singular Urbanism**: This term creates “a city of singularity” and makes it “a city imprint”. Singular Urbanism should be through activation the practice that is based on an understanding of the function of the city and the nature of its inhabitant.

29. **Socio-Spatial Analysis**: The sociologic aspect of a configured spatial space is captured at the level of topological category description, where individual spatial units can be assigned to different social or cultural groups, individuals, or activities with a diverse behavior or pattern.

30. **Sound Effect**: A tool specific to the sound environment that connects perception and action.

31. **Space Syntax**: A theory and method to analyze the relationship between human societies and the structure of the inhabited space in all its diverse forms: cities, settlements, buildings, or even landscapes, and quantify the various levels of topological relationships within a layout.

32. **Spatial Configuration**: A set of interdependent relationships between various discrete spaces, including urban areas, buildings, or temporary structures, each of which is determined by the topological connection of pair-wise connections concerning the overall emerging pattern. The arrangement of solids and voids of urban layout. This is is a more complex concept than spatial relation, which commonly refers to the reciprocal relationship between a pair of spaces.

33. **Street Vending**: A pattern of socio-spatial interactions and behaviors, embedded in urban public life through a network of multi-functional and multi-layered dynamics. Street Vending goes beyond the classic stereotypes of destitution-informality, legality-illegality, and regularity-irregularity.

34. **Syntactic Measures**: This refers to the measures produced through the space syntax analysis, such as integration, connectivity, and intelligibility measures.
35. **Transit Oriented Development (TOD):** Dense, mixed-use urban environments that enjoy an interconnected streets network connecting transit stops, houses, jobs, commercial and leisure activities.

36. **Urban Heat Island:** The area of an urban landscape which reflects significant differences in surface and air temperature compared to the surrounding non-urban area.

37. **Urban Displacement:** This includes refugees and IDPs. Refugees flee from a nation due to natural and human-made disasters, while keeping of personal rights and international stability. IDPs are people who are move within the borders of their country and are dependent the legal protection of their governments.

38. **Urban Artefacts:** Material constructions that link with the term of the spirit of architecture. Architecture and urban artefacts both appear in cities as artistic works and emerge in the dynamic of the city.

39. **Urban Market:** A basic public setting for upgrading cities’ functioning and integrating urban communities. Urban Markets accommodate a variety of economic, socio-cultural, and political activities.

40. **Western Paradigms:** A holistic intellectual base in the field of urban design throughout history, which encompasses theories, movements, schools, trends, and approach.

**FUTURE DIRECTIONS**

As researchers, academics and urban designers of toady cities, we find ourselves in a permanent debate between the logic of scientifically obtained data, recognized methodologies and ‘other’ facts that we discriminate against in the formulation of our findings. In our reviewing process for this book, we found a wide range of information from data to interpretation or behavioral profiles containing valid arguments that seem to have been voluntarily censored. It is of concern that the formulation of contributions to the discourse are, in some instances, fraught with difficulties in realms other than the topical. The editors find themselves not in a position to discuss the investment of meaning into the terminology used. We leave this for the readers to decipher. In international editions this is, of course, to be expected. We feel the importance to raise this since only through a discussion beyond the factual the reason behind the argument can truly be revealed. Current discourses will only ever be able to detect or reflect the arguments that are actually made. Any –even partial-omission as perceived by the audience will inevitably draw criticism and possibly devaluate or debase the argument entirely.


We feel compelled to point out that the much-debated paradigm shifts of course, are happening. One of the challenges is that their actual (local) significance is only communicated to the extent that is
perceived to be tolerable. If these situations persist, we might need to further explore the codes. But that would be a topic for another book.

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REFERENCES


