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Local data: A new approach to data in architecture

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Abstract

Data, information and knowledge terms are often used interchangeably. The intention of this paper is to provide a better understanding to data, information and knowledge relation with a relative perspective and to explain the usage of the term data in scientific studies. In addition to that, it is aimed to develop a classification of data for architecture. When the origin of the data is investigated, it shows natural or cultural references. This relation can be used at fundamental classification of data as natural or cultural. Besides, data is inherently associated with place in architecture. In the determination of the parameters related to the place, architectural studies, site planning studies, and legal regulations in architecture and planning are evaluated to construct a data framework. Local data framework has been developed to classify data that are used in architectural design. For the use of architectural site survey, local data provides a systematic classification in relation to location. The architect can easily access the data associated with the place. This approach supports the architect in design by using the local data. This study revisits data with a new approach as local data for use in architecture.

Keywords
Data, Information, Knowledge, Natural data, Cultural data, Local data.

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1. Introduction

The indirect relationship between the referent and the symbol began to occur by the development of the thought and the reference system in the human life (Ogden and Richards, 1989; Giannakidou et al., 2014). Primarily, human observed stimuli in the nature, and has responded to existing conditions. Human's efforts to live together in the nature as a community began to form culture in time. The development of culture is based on information and language as the basic form of communication. Cultural references clearly emerged with the transition from nomadic to settled life (Weisdorf, 2005). With the advances in the Neolithic period, the need to organize and transmit knowledge directed human to the writing (Childe, 2010). Early samples of the writing appear in the form of what they symbolize through visuals. Then, it turned away from resembling the object by use of simplified characters and also began to symbolize sounds. The writing is the most basic form of transforming information to data. Referents are physically structured via writing to symbolize anything. These advances have led to the emergence of data, which is the concrete form of information or knowledge. Data is based on perception of referents in nature or culture, and also to be recorded with specific symbols.

It is necessary to understand the differences between information, knowledge and data for the proper use of the term data. Use of these terms with the fundamental meaning provide the better understanding of relations than the other assumptions. This point of view clarifies that why term data is used instead of information and knowledge. Afterwards the origin of the data is investigated, it shows that data contains natural or cultural references. Besides, data is inherently associated with place in architecture. Local data approach can be used as a framework to classify the data in terms of architectural design. Under this approach, local data covers all data that belong to a place and its surroundings under the categories of natural and cultural data. The systematic understanding of the data for the design to be developed through the local data helps the architect's design process.

2. The relation of data, information, and knowledge

The definitions and the relations of data, information and knowledge are accepted with different aspects in literature (Zins, 2007). Most of the researchers use Ackoff's (1999) definition for the hierarchy of data, information, and knowledge. According to this definition, data are symbols that represent the properties of objects and events. Information consists of processed data, that directed to increase the usefulness of information. Knowledge is know-how, and what makes possible the transformation of information into the instructions. This hierarchy shows that data can be used to create information, and information can be used to create knowledge (Rowley, 2007). Most of these definitions are described from an information systems perspective. They base on the processes associated with the transformation between data, information and knowledge. But this hierarchy is not useful to understand these concepts and has problems about reasoning.

Despite many studies at the definition of data, information and knowledge, there is not a common acceptance of what they are and the relationships between them (Liew, 2007). The use of the three terms is not consistent, and often conflicting. Especially, the terms of data and information are often used in an interchangeable manner (Chen et al., 2009). It shows that distinctions between information, knowledge and data need to be reconsidered.

The term of information with the basic meaning is used to refer to the communication or reception of intelligence (Webster, 2018a). Information is the most primitive form of anything perceived as potentially signifying something. It is the state of knowledge outside the mind and exists independent of human (Demir, 2000). Source of information encodes the information into the reality. The meaning of the information depends on the ability to be decoded by the receiver (Aksoy, 1975; Eco, 1998). Only a protocol based on knowledge can transfer infor-

mation. The transferred information becomes meaningful as knowledge, and operable as data. If it is explained with an example to better understand, a voice such as human speech can be exploited. This speech is produced by a person in her/his native language to communicate. If it is nonsense to the listener, it is just a voice in the form of information. But if it is meaningful to the listener who understands spoken language, it is in the form of knowledge. This speech becomes data when it is recorded on a paper or a voice recorder.

Knowledge is internalized information that has decoded inside of a cognitive system. It can be described as the conceptual model of the reality in the mind (Bayazıt, 2004). The common view is that knowledge is the product of a synthesis in the mind of the knowing person, and exists only in knower's mind. It is embodied in humans as the capacity to understand, explain and negotiate concepts, intentions, and actions (Hey, 2004). It is shaped by knower's personal perceptions and experiences, and therefore individuals build their own knowledge. Only data can exist in a knowledge based structure as persistent or transient in any environment, regardless of the person.

Data is the structured statement of information or knowledge. It provides a format that can be processed by information systems (Demir, 2000). It takes shape in specific symbols by knowledge based protocols. This is the only way to capture, store and transfer the information or knowledge in a representation medium. Moreover, data has the ability to become information in reality or knowledge in mind. The type of transition depends on how the receiver gives meaning to data. Consequently, it can be said that, information, knowledge, and data have a transition which need to be simply explained.

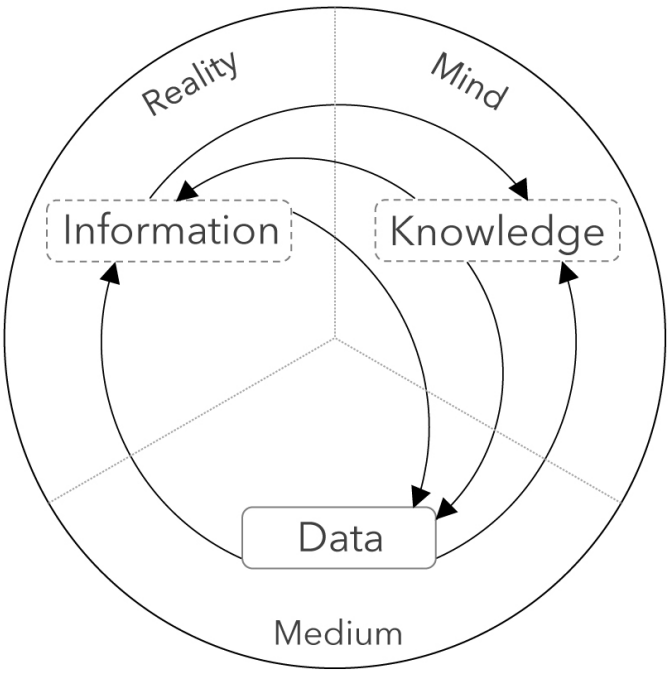

Figure 1. *Information, knowledge and data relation.*

Information flow is continuous and everywhere; but in order to be useful it has to be the data. For instance, if you are the architect who takes notes at a given place for architectural site survey, you should see factors that affect your design. They can be in a wide range from topography, climate, landscape to legal boundaries, surrounding buildings, accessing to the site etc. But if you are not eligible to reach all architectural knowledge, you can just focus on one information like vista as an important factor for design. Although the existing information is identical in the site, data varies depending on the knowledge of the person. This case indicates that if person has not knowledge about information, the information cannot transform to data.

Most of the researchers claim that data, information, and knowledge are part of a sequential order (Baskarada and Koronios, 2013). But, this study's description provides a relative approach to information, knowledge and data. One of them can derive from others, therefore it shows a cyclical relation. The identical thing can be defined as information, knowledge or data, depending to where it happened in reality, mind or representation medium (Figure 1).

Information is usually used instead of data or knowledge in daily use by the reason of not defined very well. The essential nature of information has been considered as fundamental to our existence by many studies (Sanders, 2016). This study generates a new perspective to data, information and knowledge relation, with the basic meaning of information. It also shows that data is the most concrete form of them to

use in processes. Apart from the common definitions and the relationships between data, information and knowledge, this approach can be more useful to grasp the terms.

3. Natural and cultural data

The nature covers everything and human is a part of nature. Human forms and develops culture, while nature imposes conditions that feed or restrict formation of culture. According to Marx, culture is everything that human beings create against the creatures of nature (Güvenç, 1994). Haila (2000) points out that culture may be viewed as an agent that actively struggles for domination over nature. The culture phenomenon can be recognized as a result of the interaction between human and nature. In these approaches, culture is expressed in an anthropocentric way despite the possibility of other species cultures. Human is seen as the main factor in the emergence of data that includes natural and cultural beings. The natural conditions forced human to act with an adaptive behaviour against nature. These facts directed human to be aware of the natural beings. In order to survive in nature, human adopted to the order of living together as a community, and this way of life gives birth to culture (White, 2016). The attitudes developed against natural conditions and the living in the community have led to emergence of cultural beings. In this way, human began to consider the natural data, and derived the cultural data.

According to Demir (2016), there are two fundamental categories of being associated with architecture as natural and cultural. While all layers of being can be considered in the natural category, cultural category comprises the psychical and spiritual layers (Figure 2). This approach provides a fundamental classification to use in architecture as natural and cultural category.

Nature is often equated with the natural environment, but culture is just seen as customs, rituals, beliefs and other spiritual layers. This is an incomplete view of culture without physical artifacts of human. Rapoport (2005) suggests that culture can be interpreted in different ways. According to Rapoport (2005), three types of responses can be determined for what culture does. First, the purpose of culture is to provide a life design through a variety of rules that show how things should be done. The second view accepts the purpose of culture as creating a framework that gives meaning to parts. Objects can only gain meaning in their position relative to one another in such a framework. The third view is that the aim of culture is to define groups. All these insights are gathered in a holistic perspective to make culture operational, especially as it relates to the physical environments (Rapoport, 2008).

It is seen that different conceptualizations of culture are useful to understand the most comprehensive meaning of culture. In this study, cultural layers of being are considered as the parts of the culture that gives meaning to anything. Thus, every kind of man-made being emerged from the interaction of human with the nature is considered to be the result of culture. Especially for architecture, it provides that physically existing components of culture are examined under the category of cultural data. On the other hand, everything that exists in nature itself and does not have any human interaction can be considered as natural data. These definitions are useful to understand the classification of cultural and natural data. For instance, agriculture is a cultural data despite of its natural structure, because it includes the effect of human.

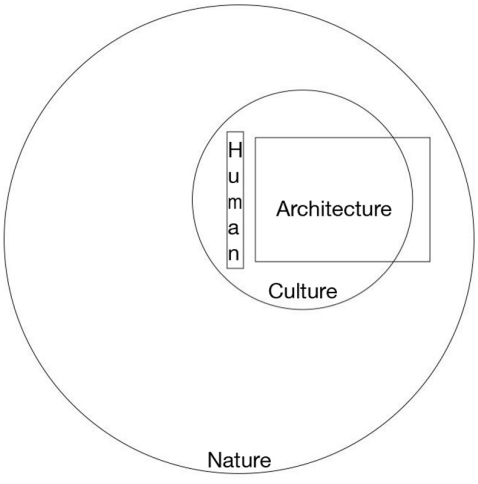

Figure 2. *Human / Nature / Culture (Demir, 2016).*

According to Bunschoten, when the conditions of the site are seen for architectural design, architects have to understand the relations between the natural layers of the world and the cultural layers that are created by humanity. These natural and cultural layers interact with each other and struggle to outrival each other (Anderson, 2011). In architecture, natural and cultural data can be used to classify via origin of data. Thus, the architect can easily be aware of the natural conditions to protect nature and avoid hazards in design, and the cultural effects suitable for the users. The classification of these layers provides a systematic approach to deal with data for architectural design.

4. Local data: A data framework for architecture

Architecture is a discipline that is directly related to the place, unlike other design disciplines. Norberg-Schulz (1980) explains the basic act of architecture as being "to understand the vocation of the place". Norberg-Schulz (1980) conceptualized "genius logi" to concretize the sense of place. This is done by means of buildings, which gather the properties of the place and bring them close to human. According to Wright (1957), architectural design is about being native to the place, and this kind of a point of view is one of the central design thought in modern architecture (Boyacıoğlu et. al., 2017). Architecture requires an appropriate relationship between the place and the building. Features of site give special character to places and shows how architecture can respond by creating a meaningful environment. Every community lives in the tension created by the intersection of the natural environment and human culture, and each develops its architectural responses to that tension (Crouch and Johnson, 2001). Architectural design focuses on the data related to the characteristics of the buildings and context of the place. On the one hand architecture needs to respond functional requirements, whilst on the other it needs to take into account the natural forces and cultural accumulations (Baker, 2003).

Depending on the place, natural data is effective on placement and form of architecture. It is essential for architecture to provide spatial arrangements according to topography, to create a comfortable environment compatible with climatic conditions, to benefit from the natural materials of nearby place, and so on. Some of the decisions taken during the design process are based on acting in accordance with natural data. Therefore, it is important to use of natural data in architecture for maintaining the link between human and nature.

Cultural data includes physical components of culture in built environment and other intangible components of culture such as habit, tradition, and ritual. All these components cover everything that human does and creates. For this reason, cultural data is the primary factor in the emergence of the architectural environment and life style of a community. Even under the same natural conditions, cultural data allows for the emergence of different architectural settlements and formations.

In architecture, natural and cultural data are needed to be discussed by the context of "local". Local means having a definite location (Webster, 2018b). According to Tekeli (2010), local serves as a framework that defines a specific place which includes the physical structures and the natural features of the environment. Alongside, community and their culture integrate with physical environment to make it meaningful. Every place has its own natural and cultural characteristics to exist as a distinctive place. Every place is unique, and there is really no other place like it (Leatherbarrow, 1993). It clearly shows that place is the source of local data for architecture.

Local data belongs to a specific place that is a whole with data around. In the context of the study, the concept of local data considers the location as the main context source for data while classifying other contextual factors. In order to benefit from local data, a framework in which data is classified is needed. Generally, architects use their observations about the place and accessible data for architectural design. This circumstance directs architects to work on limited data rather than using an extensive data framework to check all

related data. Therefore, firstly the fundamental classification is considered by natural and cultural characteristics, which are peculiar to place in architecture. Thus, it is seen that local data can be organized in a way that includes not only natural characteristics such as topography, climate, vegetation, natural resources etc., but also cultural characteristics such as buildings, utilities, legal boundaries, demography, cultural heritage etc.

Comprehensive literature research is needed to provide categories and subcategories of the natural and cultural data systematically. In the scope of the study, architectural studies (White,1983; Unwin, 1997; Fawcett, 1998; Birkeland, 2002; Thomas, 2002; Spreiregen and De Paz, 2005; Farrely, 2012; Bielefeld and Khouli, 2017), site planning studies (Lynch, 1971; Brooks, 1988; McBride, 1999; Beer and Higgins, 2000; Pitts, 2004; Towers, 2005; Carmona et al., 2010; LaGro, 2013), and legal regulations in architecture and planning (Regulation on Making Spatial Plans, 2014; National Planning Policy Framework, 2018) are evaluated to construct a data framework.

In Table 1, classes of natural and cultural data come together in different colours. These data classes are collocated by considering their relationships with each other in reviewed sources. It is observed that data classes have no differences in use and meet the common scope. Each data class contains basically the same approach from different sources. Consequently, this literature research reveals data classes as: land use, land types, boundary, density, built environment, building types, size and placement of buildings, neighbourhood patterns, local formation of buildings, construction techniques, materials of construction, topography, slope, drainage, scenery, geology, underground resources, hydrology, vegetation, wildlife and conservation areas, biodiversity, utilities, transportation, energy, electricity, gas, communication, water, sewage, waste, accessibility, pedestrian access, vehicular access, surrounding traffic patterns, public transportation, parking areas, sensory attributes, views, noise problems, odour problems, air pollution, climate, sunlight and shade, temperature, wind, humidity, precipitation, disasters, hazards, laws and regulations, social environment, demography, sociocultural context, historical development, cultural conservation areas, landmarks and historic buildings, conserved buildings, future visions and projects.

Table 1. *Evaluation of data classes for architecture in literature review.*

Natural & Cultural Data	Lynch, 1971	White, 1983	Brooks, 1988	Unwin, 1997	Fawcett, 1998	McBride, 1999	Beer & Higgins, 2000	Thomas, 2002	Birkeland, 2002	Pitts, 2004	Towers, 2005	Spreiregen & De Paz, 2005	Carmona et al., 2010	Farrely, 2012	LaGro, 2013	Regulation on Making Spatial Plans, 2014	Bielefeld & Khouli, 2017	National Planning Policy Framework, 2018
Land Use	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Land Types (Residential, Agricultural, etc.)	x		x			x	x	x	x		x		x		x	x		x
Boundary	x	x	x		x	x						x		x	x	x		x
Density	x	x	x			x	x	x	x	x	x		x	x		x	x	x
Built Environment (Existing Structures)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Building Types (Residential, Commercial, etc.)		x	x	x			x	x	x	x	x	x	x	x		x	x	x
Size and Placement of Buildings	x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x
Neighbourhood Patterns	x	x						x	x		x	x	x		x	x		x
Local Formation of Buildings		x		x				x	x		x	x	x	x	x	x	x	x
Construction Techniques	x								x	x	x	x	x	x			x	
Materials of Construction	x	x		x					x	x	x	x	x	x			x	x
Topography	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Slope	x	x	x			x	x		x			x	x	x	x	x	x	x
Drainage	x	x	x			x	x		x				x		x	x		x
Scenery (Aspect)	x	x	x		x	x	x	x				x	x		x		x	x
Geology (Ground, Soil)	x	x	x	x		x	x	x	x			x	x	x	x	x		x
Underground Resources							x			x	x		x	x	x	x		x
Hydrology (Water Resources)	x	x	x			x	x	x	x	x			x		x	x		x
Vegetation	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Wildlife & Conservation areas	x		x				x	x	x	x					x	x		x
Biodiversity (Flora & Fauna)	x		x				x	x	x	x	x	x	x	x	x	x		x
Utilities (Infrastructures)	x	x	x			x	x	x	x		x	x	x		x	x		x
Transportation (Road, Railway, Airline, etc.)	x		x				x		x						x	x		x
Energy	x	x			x			x	x	x	x		x		x	x		x
Electricity	x	x	x			x	x	x				x	x		x	x		
Gas	x	x	x			x	x					x	x		x	x		
Communicaton	x	x				x	x		x			x	x		x			x
Water	x	x	x		x	x	x	x	x		x	x	x		x	x		x
Sewage		x	x		x	x	x	x	x	x	x	x	x		x	x		x
Waste	x	x						x	x	x	x		x		x	x		x
Accessibility	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pedestrian Access	x	x	x		x	x		x	x		x	x	x			x		x
Vehicular Access	x	x	x		x	x		x	x		x	x	x			x		x
Surrounding Traffic Patterns	x	x	x			x		x	x			x	x		x	x		x
Public Transportation		x	x			x	x	x	x	x	x	x	x			x		x
Parking Areas	x		x				x		x		x	x	x		x	x		x
Sensory Attributes	x	x					x	x	x		x		x		x			
Views	x	x	x			x	x	x	x			x	x		x			x
Noise Problems	x	x		x			x	x	x	x	x	x	x		x		x	x
Odour Problems	x	x		x			x		x						x			
Air Pollution							x	x	x				x		x			x
Climate	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sunlight & Shade	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
Temperature	x	x	x			x	x	x	x			x		x	x			x
Wind	x	x	x	x	x	x	x	x	x	x		x	x	x	x			x
Humidity	x	x	x	x			x	x				x			x			
Precipitation	x	x	x	x		x	x	x	x	x		x	x	x	x			
Disasters		x	x	x							x				x	x		x
Hazards			x				x				x	x	x			x		x
Laws & Regulations	x	x	x			x	x	x	x	x	x	x	x		x	x	x	x
Social Environment	x	x	x	x	x		x	x	x		x	x	x		x	x	x	x
Demography	x	x	x				x	x	x		x	x			x	x		x
Sociocultural Context		x	x	x	x		x	x	x		x	x	x		x	x	x	x
Historical Development	x	x	x	x	x		x		x	x		x	x	x	x	x	x	x
Cultural Conservation Areas		x		x				x						x	x	x		x
Landmarks & Historic Buildings		x			x		x	x			x		x		x	x	x	
Conserved Buildings		x					x	x					x		x	x	x	x
Future Visions & Projects	x	x		x			x		x				x			x		x

In literature review, data classes that are needed in architectural design are examined for data framework. By considering the relations of each data class to other classes, the data classification system has begun to form. When the data classes are collated, the interrelat-

Table 2. *Natural and cultural local data framework for architecture.*

Natural Data (ND)	Cultural Data (CD)
ND_1 - Topography	**CD_1 - Land Use**
ND_{11} - Slope	CD_{11} - Land Type
ND_{12} - Drainage	CD_{12} - Boundary & Area
ND_{13} - Scenery	CD_{12} - Density
ND_2 - Geological Features	CD_{13} - Neighbourhood Pattern
ND_{21} - Ground Type	CD_{14} - Historical Development & Conservation Areas
ND_{22} - Underground Resources	CD_{15} - Future Visions & Plans
ND_3 - Water Resources	**CD_2 - Built Environment**
ND_4 - Vegetation	CD_{21} - Building Type
ND_5 - Climate	CD_{22} - Size and Placement of Building
ND_{51} - Sunlight & Shade	CD_{23} - Local Formation of Buildings
ND_{52} - Temperature	CD_{24} - Construction Technique
ND_{53} - Air flow	CD_{25} - Materials of Construction
ND_{54} - Precipitation	CD_{26} - Landmarks & Conserved Buildings
ND_{55} - Humidity	CD_{27} - Future Projects
ND_6 - Wildlife & Conservation Areas	**CD_3 - Utilities**
ND_7 - Biodiversity	CD_{31} - Transportation
ND_{71} - Plant Variety	CD_{32} - Energy
ND_{72} - Animal Variety	CD_{33} - Communication
ND_8 - Natural Disasters	CD_{34} - Water
ND_{81} - Geological Disasters	CD_{35} - Sewage
ND_{82} - Hydrological Disasters	CD_{36} - Waste
ND_{83} - Meteorological Disasters	**CD_4 - Legislation**
…	**CD_5 - Social Environment**
ND_n - …	CD_{51} - Demography
	CD_{52} - Sociocultural Context
	CD_6 - Accessibility
	CD_{61} - Pedestrian Access
	CD_{62} - Vehicle Access
	CD_{621} - Surrounding Traffic Pattern
	CD_{622} - Public Transportation
	CD_{622} - Parking Areas
	CD_{63} - Bicycle Access
	CD_{64} - Disabled Access
	CD_7 - Sensory Attributes
	CD_{71} - Views
	CD_{72} - Noise Problems
	CD_{73} - Air Quality & Odour Problems
	CD_8 - Hazards
	…
	CD_n - …

ed data in sources are also grouped in Table 1. These relationships are considered to determine a local data framework in this study.

All of these data classes are organized to structure local data framework that has been emerged in Table 2. In this framework, all data belonging to the place are grouped under two main categories as natural data (ND) and cultural data (CD). Categories are also clustered with subcategories according to their relationship with each other. Natural data includes the categories of topography, geological features, water resources, vegetation, climate, wildlife & conservation areas, biodiversity and natural disasters. Cultural data includes the categories of land use, built environment, utilities, legislation, social environment, accessibility, sensory attributes and hazards.

The classification of the local data comprises various subcategories under the categories. When natural data categories are grouped by their relationships, the category of topography contains slope, drainage, and scenery subcategories. Geological features are classified as ground type and underground resources subcategories. According to reviewed sources, categories of water resources, vegetation, wildlife and conservation areas have not defined subcategories. The category of climate consists of sunlight and shade, temperature, air flow, humidity, precipitation subcategories. Biodiversity includes plant and animal varieties in itself. Natural disasters can be classified as geological, hydrological, meteorological disasters.

On the other hand, cultural data that have the effect of human are grouped. The category of land use contains land type, boundary and area, density, neighbourhood pattern, historical development and conservation areas, future visions and plans subcategories. The category of built environment consists of building type, size and placement of building, local formation of buildings, construction technique, materials of construction, landmarks and conserved buildings, future projects subcategories. Utilities are classified as transportation, energy, communication, water, sewage, and waste. The category of legislation without subcategories represents all laws and regulations which organize community life and structuring conditions. The category of social environment contains demography and sociocultural context subcategories. The category of accessibility contains pedestrian, vehicle, bicycle and disabled access subcategories. Vehicle access subcategory can be classified as surrounding traffic pattern, public transportation, and parking areas. The category of sensory attributes consists of views, noise problems, air quality and odour problems subcategories. Hazards without subcategories represents human induced dangers like crime rate, night security, and so on.

This framework provides an organized structure for local data and sup-

ports the classification of data related to the place. Given the nature of this framework, location is handled as the major context source to classify the other contextual factors. Instead of being evaluated in a separate framework, temporal context is embedded in subcategories like the other contextual factors. The combination of temporal factors with data leads to the derived subcategories such as historical development, future visions and so on.

The classification of natural and cultural data can also be carried out under different categories and subcategories. This classification is realised according to data classes of reviewed sources. It is also possible to classify this framework in different ways depending on the varied classification approaches. This framework is not absolute, it's open to development. When new data may be derived, the classification system may expand. For instance, if the effects that come from space such as meteor stream affect the world, it may be included in this framework as natural data.

Local data framework has been developed to classify data that are used for architectural design. In the architectural design process, the architect needs data related to the context of the place. Observing natural and cultural resources by visiting the site provides clues about how to produce an appropriate design response. Afterwards, the architect evaluates these natural and cultural data according to the required formal, functional and structural needs. Instead of this process that uses a coincidental approach to data acquisition, local data framework provides a systematic classification in relation to location. Local data framework contains all the data that should be considered when making design decisions. In the architectural site survey, the architect can check all available data according to local data framework. Thus, the possibility of missing important data is eliminated. For instance, forgetting to check land use or legislation can cause serious problems in the implementation of the architectural design. In addition, the architect records data with its location information. Thereby, data's relationship with the place is maintained for the analysis process.

5. Conclusion

In this paper, a relative approach is adopted to provide a better understanding of the relationship between data, information and knowledge. This is essential to understand why data term is used as a concrete form of information and knowledge. At the same time, this approach prevents the use of the data, information and knowledge term interchangeably and expresses their use in scientific studies correctly. When the origin of the data is investigated, it is seen that each data carries natural or cultural references. This indicates that the fundamental classification of data can be organized under natural and cultural categories. With the extreme increasing human impact on nature, the classification of data that base on being natural or cultural can become more important in the future. Through these theoretical studies, the basis is prepared for the transition to data in architecture.

Architecture is a discipline that is inherently associated with the place. Even though place could be seen as a limitation for architectural design, it actually offers many different possibilities. By the reason of two different sites are not exactly the same, place makes architecture original and unique. Each place offers different data in terms of understanding and interpreting the site. Considering the relationship with the place in architecture, the data in the field of architectural design are handled under the local data approach. By means of this approach, local framework associated with a place is defined for architectural design. Understanding the site and its surrounding potential through local data provides an analytical process for architectural design.

To take advantage of the local data concept, a data classification framework is needed to manage data. Primarily, data classes that are needed in architectural design are examined with their origin through literature research. Architectural studies, site planning studies, and legal regulations in architecture and planning are evaluated to construct a data framework. Afterwards, local data framework is developed with the use of fundamental classification as natural data and cultural

data, and data classes relationship with each other. It is also possible to classify this framework in different ways depending on the varied classification approaches. To develop subcategories, more comprehensive research is needed for each data class. Although it is possible to define each data class with its qualitative or quantitative structure, the resources used in this study are not suitable for a research within this scope. This kind of study requires a more comprehensive research based on the practical use of each data in daily life. Local data framework is expressed as an open approach to development rather than a framework that is terminated in the study.

In addition to providing a theoretical basis, this study provides a framework for the practical use in further studies. Local data framework can be integrated into computational platforms that effectively interact with and utilize from data contained within the site. The classification of data through this framework provides a systematic approach to easily access to all data associated with the place in architectural design. Local data framework supports the architect in design by taking data into account.

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References

Ackoff, R. L. (1999). *Ackoff's Best, From Data to Wisdom.* New York, John Wiley & Sons, 170-172.

Aksoy, E. (1975). *Mimarlıkta Tasarım,* İletim ve Denetim. Karadeniz Teknik Üniversitesi Yayınları, İstanbul, 81-91.

Anderson, J. (2011). *Basics architecture 03: Architectural design.* AVA Publishing SA, 83-99.

Baker, G. H. (2003). *Design strategies in architecture: an approach to the analysis of form.* Taylor & Francis, 3-13.

Baskarada, S., & Koronios, A. (2013). Data, information, knowledge, wisdom (DIKW): a semiotic theoretical and empirical exploration of the hierarchy and its quality dimension. *Australasian Journal of Information Systems,* Volume 18 Number 1, 5-24.

Bayazıt, N. (2004). *Endüstriyel tasarımcılar için tasarlama kuramları ve metotları.* Birsen Yayınevi, 149-150.

Beer, A., & Higgins, C. (2000). *Environmental Planning for Site Development: A manual for sustainable local planning and design.* Routledge, 1-83.

Bielefeld, B., & El Khouli, S. (2017). Basics Design Ideas. Birkhäuser, 11-38.

Birkeland, J. (2002). *Design for Sustainability: A Sourcebook of Ecological Design Solutions.* Earthscan, London, 52-73.

Boyacıoğlu, C., Pulat Gökmen, G., & Ayıran, N. (2017). Anthropocene idea in modern avant-garde architecture: a retrospective discussion on Wright and Fuller. *A | Z ITU Journal of the Faculty of Architecture,* 14(2), 105-117.

Brooks, R. G. (1988). *Site Planning: Environment, Process, and Development.* Prentice Hall, New Jersey, 37-54.

Carmona, M., Tiesdell, S., Heath, T., & Oc, T. (2010). Public Places - *Urban Spaces: The Dimensions of Urban Design.* Architectural Press, 77-266.

Chen, M., Ebert, D., Hagen, H., Laramee, R., Ribarsky, W., Scheuermann, G., & Silver, D. (2009). Data, Information and Knowledge in Visualization. *IEEE Computer Graphics and Applications,* 29(1), 12-19.

Childe, G. (2010). *Kendini yaratan insan.* Varlık Yayınları, İstanbul, 79-103.

Crouch, D. P., & Johnson, J. G. (2001). *Traditions in Architecture: Africa, America, Asia, and Oceania.* Oxford University Press, New York, 1-4.

Demir, Y. (2000). An Architecture Information Management System (IMS) for Consideration of Multi-Dimensionality within Wholeness (Unpublished doctoral dissertation). İstanbul Technical University, İstanbul, 7-8.

Demir, Y. (2016). Multidimensionality and Unity as Part of Architecture & Nature & Culture Relations. *Surviving between Pedagogy and Practice in Architectural Design,* İdeal Kültür Yayıncılık, İstanbul, 33-46.

Eco, U. (1998). *Faith in Fakes: Travels in Hyper reality.* Harcourt Brace Jovanovich, Inc., Vintage, 135-144.

Farrelly, L. (2012). *The fundamentals*

of architecture. Bloomsbury Publishing, 12-33.

Fawcett, A. P. (2007). *Architecture design notebook.* Routledge, 13-38.

Giannakidou, E., Vakali, A., & Mavridis, N. (2014). Towards a Framework for Social Semiotic Mining. In Proceedings of the 4th International Conference on Web Intelligence, Mining and Semantics (WIMS14), 21.

Güvenç, B. (1994). *İnsan ve Kültür.* Remzi Kitabevi, İstanbul, 95-101.

Haila, Y. (2000). Beyond the nature-culture dualism. *Biology and philosophy,* 15(2), 155-175.

Hey, J. (2004). The Data, Information, Knowledge, Wisdom Chain: The Metaphorical link. *Intergovernmental Oceanographic Commission,* 26 (December), 1–18.

LaGro, J. A. (2013). *Site analysis: Informing context-sensitive and sustainable site planning and design.* John Wiley & Sons, 29 -188.

Leatherbarrow, D. (1993). *The roots of architectural invention: site, enclosure, materials.* Cambridge University Press, 18-27.

Liew, A. (2007). Understanding Data, Information, Knowledge and Their inter-relationships. *Journal of knowledge management practice,* 8(2), 1-16

Lynch, K. (1971). *Site planning.* MIT press, 1-24.

McBride, S. B. (1999). Site Planning and Design. Retrieved from: http://www.rri.wvu.edu/WebBook/McBride/section3.html (accessed 15 December 2018).

National Planning Policy Framework (2018). Website of National Planning Policy Framework. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf (accessed 13 December 2018).

Norberg-Schulz, C. (1980). *Genius loci: Towards a phenomenology of architecture.* Rizzoli, New York, 6-23.

Ogden, C. K., & Richards, I. A. (1989). *The Meaning of Meaning.* Harcourt Brace Jovanovich, Orlando, Florida, 1-23.

Pitts, A. (2004). *Planning and design strategies for sustainability and profit: pragmatic sustainable design on building and urban scales.* Architectural Press, 27-84.

Rapoport, A. (2005). *Culture, architecture and design.* Locke science publishing Company, 92.

Rapoport, A. (2008). Some further thoughts on culture and environment. *International Journal of Architectural Research: ArchNet-IJAR*, 2(1), 16–39.

Regulation on Making Spatial Plans (2014). Mekansal Planlar Yapım Yönetmeliği. Retrieved from: http://mpgm.csb.gov.tr/mekansal-planlar-yapim-yonetmeligi-i-4583 (accessed 15 December 2018).

Rowley, J. (2007). The wisdom hierarchy: Representations of the DIKW hierarchy. *Journal of Information Science,* 33(2), 163–180.

Sanders, J. (2016). Defining terms: Data, information and knowledge. *In SAI Computing Conference (SAI),* IEEE, 23-228.

Spreiregen, P. D., & De Paz, B. (2005). *Pre-design.* Kaplan AEC Architecture, 3-25.

Tekeli, İ. (2010). *Toplu eserler (12) gündelik yaşam, yaşam kalitesi ve yerellik yazıları.* Tarih Vakfı, 170.

Thomas, D. (2002). A*rchitecture and the urban environment: A vision for the New Age.* Architectural Press, 135-193.

Towers, G. (2005). *An Introduction to Urban Housing Design: At Home in the City.* Architectural Press, 61-110.

Unwin, S. (1997). *Analysing Architecture.* Routledge, 85-98.

Webster, M. (2018a). Information. Retrieved from: https://www.merriam-webster.com/dictionary/information (accessed 13 October 2018).

Webster, M. (2018b). Local. Retrieved from: https://www.merriam-webster.com/dictionary/local (accessed 05 December 2018).

Weisdorf, J. L. (2005). From foraging to farming: explaining the Neolithic Revolution. *Journal of Economic surveys,* 19(4), 561-586.

White, E. T. (1983). *Site analysis: Diagramming information for architectural design.* Architectural Media, 6-39.

White, L. A. (2016). *The evolution of culture: the development of civilization to the fall of Rome.* Routledge, 3-30.

Wright, F. L. (1957). A testament. Ann Arbor, MI: Horizon Press.

Zins, C. (2007). Conceptual Approaches for Defining Data, Information, and Knowledge. *Journal of the American Society for Information Science and Technology,* 58 (January), 479–493.