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The Logic of the Grid: A Structural and Representational Tool for the Ekistics

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Zuhal Acar[1]
ORCID: 0000-0003-4315-6948

Abstract

This study focused on Ekistics, the proposed science of human settlements by Constantinos A. Doxiadis in the 1960s, with reference to the current discussions in the field of knowledge, particularly the exponential growth in the amount of data. The conditions which led Doxiadis to found a new science of human settlements were discussed in a comparative manner to the current challenges scientists face today in the age of Big Data. Ekistics used the logic of the grid as an essential element in both construction and representation of the new science of human settlements. In the article, this new science was primarily considered as an effort to data-basing all human settlements that ever existed regardless of their scales, and it is argued that the logic of Ekistics fits better as a tool for analysis and documentation since it is very analytically constructed as a grid. Even though the grid logic corresponds to physical systems in the city, like roads or other infrastructural elements, abstract relationships between disciplines, or the flow of information, in Doxiadis' formulation, the grid remains a two-dimensional construct that presupposes linear advancement from analysis to production.

Keywords: *Ekistics, grid, knowledge production, data, city planning.*

[1] Part-Time Instructor, Dr., TED University, E-mail: zuhal.acar@tedu.edu.tr

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Grid: *Ekistics* için Bir İnşa ve Temsil Aracı

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Zuhal Acar[2]
ORCID: 0000-0003-4315-6948

Öz

Bu çalışma, 1960'larda Constantinos A. Doxiadis tarafından geliştirilen insan yerleşimleri bilimi olan Ekistics'e, özellikle veri miktarındaki büyük artış başta olmak üzere bilgi alanındaki güncel tartışmalara referansla odaklanmıştır. Doxiadis'i yeni bir insan yerleşimleri bilimi kurmasına yönlendiren koşullar, bilim adamlarının bugün büyük veri çağında karşılaştığı mevcut zorluklarla karşılaştırmalı bir şekilde tartışılmıştır. Doxiadis, grid mantığını, kurmaya çalıştığı bu yeni insan yerleşimleri biliminin hem inşasında hem de temsilinde temel bir unsur olarak kullanmıştır. Makalede bu yeni bilim, ölçekleri ne olursa olsun, var olan tüm insan yerleşimlerini veriye dayandırma çabası olarak ele alınmış ve Ekistics için kurgulanan gridin analitik yapılandırıldığı gerekçesiyle bir analiz ve belgeleme aracı olarak görülmesinin daha uygun olduğu iddia edilmiştir. Her ne kadar grid fiziksel yapısıyla hem kente ait yolların veya diğer altyapı unsurlarının ilişkilerini hem de disiplinler arasındaki soyut ilişkileri ve bilgi akışını kavramsal olarak temsil etme potansiyeline sahip olsa da, Doxiadis'in formülasyonunda grid, analizden üretime doğrusal bir ilerlemeyi varsayan iki boyutlu bir şema olarak kalmaktadır.

Anahtar Kelimeler: *Ekistics, grid, bilgi üretimi, veri, şehir planlaması.*

[2] Öğr. Gör. Dr., TED Üniversitesi, E-mail: zuhal.acar@tedu.edu.tr

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Introduction

This study critically analyzes the motives behind the foundation of Ekistics as the science of human settlements by Constantinos A. Doxiadis and aims to discuss it comparatively to the current approaches in the field of knowledge regarding the exponential growth in the amount of data. The unprecedented change in the amount of data not only revolutionized the processes of knowledge production but altered the meaning of the concept of data itself. This study identifies both a similarity and duality between the conditions which led Doxiadis to found a new science of human settlements and the challenges scientists face today in the age of Big Data. While in both periods the common focus is 'data' as the most fundamental component of research, there is a duality between the amount of data at hand back then and today and the available tools to produce knowledge from them.

Ekistics was founded upon a field of knowledge, which was already occupied by the disciplines that study the built environment. This new science inevitably had to position itself according to the knowledge production practices and knowledge base of these previously established disciplines, which in turn necessitated an overall assessment of the current situation of human settlements and their problems through the viewpoints of these disciplines. With the aim of "data-basing the world by focusing on every human settlement, at every scale and in every time period," the Athens Center of Ekistics was initiated within the Athens Technological Institute in 1963, appointing Doxiadis as the director. (Boyer, 2016) Central to this 'information gathering' process, as Christine Boyer underlines, was "how to visualize, organize, and cross-reference the massive amount of data." (Boyer, 2016) To control the data, as Mark Wigley notes, Doxiadis started using computers as early as 1962, and in the yearly report on the research projects of the Athens Institute in 1964, it was pointed out that "the main emphasis was now on computer programming, data processing, and methodology." (Wigley, 2001) The computer was a scanning instrument for Doxiadis that revealed hidden patterns in an overwhelming conglomeration.

Today, we face a reverse situation in which the massive amount of data available today can only be handled by intelligent machines, whereas the scarcity of data was the main obstacle for Doxiadis as he aimed at gathering the necessary data for all kinds of human settlements in every time period to have a projection of the future. With the recent increase in the amount of data, which is the most fundamental epistemological unit, data have become an

increasingly crucial concern for numerous disciplines including architecture and urban studies in the last two decades. In order to control the amount of data and find new ways to produce knowledge from it, a new science called data science was established. The cities still grow, but the growth rate is much more manageable in comparison to the massive amount of data created, collected, and analyzed about cities.

One of the main concerns for Doxiadis is to control the growth of cities in a systematic way by studying the fundamental components of the cities. Indeed, according to Doxiadis, human settlements were facing a crisis due to a rapid increase in the population, economic developments, technological advancements, and social changes. Not surprisingly, the first subheading of the introduction chapter of his book on Ekistics was entitled as "the crisis." (Doxiadis, 1968) To grasp and control these transformations, Doxiadis attempted to create a unified system that enables better comprehension of the interconnections of the city components.

The crisis was also caused by the difficulties in communication among the disciplines that study human settlements due to the differences in their use of terminology. A 'unified system' could achieve coordination of knowledge related to human settlements. Through proper documentation of the facts, concepts, and ideas related to human settlements, the aim was to readjust the disciplines and professions connected with settlements. The intellectual space of the built environment disciplines was already contested because of the diversity of theoretical stances, epistemological positions, and research traditions of those disciplines. Doxiadis aimed to create a break with them and based the new science of human settlements on the methods of the natural science disciplines, as Ali Madanipour claims, Doxiadis "imitates the methods of science, looking for discovering the hidden rules in the world." (Madanipour, 2010)

To systematize the study of the human settlements and give an order to it, Doxiadis used the grid as an instrument first to show the existing relations between the elements of the settlements and then to discover the hidden ones. The grid was an essential element for Doxiadis in founding the new science because of its ability to connect, order and discover these relationships. The use of the grid was two-fold, both as a tool to arrange the field of study and document the previous knowledge base and to structure the new science of human settlements. However, it is discussed in the study that because of its two-dimensional and strict nature, the grid fell short of providing the complexity required for the complicated study of the built environment.

Ekistics: The Grid

In founding Ekistics, the starting point for Doxiadis was "the premise that human settlements are susceptible of systematic investigation" (Doxiadis, 1968), and the fact that "cities were expanding out of control." (Wigley, 2001) The basic idea was to understand cities from a rational perspective and identify a universally applicable framework for structuring future settlements. As explained by Doxiadis, the strategy was to inspect the human settlements under three aspects. (Doxiadis, 1968) In this tripartite framework, the first aspect was the five elements that compose the city: man, nature, society, shells, and networks. The second aspect is the five points of view which could also be defined as the scientific study of cities, listed as economic, social, technical, political, and cultural. The third and last aspect was the space-units organized according to the increase in their dimensions and populations. Doxiadis define the interrelations of these aspects as such:

One dimension, the horizontal one, should be the ekistic logarithmic scale from man to the whole earth (or ecumenopolis, the universal city) with the size of the human settlement as its basic characteristic. The second dimension should cover either the elements of human settlements (Nature, Man, Society, Networks, Shell), or the disciplines dealing with them (economics, social sciences, political administrative sciences, technology and art); or other aspects which are of special interest to us. (Doxiadis, 1972a)

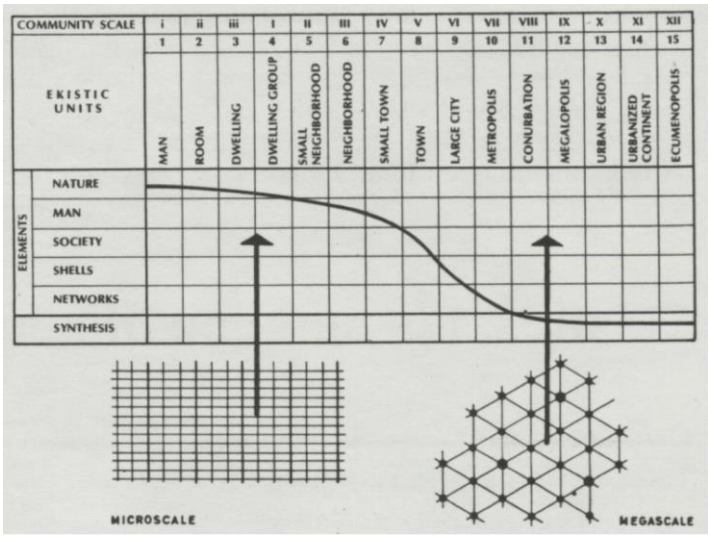


Figure 1. Settlement patterns at the microscale and mega-scale (Doxiadis, 1972a)

What Doxiadis defines is a two-dimensional grid that links the components of the city and the disciplines dealing with them to the various scales of populations existing on earth. (Figure 1) However, the orthogonal grid is not the only type of grid Doxiadis utilized in his writings. In Figure 1, a hexagonal grid is also shown along with the basic right-angle grid as a result of the basic distinction Doxiadis made between the micro and mega scales of settlements in terms of their physical formation. Doxiadis claims that the "spaces of lower order such as room, dwelling and building" impose a pattern of right-angle axes; whereas the large scale requires the hexagonal pattern which he defines as "a natural pattern derived from considerations related to open space and to the location of settlements within it." (Doxiadis, 1963) Compared to other forms such as triangles, squares, or rectangles, hexagons work best at the largest scales, since they give "the smallest average difference in distance of movements between the centre and the periphery." (Doxiadis, 1968) The use of hexagons to depict large-scale settlements is a direct influence of the geometrical basis of 'central place theory' developed by Walter Christaller, who is one of the most influential individuals in shaping Doxiadis' understanding of human settlements. (Tyrwhitt, 1978) Indeed, Doxiadis continuously developed his ideas around the theme of 'Ekistics,' almost spanning two decades between 1955 to 1975. This present study only concentrates on the logic of the above-discussed orthogonal grid created by Doxiadis.

The peculiarity of this grid lies in its twofold usage both as an analytical device employed in the journal of *Ekistics* and as a tool to organize 'Ekistics' as a systematical study of human settlements. In January 1965, when it was first introduced as a classification tool for the articles published in the journal, the grid was used as a knowledge-management tool and then transformed into a basis of a new 'science' of human settlements. This paper aims to discuss this dual nature of the Ekistics grid, first as a "networking instrument" (Wigley, 2001) in the form of a journal and second as a rigorous attempt to formulate the theory of "human settlements." (Doxiadis, 1968). While the former is mainly descriptive in nature, the latter aims to be prescriptive for the future development of settlements. The study asserts that the logic of the grid could serve as a regulating mechanism for the knowledge base on human settlements, however, its viability as a method for a new science is questionable.

The claim here is that achieving the aims of the Ekistics was not possible with the grid, which necessitates dividing the complex entities into distinct components. The Ekistics grid systematically separates the elements of human settlements, which have fluid and shifting relations between them. The

overall system still produces complex results thanks to the countless combinations it creates between these elements; however, it is the grid itself that intrinsically creates these relations. In doing so, the grid reinforces the claim that the path from data to knowledge is direct and, therefore, the knowledge is purely objective, rational, and value-free in the science of Ekistics.

The Ekistics Grid and the Total Anthropocosmos Model

The Ekistic Grid was developed, disseminated, and revised over time within the journal of Ekistics, and the total anthropocosmos model was the revised and final version of the Ekistics grid. In this model, each of the five elements of human settlements was defined with a set of components; nature, for instance, was represented with thirty-two components such as air, land, water, flora, and fauna. (Doxiadis, 1972b) The five elements in total have two hundred and fifty-eight components, and their relations with each other create approximately sixty-six thousand connections. Then, they are differentiated according to one hundred and fifty units of space-time, a combination of fifteen units of space with ten time scales. Finally, these relations were assessed through man's primary concerns, social, economic, political, technological, and cultural, with reference to a reality factor concerning their desirability and feasibility.

The strategy for dealing with this complexity was to use statistics that could "seclude and express the most important information, and provide the perfect solution" without necessarily knowing "all the complex parameters of a problem." (Tsiambaos, 2007) For Doxiadis, the growth of the cities would not be analyzed via traditional methods, which he aimed at replacing with global statistics. His insistence on gathering data and dividing them into parts to present them in a quantifiable form resulted from his desire to control the growth of human settlements, which could only be achieved by controlling the data. (Wigley, 2001) However, this linear logic which comes from the grid, presupposes that "the data collection and analysis unproblematically lead to the planning and formulation of policy solutions." (Wigley, 2001) Doxiadis aimed to discover the existing patterns in the relationships between the objects to approximate the future direction for the growth of cities. This, however, reduces the complexity of 'human settlements' "to a series of 'orderly classifications' of size, location, and function." (Davoudi, 2012)

Ekistics aimed at providing the laboratory conditions for studying human settlements by enabling the isolation of certain instances. The elements of human settlements were too big to be enclosed in a laboratory; however, Doxiadis referred to Ekistics as "one big laboratory" consisting of "many cases created by humanity over thousands of years on the surface of the Earth, from which we can draw the necessary material." (Doxiadis, 1968) Since the objectivity of laboratory sciences comes from the aspect of the laboratory to analyze or manage data free from the conditions of the real world, this implicitly suggests the detachment of the Ekistics from the complexities concerning human settlements.

The journal *Ekistics*

The journal *Ekistics* that Doxiadis started toward the end of 1955 marginalizes itself in its organization from other scholarly journals as it did not publish freshly produced knowledge but only presented a collection of already published texts with reference to the "Ekistics grid" formulated by Doxiadis. The journal's main aim was "repackaging and rebroadcasting existing data." (Wigley, 2001) As Wigley (2001) asserts, "everything that is republished in the magazine is codified as a visual pattern within the grid, a generic frame through which all planetary activity can be monitored" since January 1965. Wigley, therefore, defines the journal as "a scanning device, constantly monitoring information flow in other magazines." (Wigley, 2001)

Wigley considers the *CIAM* grid, proposed in 1949 by Le Corbusier and the *ASCORAL* group, as a precedent for the Ekistics grid, which he regards as "an extension of modernist ambitions." (Wigley, 2001) The modernist practice of ordering knowledge in a systematic way has its origins in the scientific revolution and the eighteenth-century Enlightenment project. The prevailing intellectual view of that period regarded the universe as an ordered entity that is open to scientific discovery, and it is presumed that by virtue of the scientific method, the obscurities of nature could be unraveled and controlled.

The 1950s and the 1960s were also when the architectural discourse was overwhelmed with the efforts to systematize architectural knowledge and even standardize the design process. Doxiadis' anthropocosmos model was generally seen as a continuation of the previous attempts to set a framework to encompass the totality of urban problems. The complexity of design issues was approached from novel perspectives to manage the pressing matters of technological innovations and environmental concerns. These efforts were heavily

criticized for their 'artificial' scientific grounds, as the processes of knowledge production in empirical sciences were themselves called into question by philosophers of science such as Karl Popper and Thomas Kuhn in the early 1960s.

Descriptive and Prescriptive Approaches in Knowledge Production

When referring to Ekistics, Doxiadis points out to its character as both descriptive and prescriptive. It needs to be descriptive first to learn from the thousands of years of experience of humanity in constructing and maintaining human settlements, and simultaneously it also has to be prescriptive and impose a method or a rule for the creation of new human settlements. The demand from Ekistics, for Doxiadis, "is not knowledge only but also directives for action." (Doxiadis, 1972a) However, in this configuration, being descriptive and prescriptive were considered successive phases, which implies a linear logic from analysis to creation. In Doxiadis' words, to successfully form the new discipline of Ekistics, "we must first work as scientists, and that we will be free eventually to work as technicians and artists in the actual formation of better human settlements only if our basis is scientific knowledge." (Doxiadis, 1968)

The logic of Ekistics fits better as a tool for analysis and documentation since it is very analytically constructed as a grid. It could be used as a classification tool for the already produced textual knowledge even though the editors of the journal "sometimes encountered difficulties in quantifying the data of its research and its articles into its charts." (Pyla, 1994) Considering the fact that the Ekistics grid sometimes failed as a scanning mechanism coordinating and editing already existing ideas, it was not possible for Ekistics to be an adequate science to study a very complex phenomenon like 'human settlement' because of its linear and static logic. Analyzing or classifying the already existing knowledge substantially differs from producing new knowledge, which is a fundamental condition to be regarded as a proper science.

Oriented to the Future: Controlling the Growth of Cities

As Wigley underlines, Doxiadis insisted that the real dimension of cities is not space but time and valued cities' trajectory of development more than its form. While the growth of the cities could be based on scientific reasoning in a rational manner that he implemented with the Ekistics grid, the spatial planning or the design of the cities were in the domain of cultural-aesthetic and technical disciplines whose knowledge cannot be considered as 'scientific' in

Doxiadis' own understanding. The elimination of the 'spatial' dimension also resulted in overlooking the concerns around the social aspect of the city. While spatial practice is understood as the "projection" of the social onto the spatial field, space also has an impact on the social, and they cannot be separated as such. (Lefebvre, 1991)

The grid was also a tool to predict the future of the cities in their physical form. As claimed by Doxiadis (1968), "an ideal city should be built on the basis of a rectangular grid network of roads." This linear process from collection and analysis of data to solution also implies an orderly "growth" for the cities expanding according to the grid. However, the city is not a static entity; it can be defined as a system that continuously produces different types of data and is transformed due to the interventions carried out on the basis of the collected data. Since a city is a common object of study for numerous practices and disciplines, it also generously engages conceptual constructs with interdisciplinary dynamics, such as daily life, cultural conflict, and collective memory. (Basa, 2015) The static representation of the growth of cities ignores this dynamic interplay of various practices.

Quantitative Revolution and the Advent of Big Data

This will to order and systematize the data of various disciplines into a single whole coincided with the quantitative revolution of the 1960s and the rise of systems thinking. Simin Davoudi (2012) states that systems theory, which is derived from the science of cybernetics and imported into planning in the late 1960s, "conceptualized cities as complex systems whose parts could be unpicked and then monitored and controlled by planners." The aim was to "develop spatial interaction models capable of measuring and predicting patterns of spatial change." (Davoudi, 2012)

Ekistics is considered as a response to this emphasis on quantitative analysis and the urge to divide complex entities into their parts to analyze them as a whole. While the growth of cities was the main reason back then, today's quantitative revolution, on the other hand, is caused by the exponential growth of data. This debate between quantitative and qualitative approaches inevitably places an emphasis on the opposition between knowledge produced within the humanities disciplines to the knowledge derived from the natural sciences. Today, it is still argued that much of the big-data analytics used in the social sciences are related to the ideas of positivism. With the rise of big data, Zeynep Alexander (2014) argues that the traditionally humanistic

disciplines of architecture and urbanism are increasingly dominated by the quantitative, with other forms of knowledge marginalized. (Alexander, 2014)

The current age has been defined as the age of 'information,' 'big data,' and the "internet;' due to the increase in the amount of data we have compared to earlier periods and the advancement in the technologies for collecting and transmitting data and information. When considered together with previous periods of 'information overload' in history, "Big Data can be seen as a chapter in a longer history (or, rather, histories) of observation, quantification, statistical methods, models, and computing technologies." (Aronova et.al., 2017) In each of these historical periods of 'information overload,' "the strategies and technologies developed to deal with it played a vital role in making knowledge itself." (Aronova et.al., 2017)

The reason to bring back Ekistics is that it shows similarities to the current issues about handling data and how data should lead to knowledge with the concerns of controlling the growth of data. The grid as a strategy to deal with the expansion of cities is also used to control the data, which eventually dictates how knowledge must be produced, exceeding its role as a simple tool for classifying and ordering knowledge. Second, Ekistics also illustrates the idea of networking, although with a very limited rectangular two-dimensional grid, today, knowledge is thought to take the shape of a network itself through digital means and data collection, analysis, and sharing tools. Moreover, this networking of knowledge also revitalizes the discussions around the relationships between disciplines in an unprecedented way.

With the growth in the amount of data not produced within the confines of specific disciplines, there occurs a need for new science to make sense of the data at hand. This new 'data science' is a specific endeavor to produce knowledge from data that do not belong to a specific discipline. Today's big data movement destroys "the rigid conceptualization of 'disciplinary' knowledge spaces, communities and tools." (Leonelli, 2020) Leonelli (2020) points out that "the disruptive power of data with respect to institutional and disciplinary boundaries" resulted from their "ability to transcend boundaries" and move across contexts.

Ekistics and the Interrelated Disciplines

Doxiadis (1970) defines Ekistics as a condisciplinary science rather than interdisciplinary and proclaims that "to achieve the needed knowledge and develop the science of human settlements, we must move from an interdisciplinary to a

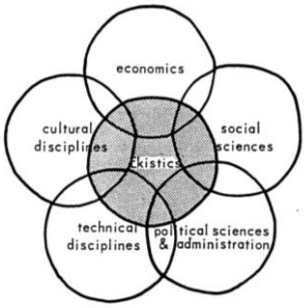
condisciplinary science; making links between disciplines is not enough." Even though Doxiadis did not offer a specific definition of "condisciplinary," the prefix 'con-' is defined as "with, together, jointly." (Merriam Webster, online edition) The urban planner Jacqueline Tyrwhitt, the editor of Ekistics, specifies a list of disciplines that have the similar concerns with the Ekistics; but refuses to reduce it to a "mere bundling together of a number of different facets of the human environment." (Tyrwhitt, 1962) As she further states:

Like geography, resource development, regional science, regional and city planning, landscape architecture, urban design and architecture, Ekistics is concerned with the organization of terrestrial space. Like history, literature, economics, and sociology, it is concerned with man- his aspirations, his thoughts and his acts. But Ekistics is no mere bundling together of a number of different facets of the human environment. It is an earnest and scientific endeavor to find ways of identifying and verifying the relations between the most significant factors that combine to make a viable human settlement. (Tyrwhitt, 1962)

According to the grid, the units of settlements are defined according to a logarithmic scale from man to ecumenopolis, and the five elements that make up the settlements are shaped by the disciplines that examine them. (Figures 2&3) In other words, disciplines are assigned both to different scales within this organization and to each of the elements. As Doxiadis (1968) asserts, "the influence of the cultural-aesthetic disciplines on ekistics should be the maximum possible in the micro-scale," which is "from room to neighborhood: the space which can be seen and conceived by man with all his senses." When "we move to the large spaces, which man cannot so easily perceive with his senses, the impact on ekistics of the cultural aesthetic disciplines begins to decrease." (Doxiadis, 1968) Conversely, the importance of political disciplines grows gradually beyond the unit of the neighborhood and "attains a very high degree of influence when we reach the level of the national state where national-political issues prevail on major decisions." (Doxiadis, 1968)

The discipline of architecture, in Doxiadis' scheme, cannot be confined to one of the categories since it contains technological as well as cultural-aesthetic elements. However, its existence is also limited to micro-scale to a great extent. As Doxiadis (1968) states, while "architecture participates in the entire spectrum of the micro-scale, its importance decreases in the middle scale and becomes practically nil in the macro-scale." Though there are some peculiar cases like architecture, Doxiadis very straightforwardly states that the contribution expected from other disciplines and fields of knowledge was learned

through an empirical analysis of the articles published in the Ekistics journal, which was "inspired by the need to collect all useful information leading to the formation of the science of Ekistics." (Doxiadis, 1968)



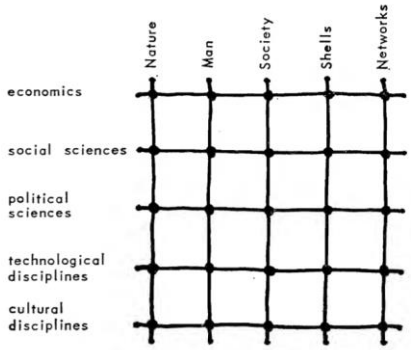


Figure 2. (left) "Ekistics and the sciences directly contributing to it." (Doxiadis, 1968)
Figure 3. (right) "Elements and sciences in the study of human settlements." (Doxiadis, 1968)

While Doxiadis' grid aimed at dividing the disciplines within their respective scales, these scales are part of a continuum and not independent from each other. Disciplines themselves cannot be neatly limited to their object of study or the field of inquiry. Disciplines are dynamic entities that could be likened to cities in this study, like cities that are described as having various components; disciplines are generally defined with a set of epistemological and institutional units.

Doxiadis attributed great importance to deciphering the relationship of Ekistics to other sciences even though the systematic classification of science was undergoing constant change at the time because it was necessary to draw conclusions about its methods and its future. (Doxiadis, 1968) Even though Doxiadis admits that both the natural and social sciences influence Ekistics, the findings of the natural sciences were more reliable to him since they deal with more specific phenomena and are more advanced. Since Ekistics is defined as a science aimed at "the creation of settlements for human satisfaction and happiness," Doxiadis states that it leads back to humanistic ideals, which "have always been largely quality-oriented, whereas the scientific method requires a quantitative approach." (Doxiadis, 1968)

These dualities between descriptive and prescriptive or between quantitative and qualitative approaches in knowledge production could also be traced to the opposition between positivist and interpretivist epistemological

stances. The hermeneutical turn challenged the dominance of natural sciences over human sciences. With the rise of interpretation as an equally legitimate method to produce knowledge, the sharp distinction between explicit and systematized knowledge and other kinds of knowledge is blurred, and the qualitative approaches to knowledge production are valued equally.

Ruşen Keleş (2020) also asserts that the sole emphasis on numerical, quantitative indicators could be misleading. While evaluating the performance of an urban system, "it is not possible to disassociate a great many factors from a much larger environment, which encompasses all activities and resources of man, as well as his surroundings." (Keleş, 2020) As he underlines "great caution should be exercised when trying to aggregate many social phenomena into a single measure." (Keleş, 2020)

Conclusion

Ekistics comes from the Greek word "Oikos," which means home, and is also the root name for many scientific disciplines such as economics and ecology. Even this conscious choice reveals that the scientific logic of other disciplines was needed to found Ekistics. Doxiadis aimed to alter the role of the architect to "archi-technicians" since he was convinced that the current architects need to deal with architecture in a scientific way and should learn the objective, scientific method of experimentation.

Even if Ekistics eventually failed to establish itself as an independent science, what remained important for Doxiadis was the consideration that to be creative, an architect should implement the scientific logic of other disciplines enriching and refining personal methodologies to provide solutions to complicated and intense problems. This emphasis on objective methods ignores the material practices of disciplines such as architecture, urban design, and landscape design, which play active roles in forming cities. When the study of the built environment is considered, regardless of the disciplinary divisions, it becomes vital to go beyond the dualities of knowledge production practices in human and natural sciences.

In conclusion, Doxiadis attempted to build a database so that the genuinely novel and surprising patterns could be born from the data, however, having all instances of data can produce meaningful information as long as they are managed with the appropriate tools and not simplified.

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