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Research Paper

Bridging The Gap Between Theory And Action: Implementing Environmental Theories In Architecture And Urban Planning

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Abstract
Theoretical principles in environment-oriented disciplines are crucial, serving as the foundational knowledge base for all processes and activities within these fields. Their significance lies in their ability to establish a distinctive identity for these disciplines, differentiating them by their content, methodologies, and values. This research investigates the core concepts and fundamental ideas that underpin architecture and urban planning, linking these theoretical frameworks to knowledge management indicators. Understanding these theoretical foundations is vital as they are informed by knowledge-centric perspectives. Furthermore, recognizing the term "science" within these disciplines necessitates acknowledging existing frameworks and exploring new theoretical fields. The integration of software tools, particularly artificial intelligence, facilitates the application of these theoretical principles through logical algorithms. Therefore, it is essential to comprehend these fundamental concepts, which form the basis for theoretical support across all aspects of these disciplines. In simpler terms, theoretical principles can be viewed as foundational ("Foundation"), their formation as structural ("Structure"), their appearance ("Appearance"), and their application in architecture, urban planning, and urban geography as functional ("Function"). This research utilizes qualitative content analysis, specifically employing artificial intelligence via MaxQDA software. The study's findings enhance our understanding of existing theoretical foundations, enabling their adaptation into environmental scenarios and their application in new contexts and situations. By integrating these environmental scenarios into architectural and urban planning practices, professionals can create more sustainable, resilient, and livable environments, benefiting both people and the planet.

Keywords: *Theoretical Framework, knowledge Structure, Scientific interventions, Theoretical foundation, Theoretical appearance, Theoretical structures, Theoretical function.*

1. INTRODUCTION

The epistemological core of environmental-oriented disciplines lies in the integration of diverse knowledge systems and perspectives. This integration necessitates a reevaluation of environmental sciences and the establishment of their epistemological status through theoretical principles (Jasso, 2017, p. 647). It demands a critical and historical understanding of environmental education (EE) and its connections with interdisciplinary factors (da Costa & Loureiro, 2015, pp. 694-695). Additionally, it involves acknowledging the value and moral attitudes towards nature, as well as incorporating social needs into individual interests (Lopatina, 2022, p. 250). Indigenous knowledge systems provide alternative

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scientific criteria that can enhance the effectiveness of environmental sciences as an institutional agency within architecture and urbanism (Rivillas, 2020, pp. 230-231). Thus, an ethics-based epistemological framework is necessary for environmental philosophy, which contrasts with the epistemology-based ethics derived from the foundations of mainstream theories (Tong J., 2017, p. 780).

This ethics-based epistemology draws upon examples from indigenous cultures, influencing the understanding and resolution of environmental issues within the theoretical foundations of environmental-oriented disciplines. This alternative perspective acknowledges the agency and autonomy of natural processes and entities, thereby recognizing the interconnectedness between humans and nature (Steil & Carvalho, 2014). This reflection on needs shapes the development of theoretical frameworks by highlighting the roles, duties, and tasks in these disciplines. It underscores the necessity of addressing the essential needs of present and future generations, while also considering the constraints imposed by technology and social organization on the environment's capacity to fulfill those needs (de Oliveira, Domingos, & Colasante, 2020, pp. 175-177).

The use of intervention tools in environmental-oriented disciplines significantly impacts the formation of new and integrated theoretical perspectives and methods (Kitch, 2017, p. 8). Interdisciplinary fields such as social studies and anthropology, which incorporate public viewpoints, have contributed to creating a common language between these disciplines and designers and urban planners. This expansion of theoretical foundations is facilitated through innovative approaches, such as participatory visual research methods (Vallejo, 2023, pp. 7-8). This interdisciplinary collaboration has extended to linguistics, influencing the theoretical principles of these fields. Consequently, designers and planners utilize these skills to comprehend the worldview, desires, and demands of their audience, enabling them to design multiple future scenarios based on diverse values and perspectives (Li, Liu, & Peng, 2020, p. 3).

In further application, interventions within environmental-oriented disciplines are designed to regulate facilities and activities that may pose risks to individuals or the environment. These interventions, which include the use of instruments for environmental administrative supervision, are grounded in interdisciplinary theoretical foundations (Palanca, 2016, pp. 866-867).

Overall, environmental scientists seek to promote a broader message of public awareness and engagement through their theoretical foundations, while also taking into account the social, political, and economic dimensions of environmental issues (Boora, Karakunnel, & Savarimuthu, 2022, p. 11454). The theoretical principles of environmental-oriented disciplines have notably influenced the field of sociology. In particular, the New Environmental Paradigm (NEP) has challenged the dominant Human Exceptionalism Paradigm (HEP), thereby expanding sociological relevance to include variables traditionally overlooked in sociology (Sheykhi, 2022). This shift underscores the importance of theoretical foundations in shaping social phenomena within environmental disciplines and promoting sustainable development (Mitić, Zdravković, & Dimitrijevic, 2019, pp. 171-172)

For instance, the impacts of environmental supervision on enhancing the environmental impact assessment system include reducing information asymmetry, protecting the rights and interests of citizens, and mitigating the effects of urban regulations (Mishra, Grasso, Essien, & Luiselli, 2020, pp. 37-38). The formation of **knowledge-thematic gaps** has been observed in the ongoing process between the existing theoretical principles and this large volume of diverse environmental demands and needs in specific audiences such as organizations, companies, and general businesses (Fig 2). Existing theoretical principles often fall short in addressing environmental demands and needs, as they lack frameworks and models that effectively elucidate the complex relationships between individuals, their behavior, and the environment (Maurice, 2022, pp. 3-15).

On one hand, various theoretical principles are integrated into design processes to establish a framework grounded in scientific processes and tailored to meet audience needs (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003). This approach emphasizes both the pragmatic and theoretical aspects of design experiments, which facilitate learning and the development of domain-specific theories (Schwartz-Shea & Yanow, 2013). Additionally, there is a focus on design-based research as an interdisciplinary, mixed-method approach, highlighting the necessity for heightened scientific, theoretical, and methodological rigor in design research. It is suggested that design research could become more rigorous, relevant, and impactful through a theory-driven approach (Cash, 2018, pp. 84-85).

While both science and knowledge contribute valuable insights to architecture and urban planning, it is crucial to comprehend their strengths, weaknesses, opportunities, and threats (Figure 1). Architects and urban planners must strategically navigate the interplay between these two forces, employing scientific principles with critical awareness. They should integrate diverse knowledge bases to create designs and plans that are both innovative and context-sensitive, serving the needs of society and the environment in a responsible and sustainable manner [1] (Bibri, 2018).

The absence of an understanding of the scientific nature derived from the theoretical principles of architecture and urban planning disciplines has primarily resulted in personal awareness, perceptions, and interpretations, thereby increasing the diversity of designers and planners in these fields (Farhangdoust, Farkisch, & Hanaee, 2022, pp. 102-103). Conversely, the theoretical principles of environmental disciplines have consistently aimed to organize interventions in nature throughout history. However, these efforts have often been limited, relying on weak approaches such as visualizations (Grainger, Mao, & Buytaert, 2016) and conceptualizations (Duvall, Lennon, & Scott, 2018) of nature in urban planning, rather than employing rigorous theoretical methods, even among scientists and within complex subject matter.

The management of human interventions in nature has emerged as a significant topic in contemporary human society (Hudson & LaFevor, 2014, p. 1), aiming to integrate these actions with the theoretical principles of maintaining, conserving, and preserving nature's sustainability (Malt & Majid, 2023, pp. 334-335). Consequently, to align with the evolving needs of the contemporary world and changes in content, theoretical principles require a fundamental review. This review involves creating and modifying theoretical perspectives and optimizing the relationship between executive methods and these principles (Bonnard, 2022, pp. 17-18). It should be noted that virtual technologies' widespread emergence and applications (Berrett, 2018, p. 30) have created a lot of **knowledge-methodical gaps** (Fig 2).

The **importance** of engaging with theoretical principles as considered in this research (Figure 2) lies in recognizing their significance and understanding their role in shaping contemporary human life values (Tarasova, 2020, pp. 1-2), categorized under the term "function". As highlighted, changes in the lifestyle and mindset of contemporary humans have given rise to new topics (Zulfiqar & Kausar, 2023, p. 40). While environmental disciplines have predominantly focused on generating new studies to address emerging societal contexts, the current research has specifically directed attention towards these topics, studies, and motivations through the lens of the keyword "foundations".

[1] Science refers to a systematic and organized body of knowledge that is grounded in empirical evidence, experimentation, and observation. Within the realm of architecture and urban planning, science is employed to study and analyze various aspects of the built environment, including building materials, construction techniques, and environmental impact. Scientific principles and methods serve to inform design decisions, ensuring that buildings and urban spaces are sustainable, functional, and safe. On the other hand, knowledge encompasses a broader range of information and understanding that may not be strictly rooted in scientific principles. In architecture and urban planning, knowledge can derive from diverse sources such as historical precedents, cultural traditions, and personal experiences. It encompasses practical know-how, design intuition, and local expertise, which may not always be easily quantifiable or measurable.

Fig 1. SWOT table of distinguishing between two different approaches about the terms "science" and "knowledge" in architecture and urban planning (Halla, 2007; VOROBIOV & SHYLO, 2023; Olga, Slyamkhanova, Yeraly, Abdrashitova, & Butabekova, 2022; Halepoto, Anwar, Uqaili, Chowdhry, & Tahir, 2015)

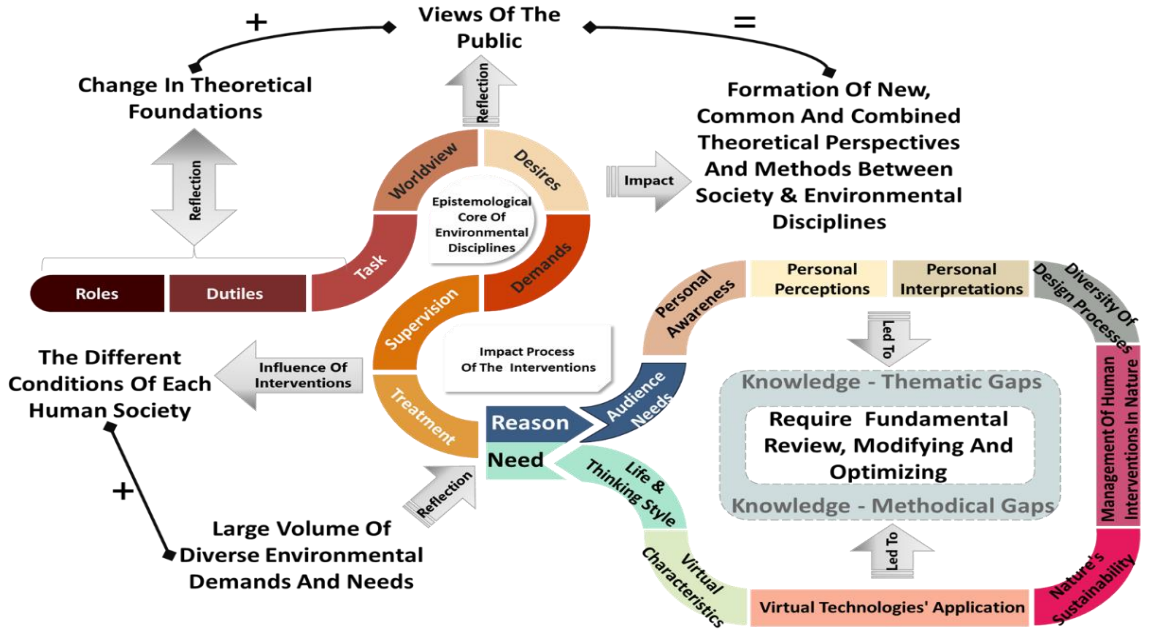


Fig 2. Informative framework about formation fields of this research (source: authors)

The structure of theoretical principles governing intervention processes in these disciplines is deemed weak due to the limited responsiveness and adaptation to new studies and motivations (Naghibi Rad, et al., 2021). This paper has investigated the structure and systems of theoretical principles under the category of "Structure". By doing so, it aims to observe how different systems for the theoretical development of these disciplines are formulated according to the perspectives of each scientific field (Perovic, 2015, pp. 243-244). The preceding discussion on contemporary architecture research has led to the emergence of new stages and sections, which the current research has examined under the guise of the "Appearance" of theoretical principles.

The **reason** for this can be traced back to the changing demands of the human audience in these fields, which demand both physical and virtual environments simultaneously (Murtagh, Roberts, & Hind, 2016). Indeed, the evolution of lifestyle has given rise to the concept of the virtual city, where individuals immerse themselves in environments that possess virtual characteristics, playing a significant role in their daily lives. The **need** for this research is based on reforms in environmental disciplines' theoretical principles due to audience changes in life and thinking style. These shifts in lifestyle have necessitated the development of realistic and interactive virtual cities capable of representing and simulating various facets of human behavior and social interactions.

2. BACKGROUND

The research in existing studies highlights the significance of theoretical principles in environment-focused fields, emphasizing their pivotal role in shaping all processes (Corral-Verdugo, Aguilar-Luzón, & Hernández, 2019). However, these principles have not been extensively studied as an independent subject in their own right. In fact, in the source provided (Figure 3), a novel approach to environmentally adapted architecture is introduced. This approach, rooted in creative structural systems thinking (Innovative Thought Methodology), underscores the importance of environmental design and nature conservation in supporting scientific innovation, the development of novel materials, and advancements in building technologies. These efforts aim to establish a contemporary environmental language for architecture and urbanism, guided by specific criteria (Abeer & Yousef, 2020).

In simpler terms, designers have contributed theories that shaped and advanced these disciplines, like introducing ecological psychology as a framework for architectural design (Pagano, Day, & Hartman, 2021). As science has evolved post-modernism, generating theories has become more challenging due to the interconnectedness of various scientific branches, resulting in interdisciplinary aspects within these disciplines. Nonetheless, there is a growing need for fresh ideas and innovative approaches to apply theories in novel processes across all aspects of these fields.

Based on the thematic analysis research method, after going through the above steps, it is necessary to **classify the content** of document sources using appropriate criteria. The most general indicator for this type of classification is the relevance of these categories to the subject, questions, and answers of the study. Building on the overarching points presented in Figure 3 and following the research methodology of this study, the identification of supporting theories is crucial. Along the three fields of "what," "why," and "how," artificial intelligence has organized and classified resources in a specific manner, suggesting keywords related to each other. The authors have structured these keychains and prepared them for the subsequent stage of the research (See Figure 4).

Regarding the keyword «**Why»** is the theoretical principle important? The diversity of needs within the environmental field is a significant factor shaping its differences (Ramírez & Romeva, 2005, p. 168). Moreover, the objectives of these subjects are closely linked to the extent to which their theoretical principles are interconnected (Kokarevich, Lankin, & Voytsekhovskaya, 2019, p. 5). Simply put, within the theoretical principles of these disciplines, diversity has a similar impact on shaping needs as dynamism does on goals (Zheng & Deng, 2018, pp. 15-18). Research on architectural history, urban planning, and urban geography also indicates that the role of theoretical principles in these traditional fields was aligned with the context and suited the goals of the respective era (Tarasova, 2020).

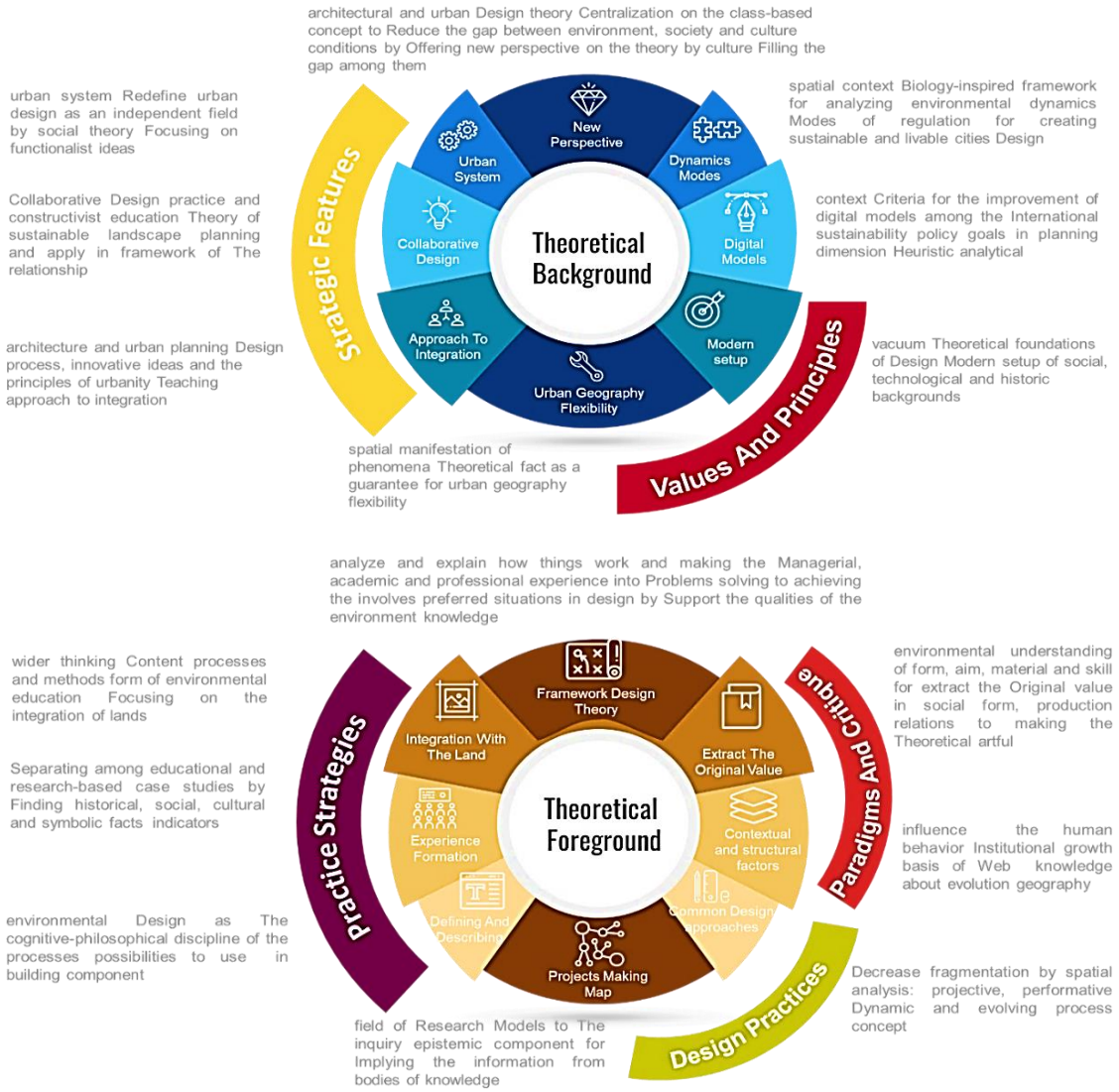


Fig 3. Understanding the information in library resources by summarizing the content and identifying the key

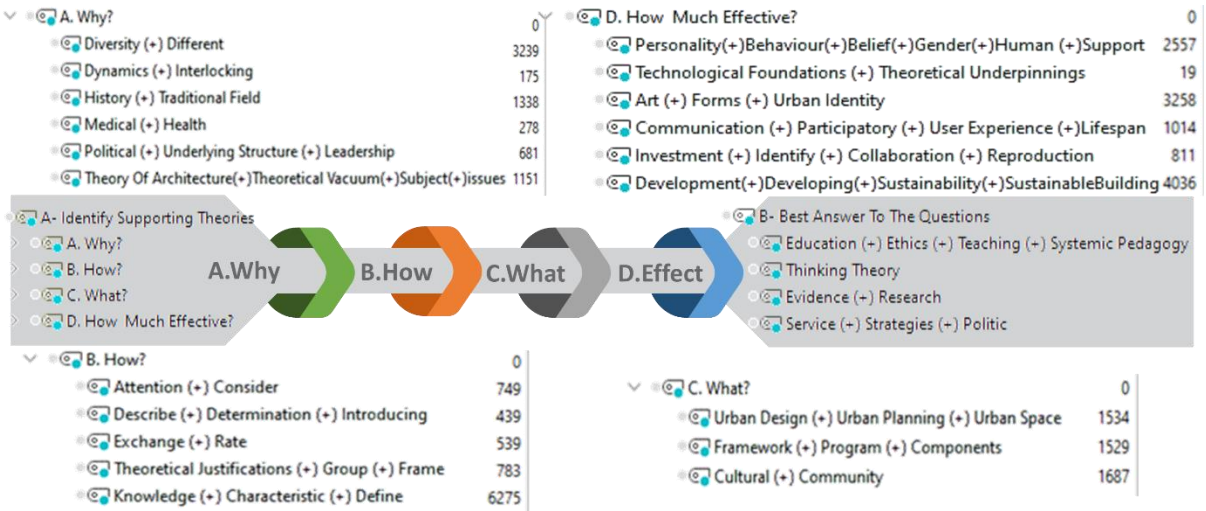


Fig 4. Using the research method to classify the content by breaking down the goals and questions into four sections: «What», «Why», «How», and «Effect» (Source: modified and approved output of MAXQDA software by the authors)

Among the most influential factors shaping the theoretical principles of these disciplines are the political structures of their respective eras, the underlying structure of human settlements, and the simultaneous and interrelated role of human beings as elements of community leadership (Schenk, 2013). The manifestation of such approaches has influenced architectural theories over time, creating a theoretical vacuum in how to effectively address disciplinary subjects and issues through the creation of appropriate theoretical principles to support them (Zakharchuk, 2021, pp. 4-5). Often, the creation of various states of theoretical principles in these disciplines has been driven by theoreticians rather than current events in society (Dovey & Pafka, 2016, pp. 1-2).

For instance, there is a constant need to provide medical and health services as urban infrastructure (Narula & Bhattacharya, 2021, p. 101). However, understanding how to plan and develop a city has always varied across different eras and societies due to their political and scientific systems for providing these services (Panagopoulos, Duque, & Dan, 2016, pp. 137-138). Consequently, each era has contributed differently to the theoretical principles of these disciplines (Cuthbert, 2007, p. 177). Based on this premise, it is valuable to revisit, reconsider, and deepen various aspects and fundamental ideas of the theoretical principles (Almandoz, 2020, p. 273).

In the field of answering «**How»** the theoretical principles play a role in these fields, it should be said. The theory emphasizes the importance of paying attention to the context and environment when implementing interventions (Naghavi & Mazaherian, 2019, pp. 69-70). To achieve this objective, descriptive methods are utilized to elucidate the meaning of environmental elements, simplifying them for designers and environmental planners to comprehend (Yalçin, 2015, p. 3531). Another crucial concept in these fields is prioritization (determining the significance of data) and sharing information about the environment with other relevant sciences (Murillo, 2019, p. 77).

Another type of theoretical principle in these disciplines involves theoretical justifications for forming groups and theoretical frameworks (Catalanotti, 2020, p. 101). Theories or ideas are utilized to comprehend and explain phenomena, aiding in the creation of plans to enhance the environment based on theory (Akintunde, 2017, p. 120). In this manner, theoretical principles serve as the foundation for designing, planning, and implementing environmental interventions (Driscoll & Lindenmayer, 2012, p. 129). Simply put, the most effective way to utilize knowledge is to utilize environmental data to define changes based on theoretical and practical characteristics (Baldassarre, Keskin, Diehl, Bocken, & Calabretta, 2020, p. 1).

In this situation, finding an answer to the question «**What»** is affected by the basic ideas of these subjects, it can be said architecture, Urban design, urban planning, and urban space are important areas that directly use theoretical principles (Lang , 2013, pp. 51-52). These areas are significant as they serve as frameworks for shaping and creating programs, as well as defining their components. Moreover, the importance of the theoretical principles of these disciplines is crucial in addressing societal and cultural issues (Tarasova, 2020).

Understanding people's social and cultural backgrounds is crucial when considering how environmental changes might affect them, highlighting the importance of studying how these changes could impact their lives carefully (Raji & Aliyu, 2021, p. 71). Therefore, after establishing the fundamental concepts of general theoretical principles in environmental studies across three categories— "what," "why," and "how"—it is imperative to discuss how they are utilized. This involves specifying which factors utilize these categories and how they are effective (Figure 5).

In summary, the theoretical principles crucial for comprehending the significance of architecture and urban planning entail the examination of architectural thought as a cultural phenomenon, the evolution of a concept that mirrors the advancement of architectural scholarly knowledge, and the representation of this knowledge as an integrated system (Groat & Després, 2012, pp. 47-48). Ultimately, there appears to be a necessity for an epistemological foundation framework to address the misdirection observed within environmental disciplines (Grubbauer, 2019, p. 470).

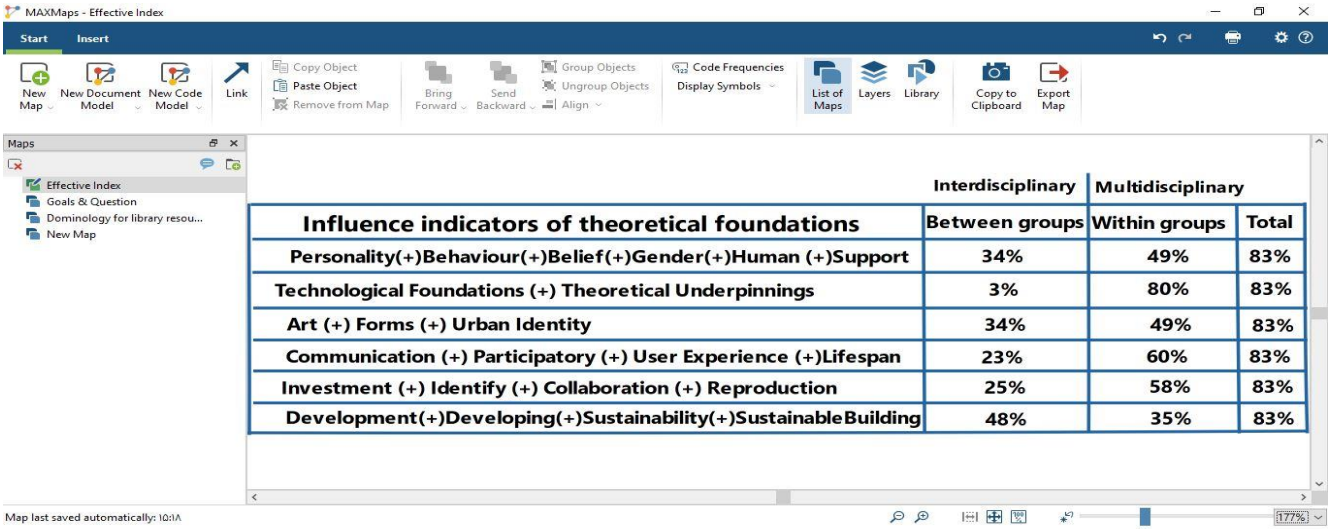
Now that the main concepts regarding theoretical principles have been discussed, such as «what» they are, «why» they matter, «how» they work, and how much they «affect» things, it becomes imperative to categorize and assess the diverse responses to these inquiries to find out the «**Best Answer»** of them. The first type of theoretical answer includes things like education and teaching[1]. One category emphasizes professional ethics and underscores the significance of systematic education as a fundamental approach to operation (Abusaada, 2019, pp. 1-2). The second

[1] This underscores the importance of systematic education in architecture and urbanism, as emphasized by Nicol & Pilling (2000). They advocate for a new professionalism that incorporates communication, collaboration, design thinking, and lifelong learning.

category delves into cognitive theories to elucidate individuals' thought processes. It posits that practitioners in these fields perceive the environment through their unique cognitive frameworks, thereby shaping the aesthetic structure (Brenner & Schmid, 2015, p. 152).

The third category of response within ecology emphasizes research, environmental initiatives, and empirical evidence (Heymans, Breadsell, Morrison, Byrne, & Eon, 2019, pp. 2-3). Conversely, the fourth group posits that the societal contributions of these disciplines will precipitate the development of environmental policies and intervention strategies (TOPCHIY & FATKULLINA, 2020, p. 323). Put differently, proponents of the fourth category contend that prioritizing the practical application of these subjects will facilitate the formulation of regulations and environmental plans (Yaneva, 2017).

According to the details provided in Figure 2, the initial step involves identifying the topics to explore and determining the relevant keywords essential for effectively coding the sources. These resources are initially categorized into four main domains within environment-oriented disciplines: Urban Geography, Architecture and Urbanism, comparative sources, and Knowledge Management resources. Subsequently, key terms extracted from the text are systematically inputted into MAXQDA software, arranged in a sequential order reflecting their interrelationships. Then, they were coded (Fig 6).



Influence indicators of theoretical foundations	Interdisciplinary	Multidisciplinary	
	Between groups	Within groups	Total
Personality(+)Behaviour(+)Belief(+)Gender(+)Human (+)Support	34%	49%	83%
Technological Foundations (+) Theoretical Underpinnings	3%	80%	83%
Art (+) Forms (+) Urban Identity	34%	49%	83%
Communication (+) Participatory (+) User Experience (+)Lifespan	23%	60%	83%
Investment (+) Identify (+) Collaboration (+) Reproduction	25%	58%	83%
Development(+)Developing(+)Sustainability(+)SustainableBuilding	48%	35%	83%

Fig 5. Investigating the percentage of effectiveness of the factors mentioned in the category of «what», «why» and «how» on the macro-impact areas in environmental fields (Source: the confirmed output of MAXQDA software by the authors)

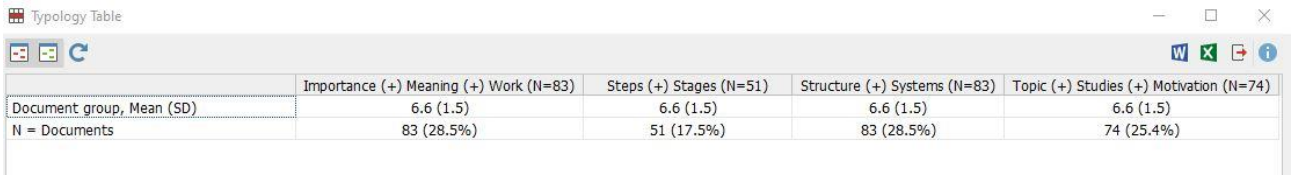
Code System	Urban geography	Architecture and Urbanism	Comparative sources	Knowlage Management
0- Determining Generalities				
0-1-Domine				
International (+) World View	92	473	163	2
Language (+) Linguistics	4	660	137	10
Nature	67	1437	119	18
Organization (+) Enterprise (+) Business	125	469	117	23
Psychology (+) Sociology	19	181	43	4
Public (+) Social (+) Anthropology	343	3487	332	66
Science	181	745	158	73
Supervision (+) Treatment	2	84	24	4
Virtual City (+) Virtual Environment (+) Virtualit		123	97	
0-2-Questions				
Importance (+) Meaning (+) Work	175	3242	582	42
Steps (+) Stages	21	317	123	22
Structure (+) Systems	329	1819	716	38
Topic (+) Studies (+) Motivation	152	930	241	35
0-3-Goals				
Disadvantage (+) Advantage	27	94	27	5
Review (+) Discovery (+) Understanding	136	1344	277	88
Value (+) Assets (+) Policy	171	1041	97	47

Fig 6. The distribution percentage of macro topics of theoretical principles in the sources of this research (Source: modified and approved output of MAXQDA software by the authors)

The examination involved assessing the quantity of codes present within each resource group to ascertain their alignment with the overarching chain (refer to Figure 6 for comprehensive elucidation). Furthermore, an evaluation of the utilized sources was conducted to gauge the extent to which they addressed the principal inquiries, as evidenced by their distribution percentage. This assessment was complemented by the significance index, which encompassed means and standard deviations (as depicted in Figure 7). Subsequently, to elucidate and affirm the correlation between the research inquiries and the insights derived from its sources, an analysis of keywords was undertaken, exploring novel combinations emanating from both realms (refer to Figure 8 for further elucidation).

So the main **question** is how important and meaningful theoretical foundations work for the environmental disciplines. In addressing this question, attention was directed towards examining the **goals**, particularly focusing on the development of Steps and Stages, as well as the architecture and organization of the theoretical foundation. Additionally, an exploration encompassed current Topics, Studies, and Motivations outlined within the background section. The overarching objective of this research is to scrutinize the advantages and disadvantages inherent in the theoretical foundations of environmental disciplines. This analysis is conducted through a comprehensive review of environmental policies, identification of Assets, and an elucidation of their respective values.

This research's **solution** is to analyze the theoretical principles on one side and to discover the foundation and its structures, based on the questions stated. Conversely, the objective is to comprehend the function and manifestation of the theoretical foundation within areas of research that are of particular interest. The **innovative** fundamental ways of this research to answer these questions are based on the adaptation and matching the scope of these questions to the sections identified by artificial intelligence of MAXQDA in the library resources content. To validate these identified sections, employing interpretive methods that prioritize the discernment of Advantages and Disadvantages articulated within the theoretical principles of available sources is paramount.


Typology Table

	Importance (+) Meaning (+) Work (N=83)	Steps (+) Stages (N=51)	Structure (+) Systems (N=83)	Topic (+) Studies (+) Motivation (N=74)
Document group, Mean (SD)	6.6 (1.5)	6.6 (1.5)	6.6 (1.5)	6.6 (1.5)
N = Documents	83 (28.5%)	51 (17.5%)	83 (28.5%)	74 (25.4%)

Fig 7. Typology Table based on the calculating percentage of distribution of questions in research sources According to the significance index (means, standard deviations)
(Source: the confirmed output of MAXQDA software by the authors)

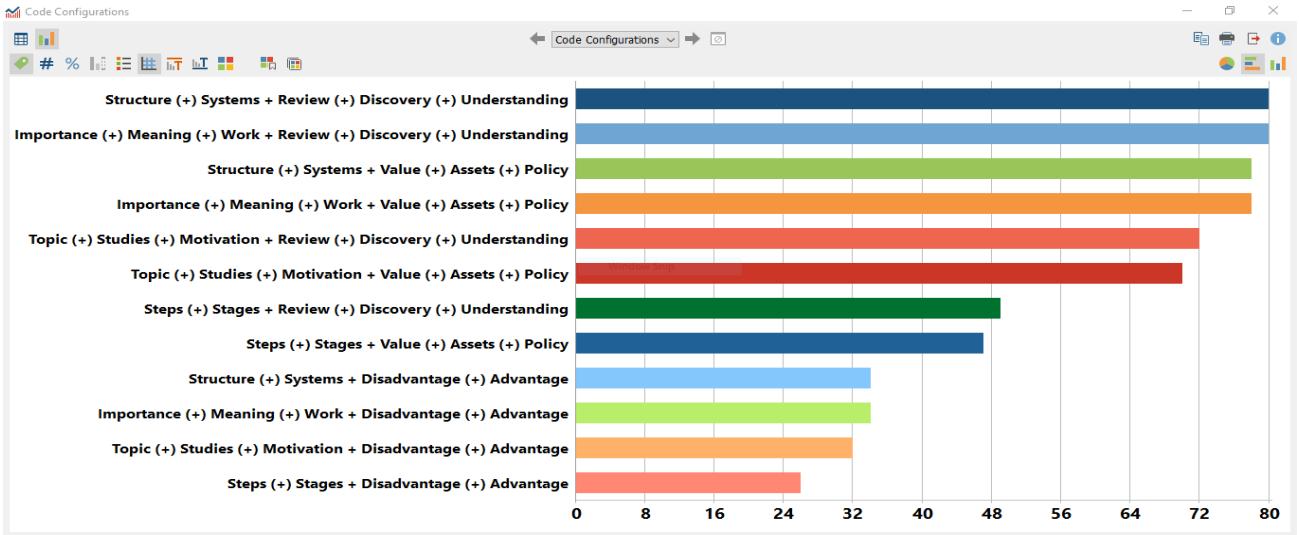


Fig 8. The percentage of occurrence of the keywords of questions and research objectives in a combined form in the sources of this research
(Source: MAXQDA software output)

3. MATERIALS AND METHODS

For each research endeavor, the plan should articulate a clear rationale for the study, provide insights into the subjects or entities under examination, outline the methodology for data collection, and specify the analytical approach. It is imperative to ensure that the decisions regarding the study are logically aligned with its execution (Richards & Morse, 2012). The research question serves as a guiding framework for delineating the necessary steps and methodologies to achieve the study's objectives (Schreier, 2013). In this particular study, qualitative content analysis methodology was employed to analyze the data. This method encompasses various definitions, procedural frameworks, conceptual interpretations, and theoretical underpinnings within the literature (Polit & Beck, 2017). Each delineation of this methodology emphasizes how language or written expression, within its contextual backdrop, aids in comprehending, categorizing, and perceiving social reality in a thoughtful and scientific manner (Shava, Hleza, Tlou, Shonhiwa, & Mathonsi, 2021).

Content analysis, with a history spanning over 50 years, has been widely utilized across disciplines such as communication, journalism, sociology, psychology, and business. Its methodologies predominantly originate from the social and behavioral sciences (Neuendorf, 2016, p. xv). It stands as one of the rapidly expanding techniques within quantitative research. The approach adopted in this article pertains to Interpretative Analysis (Neuendorf, 2016, pp. 1-6). This technique places emphasis on deriving theoretical insights from the examination and coding of messages (see Chart 1). Rooted in social scientific inquiry, it encompasses elements such as theoretical sampling, analytical categories, cumulative and comparative analysis, and the formulation of types or conceptual categories (McEwen, 2004).

Qualitative content analysis serves as a versatile method applicable to various philosophical frameworks such as positivism, interpretivism, and pragmatism, although its predominant alignment lies within the paradigm of interpretivism (Stemler, 2001). While this method is frequently employed in urban studies, its application within architecture, planning, and urban studies remains ambiguous due to its multifaceted nature (Sheydayi & Dadashpoor, 2023). Furthermore, due to the diversity of ideas and concepts inherent in this methodology, achieving theoretical saturation necessitates a substantial amount of data. The optimal volume of data is contingent upon factors such as the nature, quantity, and subject matter of the data, as well as the complexity of the problem under investigation and the objectives of the analysis (Graneheim, Lindgren, & Lundman, 2017).

To guarantee the **quality of data** in the field of architecture and urbanism, some best practices for validating and verifying data include the use of a Validation and Verification (V&V) model with a hierarchical process (Serrano, 2022). The model outlined herein offers data abstraction, value-added services, and authentication through the utilization of Artificial Intelligence (AI) (Xu, Liu, & Yang, 2023). These methodologies serve to uphold the validity, reliability, and credibility of the managed information within the realm of architecture and urbanism research. Consequently, the data employed in this research have undergone rigorous review, approval, and verification processes, adhering to the following criteria:

A: alignment of the degree of consistency of content values with the macro-view of this study.

B: The origin and assets of the data formation and amount to the extent of the chosen data`s coverage with current research inquiries.

C: The alignment of data formation policies with current research questions.

The present study examines the significance of environmental considerations within the realms of architecture and urban design, positing that a comprehensive comprehension of human-environment dynamics can augment the design process. Furthermore, it advocates for a novel theoretical framework in environmental design, which incorporates techniques of knowledge discovery, such as artificial intelligence and data mining, to refine the design process and tackle environmental behaviors effectively. Upon aligning all findings with the research inquiries (as depicted in Figure 9), it becomes evident that this study collectively underscores the transformative capacity of theoretical principles in guiding environmental interventions within the domains of architecture and urbanism.

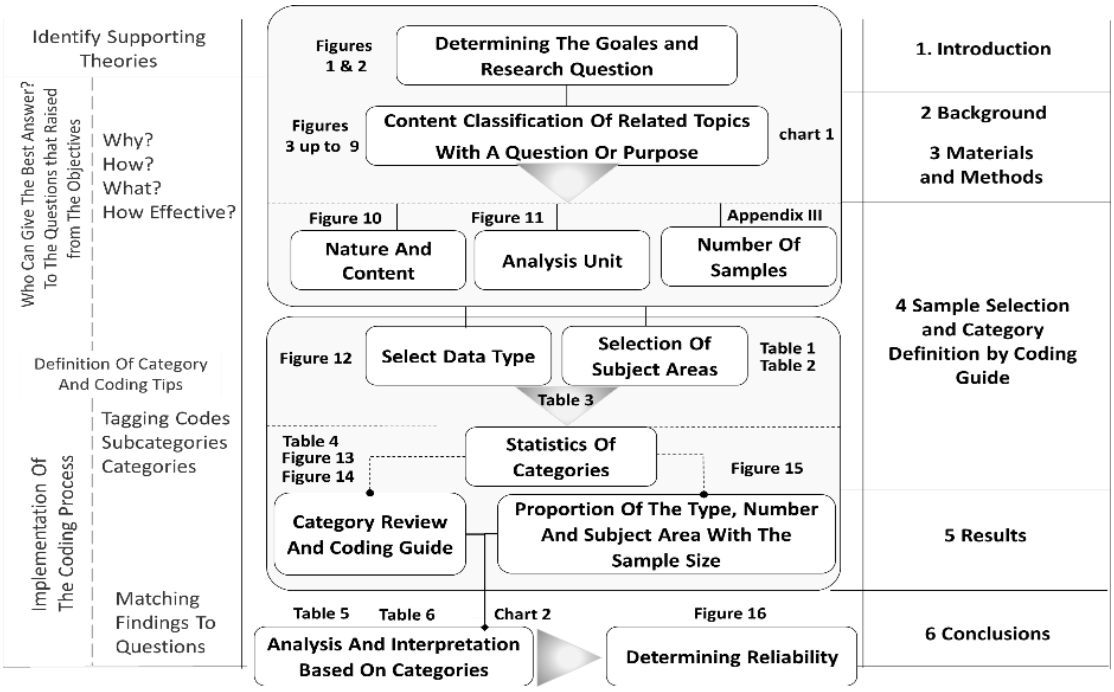


Chart 1. The process of qualitative content analysis research method implemented in this research (Source: Neuendorf, 2016)

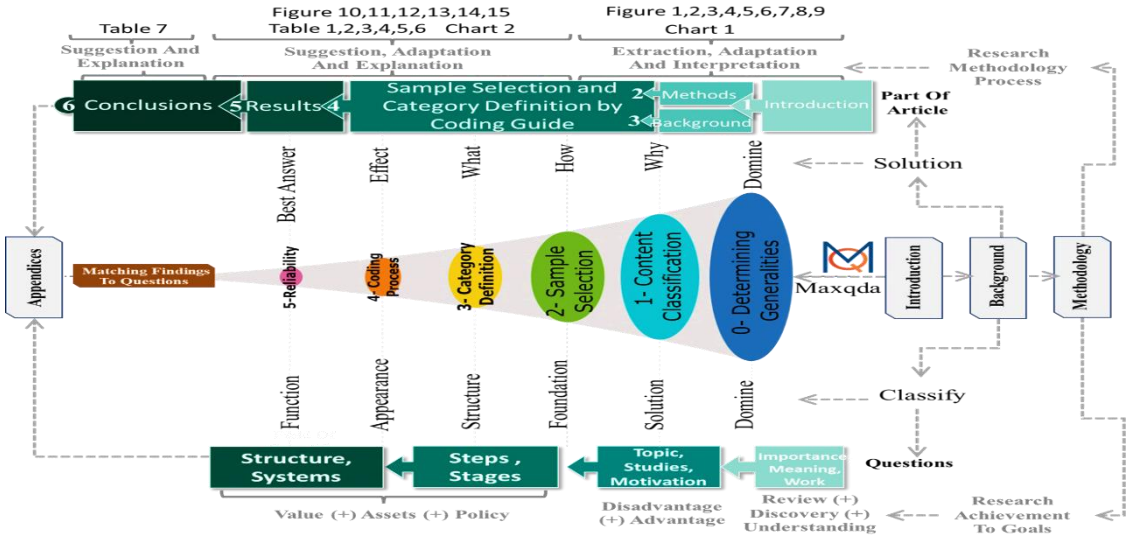


Fig 9. Process of Matching Findings to Questions (Source: authors based on research findings)

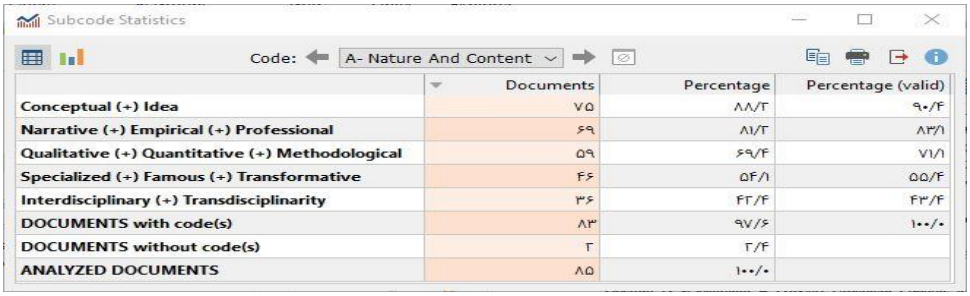
4. SAMPLE SELECTION AND CATEGORY DEFINITION BY CODING GUIDE

In accordance with our research methodology, it is imperative to classify the content of resources utilizing indicators pertinent to knowledge management. Irrespective of the diverse theoretical principles under examination, various theories contribute to the study of the environment, each playing a distinct role in scientific inquiry. Therefore, it is essential to amalgamate these two indicators, namely the measure of nature and content index (inclusive of the information contained). This necessitates the utilization of artificial intelligence to generate clusters of significant keywords that reflect these indicators (as illustrated in Figure 10). Prior to the coding phase, it is incumbent upon the researcher to delineate the rules, assumptions, and patterns of categories, as well as elucidate the methods of posing questions, comprehending, and interpreting the textual data (Sandelowski, 2011).

The methodology, as elucidated, diverges from conventional scientific inquiry due to its wholly qualitative nature and its iterative process, wherein the analyst is engaged in continual exploration and refinement. The researcher is presumed to be a

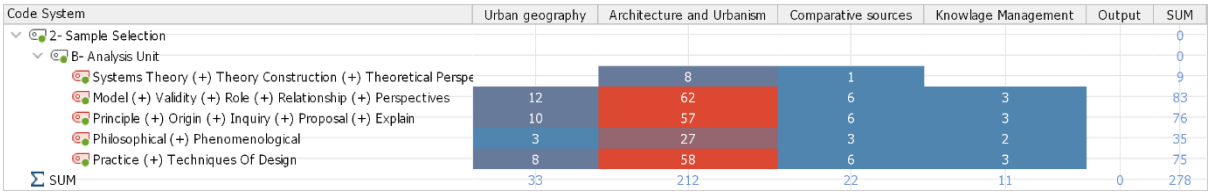
proficient observer (Neuendorf, 2016, pp. 50-51). Once the sample groups are established, it becomes imperative to correlate them with analogous groups within the environmental disciplines (refer to Figure 11). These units are suggested by artificial intelligence and subsequently evaluated by the authors. This entails utilizing the MAXQDA program to ascertain the frequency of certain words or concepts within the sources, and the authors then determine their interconnectedness, removing those that do not meet the criteria.

In the initial stages of the study, significant components were established based on the research objectives and the execution of the research methodology. Essentially, these components were structured into distinct groups according to the researchers' objectives and the methodologies employed. However, at this juncture, it becomes imperative to delineate categories, determining how to categorize elements based on their characteristics within the realm of knowledge management, under the designation of «**Analysis Unit**». This task involves two primary steps. The initial step entails devising a comprehensive list of keywords, encompassing crucial terms relevant to environmental disciplines.



	Documents	Percentage	Percentage (valid)
Conceptual (+) Idea	۷۵	۸۸/۲	۹۰/۴
Narrative (+) Empirical (+) Professional	۶۹	۸۱/۲	۸۴/۱
Qualitative (+) Quantitative (+) Methodological	۵۹	۶۹/۴	۷۱/۱
Specialized (+) Famous (+) Transformative	۴۶	۵۴/۱	۵۵/۴
Interdisciplinary (+) Transdisciplinarity	۳۶	۴۲/۴	۴۳/۴
DOCUMENTS with code(s)	۸۳	۹۷/۶	۱۰۰/۰
DOCUMENTS without code(s)	۲	۲/۴	
ANALYZED DOCUMENTS	۸۵	۱۰۰/۰	

Fig 10. Studying how much (Documents Column) of the knowledge management strings (left column) in this research comes from the used sources (percentage column) to achieve the Reliability indicator, and how well they connect to the main topics (Nature and Content indexes) by Percentage (valid) to achieve the Validity indicator (Source: the confirmed output of MAXQDA software by the authors)



Code System	Urban geography	Architecture and Urbanism	Comparative sources	Knowlage Management	Output	SUM
2- Sample Selection						0
B- Analysis Unit						0
Systems Theory (+) Theory Construction (+) Theoretical Perspe		8	1			9
Model (+) Validity (+) Role (+) Relationship (+) Perspectives	12	62	6	3		83
Principle (+) Origin (+) Inquiry (+) Proposal (+) Explain	10	57	6	3		76
Philosophical (+) Phenomenological	3	27	3	2		35
Practice (+) Techniques Of Design	8	58	6	3		75
SUM	33	212	22	11	0	278

Fig 11. The frequency of dealing with the analysis units in the library resources of this research (Source: the confirmed output of MAXQDA software by the authors)

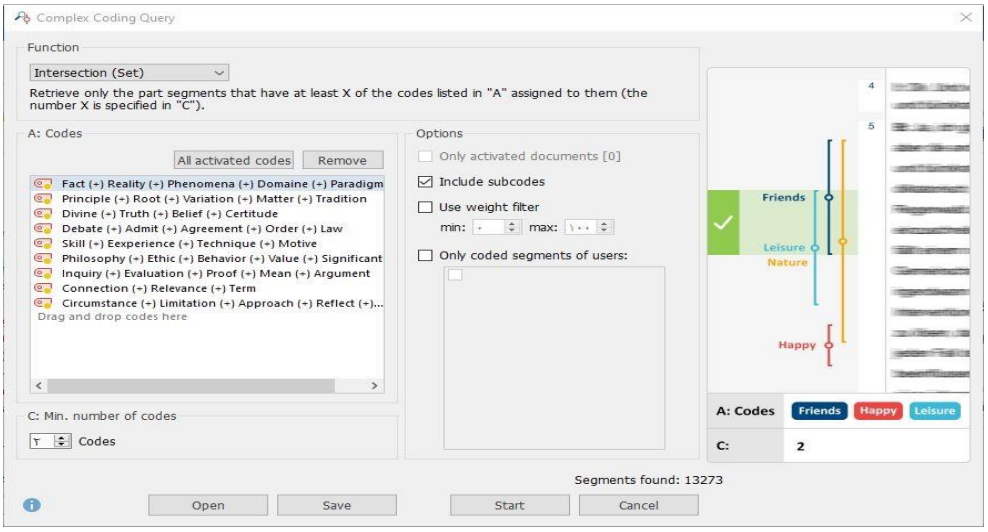


Fig 12. Complex Coding Query of «Analysis Unit» and tagging a Set of strings with at least 2 number of codes by Intersection (Source: modified and approved output of MAXQDA software by the authors)

This process was executed by extracting significant terms from research and knowledge management literature and inputting them into the MAXQDA software, specifically under the «**Subject Areas Selection**» title (refer to Figure 12). Artificial intelligence has examined the interconnections among these pivotal words within the text. Authors then scrutinized the relationship between these keywords if they were present in the text of the sources (as shown in Table 1), under the designation of «**Data Type Selection**». The results of this section of the study have shown the scientific foundation behind environmental studies.

In the subsequent step (Table 2), emphasis was placed on identifying the most salient words characterizing the theories outlined in the utilized sources. These words were then categorized into groups based on their semantic significance and their relevance to the main topics within the Analysis Unit (as suggested by artificial intelligence prior to the step illustrated in Table 1). Based on the findings of this section, the basic **Foundation** has been revealed from the perspective of the philosophy of science in environmental fields.

At this stage of the study, there is a need to systematically sort and organize the information gathered regarding the research topic by tagging codes to the sources. To facilitate this process, two main groups have been identified based on the type of codes: idioms, representing meaningful phrases, and keywords, representing vocabulary. These two categories encompass distinct types of language. The analysis involves scrutinizing these words and terms to ascertain their relationship with the categories established in the previous stage, utilizing the relationship index and Statistics of Categories. Leveraging the artificial intelligence capabilities of the MAXQDA Software, these words and terms have been identified and grouped into similar categories within the environmental disciplines (as depicted in Table 3). In other words, the findings of this part of the research reveal the «**Appearance**» of the theoretical principles in environmental disciplines.

Table 1. Adaptation of knowledge management propositions with existing propositions in the theoretical principles of environment-oriented disciplines (Source: categorization and sorting by the authors based on the: Hashemizadegan, Mansouri, & Barati, 2020; Mohajer Milani & Einifar, 2022)

The Viewpoint of Information Management	A. Subject Areas Selection ⟶ B. Data Type Selection			The Viewpoint of Environmental Disciplines
	Conceptual Chains of Facts		Modes of Theoretical Principles	
	Fact (+) Reality (+) Phenomena (+) Domaine (+) Paradigm	A	Legislation (+) Act (+) Law (+) Policy (+) Ordinance	
	Principle (+) Root (+) Variation (+) Matter (+) Tradition	B	Bylaw (+) Guideline (+) illustrative (+) Instruction (+) Index	
	Divine (+) Truth (+) Belief (+) Certitude	C	Common law (+) Directive (+) Routine	
	Debate (+) Admit (+) Agreement (+) Order (+) Law	D	Concept (+) Model (+) Codes (+) Template	
	Skill (+) Experience (+) Technique (+) Motive	E	Objective (+) Criteria (+) Norm (+) Standard (+) Exemplar	
	Philosophy (+) Ethic (+) Behavior (+) Value (+) Significant	F	Framework (+) Protocol (+) Regulation (+) Rules	
	Inquiry (+) Evaluation (+) Proof (+) Mean (+) Argument	G	Paradigm (+) Foundation (+) Principle (+) Subjective	
	Connection (+) Relevance (+) Term	H	Constraint (+) Restriction (+) Requirement (+) Provision	
	Circumstance (+) Limitation (+) Approach (+) Reflect (+) Conduct	I	Schema (+) Pattern (+) Symbol (+) Specification	

Table 2. Matching types of knowledge with scientific layers in environment-oriented disciplines (Source: categorization and sorting by the authors based on: Ghasemi & et.al, 2023, p. 23; Farhangdoust, Farkisch, & Tabasi, 2021, p. 101)

Body of Knowledge			Layers of Knowledge in the Environmental Disciplines
 Cognitivism	C	The highest degree of authenticity, wisdom, generalizations, stability, meaning, reliability, and inclination	
	F	The most general concepts suitable for creating behavioral, ethical, and executive frameworks with high durability	
 Actualism	A	macro platform for the integration of related concepts based on the same domains (for example, the same meaning or application)	
	G	Subjects that can be proved (verifiable), interpreted, communicated, and expandable based on the ratio of awareness and understanding of the knowledge and understanding of macro-level contexts	
 Essentialism	D	Determining scientific facts by acknowledging the inadequacy of truth, knowledge, and its relative nature	
	H	Creating an effective framework for making a description of a valuable framework, validity time, and sphere of influence for scientific relativistic contracts.	
 Methodology	E	Define measurement frameworks, meaningful significant indicators, executive methods, and scientific toleration procedures	
	B	Defining the theoretical supports of executive actions with conceptual or analogical citations to theoretical concepts	
 Theorizing	I	Creating execution cycles using a combination of commands, rules, and methods of changeability by defining the conditions of saturation, deadlock, or theoretical failure.	

Table 3. Statistics of Categories about the theoretical principles of environment-oriented disciplines and number of Code Sets for each one (Source: the confirmed output of MAXQDA software by the authors)

∋Community And Social Actors Rule	24885
∋Components	16926
∋Conceptualization	13360
∋Contextualism	23427
∋Design Performance	19489
∋Design Theories	50873
∋Development Idea And Plan	32923
∋Ecological & Enviromental Formations	4623
∋Education Theories	14372
∋Existing Design Theories	19760
∋Existing Design Theories	19760
∋Flexibility	42862
∋Form Process	18922
∋Information Management	3770
∋Making Framework	9909
∋Merging Design With Knowledge	31362
∋Method Of Definition	16440
∋Method Of Design	43796
∋Pedagogical Strategies	5083
∋Philosophical Idea And Origins	26456
∋Research Models	23801
∋Space Geometry	16911
∋Stakeholders Rule	35626
∋Standardization	32226
∋Strategies	31648
∋Sustainable Design	19343
∋Theory Conditions	16756
∋Theory Informed	18379
∋Theory Of History	15998
∋Type Of Interventions	11695
∋User Experience	17372

5. RESULTS

Theoretical principles serve as pivotal constructs in guiding the endeavors of architects and urban planners. They furnish a structured framework for comprehending and dissecting intricate planning issues, including those entailing multiple stakeholder participation and diverse preferences across multiple attributes (Barnett, Charles, Greengard, & Magland, 2022, p. 37). These foundational principles enable planners to make well-informed decisions by taking into account a multitude of factors and their interrelationships, thus transcending the limitation of singular decision-making approaches (Lai & Huang, 2017, pp. 1034-1035).

Theoretical principles further serve as guiding beacons in shaping the design of urban spaces, ensuring their alignment with the fundamental tenets of urbanism, architecture, and urban design (Amiri, 2016, p. 1636). They empower designers and architects to craft spaces that not only meet the needs of the present but also anticipate and accommodate future demands (Zheng & Deng, 2018, pp. 15-16). Furthermore, these theoretical foundations play a pivotal role in shaping the development of management frameworks for cities, particularly within the context of digitization and transformative shifts (Kostko, 2021, p. 85). They furnish a conceptual groundwork for comprehending the social fabric of urban environments and their constituent elements,

thereby facilitating effective governance and management strategies.

Therefore, based on the research method, it is necessary to check the groups found in the earlier parts (especially the groups made when organizing the information. See Table **3**). The general criterion of artificial intelligence for these evaluations is to examine the relationship between the fields of this research through these categories by **Category Review and Coding Guide**. In other words, the main way to judge artificial intelligence is by looking at how different areas of research are connected (Fig 13).

This research employs specific keywords to establish connections between its various components. Consequently, the position of all keywords utilized throughout the research has been delineated, facilitating an understanding of their role in shaping the theoretical principles of environmental disciplines.

As evidenced by the findings depicted in Figure 13, it is apparent that theoretical principles in architecture and urbanism have undergone evolution to achieve a more harmonious alignment with contemporary contexts and objectives. The exploration of architectural and urbanistic thought as a cultural phenomenon has gained prominence, characterized by a concerted effort to reevaluate historical theories employing modern methodologies and tools. Notably, contemporary theorists of postmodern architecture and urbanism have embraced manifestos as a means to articulate cohesive discourses, even if such discourses did not actually exist, while integrating ideas from the progenitors of modernity.

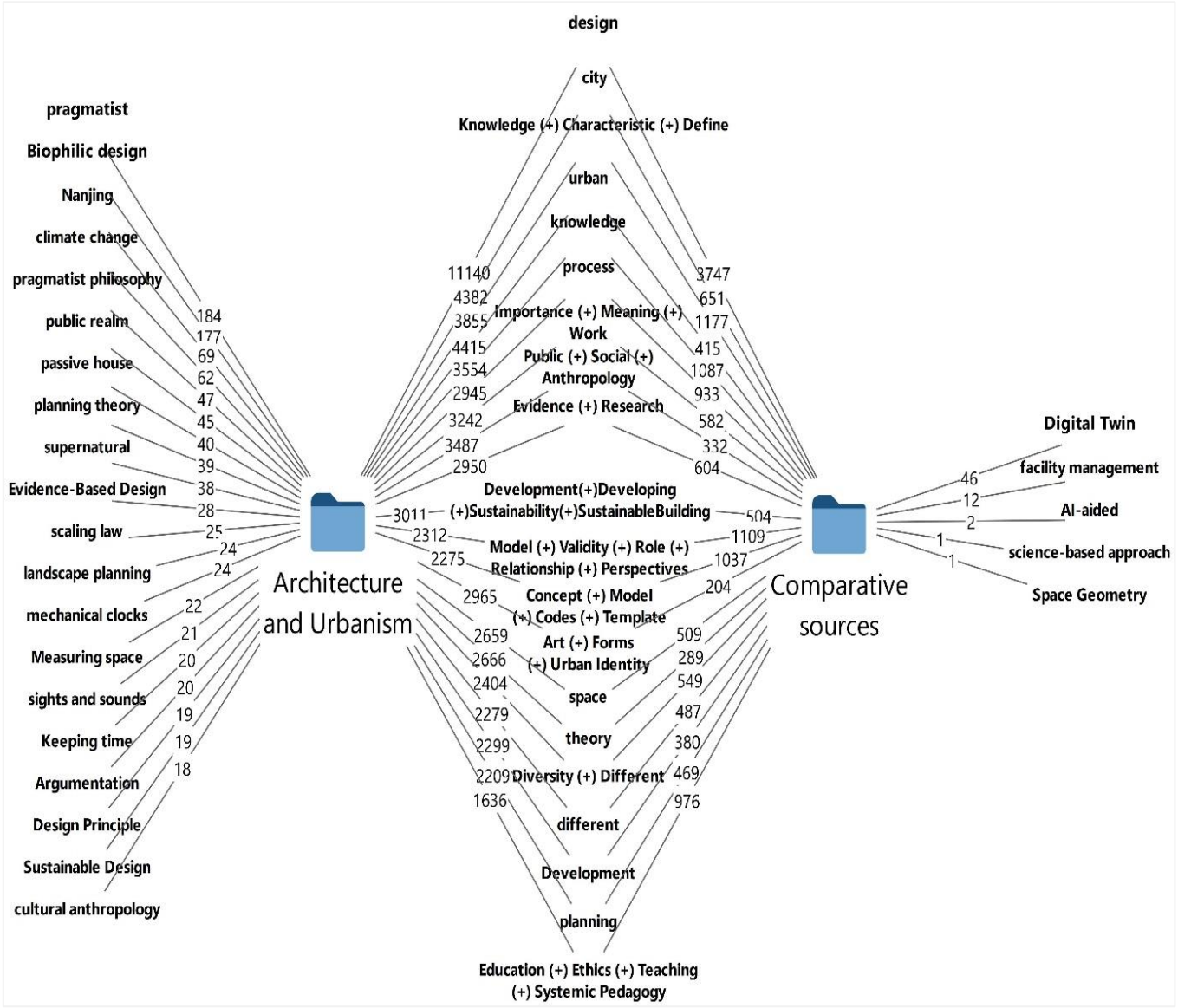


Fig 13. Examining the relationship among the fields of the research through the Category Review and Coding Guide by subcodes with up to 4 levels of debt (Source: MAXQDA software output)

A notable shift has occurred towards embracing diversity, variability, and interactivity within environmental theory, coupled with a heightened emphasis on the preservation of architectural and urban heritage. This departure from universalism signifies a transition towards a multi-level and participatory transdisciplinary approach. Moreover, the evolution of the concept of development and sustainability underscores a renewed focus on sustainability, emerging technologies, and the conception of the urban landscape as a finite resource. Consequently, the significance of theoretical principles in environmental disciplines has been acknowledged, prompting designers and planners to engage in discourse surrounding this issue while accounting for both present and future contexts.

Upon examining these groups and juxtaposing them with the previously established coding guide, it becomes evident that they fulfill significant roles within the research framework (

Table 4). These different **Structure** modes have been measured in different fields in this research: function, appearance, foundation, and structure. Indeed, by delineating between science and knowledge categories in this manner, architects and urban planners are equipped to discern the strengths and weaknesses inherent in each category. This discernment enables them to employ these categories judiciously, tailoring their utilization to suit the specific context and design challenges they encounter.

According to the research methodology, it is imperative to investigate the remaining aspect of theoretical principles, namely appearance. The most viable approach for addressing this aspect involves scrutinizing information from all sources within the research and comprehending their insights regarding the knowledge within that discipline. Consequently, each source has been evaluated from four scientific perspectives (as depicted in Figure 14). In essence, integrating the variables for theoretical principle mods in Table 4 (coded sources by the mods of theoretical context usage) with the scientific aspects in Figure 14 (coded sources by the mods of methodological context usage) represents a comprehensive strategy. The next step is the **Analysis and Interpretation Based on Categories** (Table 5)**.** In other words, the findings of this part of the research reveal the **«Function»** of the theoretical principles in environmental disciplines.

Table 4. Quantitative (numbers) and qualitative (colors) influence of theoretical principles' penetration in different sections (left column) of environmental fields (Source: manual sorted, modified, and approved output of MAXQDA software by the authors)

Categories from Table 3	Function	Appearance	Foundation	Structure
Community and Social Actors Rule	4/8	3/6	1/2	2/4
Components	2/4	1/2	2/4	1/2
Conceptualization	7/1	4/8	2/4	3/6
Contextualism	1/2	6	6	3/6
Design Performance	6	1/2	4/8	6
Design Theories	3/6	3/6	2/4	2/4
Development Idea and Plan	10/7	8/3	3/6	10/7
Ecological & Environmental Formations	1/2	1/2	3/6	2/4
Education Theories	1/2	2/4	4/8	7/1
Efficiency	3/6	2/4	6	1/2
Existing Design Theories	3.6	8/5	4/8	1/2
Flexibility	1/2	2/4	2/4	3/6
Form Process	2/4	3/6	3/6	2/4
Information Management	3/6	2/4	2/4	2/4
Making Framework	1/2	1/2	6	3/6
Merging Design with Knowledge	4/8	4/8	2/4	1/2
Method of Definition	3/6	6	3/6	6
Method of Design	2/4	8/3	7/1	1/2
Pedagogical Strategies	1/2	3/6	2/4	3/6
Philosophical Idea and Origins	4/8	6	1/2	3/6
Research Models	2/4	3/6	2/4	4/8
Space Geometry	1/2	1/2	3/6	4/8
Stakeholders Rule	1/2	2/4	1/2	6
Standardization	2/4	1/2	3/6	2/4
Strategies	7/1	4/8	1/2	4/8
Sustainable Design	6	4/8	6	3/6
Theory Conditions	4/8	3/6	7/1	1/2

Categories from Table 3	Function	Appearance	Foundation	Structure
Theory Informed	2/4	1/2	1/2	2/4
Theory of History	1/2	1/2	4/8	4/8
Type of Interventions	1/2	1/2	2/4	1/2
Urban Challenges	1/2	1/2	2/4	2/4
User Experience	1/2	1/2	2/4	1/2
User Livability	3/6	2/4	1/2	2/4

Mediation role (helping to statements and solve problems)

Separation role (keeping things apart from other related field) and index of its

Completion and confirmation role (help with approving and approach)

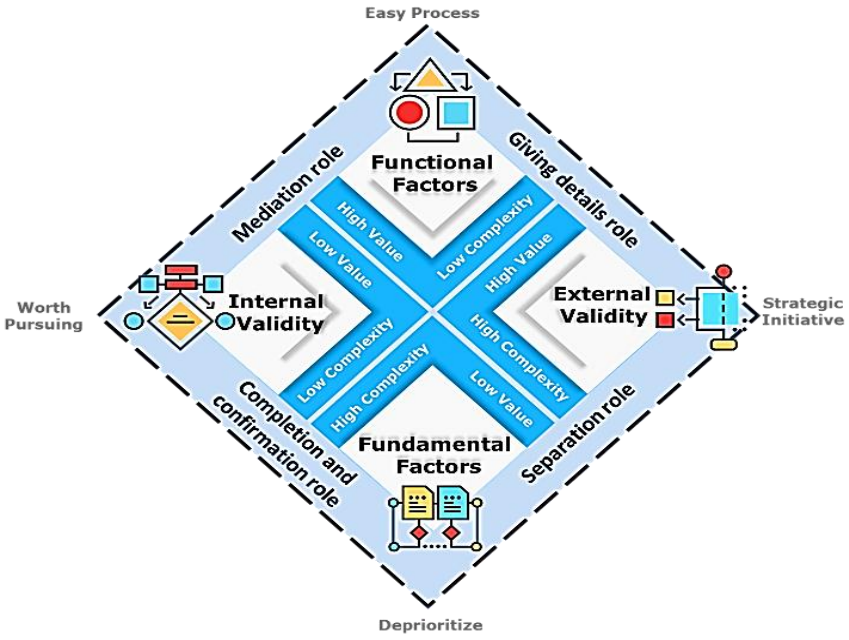
Giving detail Of Scopes, Aims, Processeager, relationships, and Steps (Descriptiveness)

Code Variables

List of Code Variables

14 Variables

Variable	Variable type	To be displayed	Source
Mediation role	Text	☑	User
Separation role	Text	☑	User
Completion and confirmation role	Text	☑	User
Giving details role	Text	☑	User



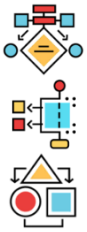
Document Variables

List of Document Variables

Variable	Variable type
Functional factors	Text
External Validity Factors	Text
Internal Validity Factors	Text
Fundamental factors	Text

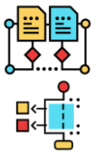
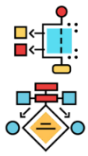
Fig 14. The matrix for prioritizing content and method modes for using theoretical principles in environmental fields based on value and complexity i14ndicators (right side) and introducing method factors to artificial intelligence (left side) (Source: manual sorting of MAXQDA software output by the authors)

Table 5. The answer of this research to the question about the Function (right column), Appearance (left column), Foundation (inner right column), and Structures (text and keywords in the middle) of theoretical principles in environmental fields from the aspect of Knowledge—Thematic Gaps (Source: manual sorted, modified and approved output of MAXQDA software by the authors)

Community and Social Actors Rule	Cities Knowledge Based on Social Networks in and Among Cities	G	
	Extensive Model for Reading Urban Life and Develop Policies	D	
	Understanding Community Growth and Actors Rule in Towns Program	I	
	Sociology Paradigms in Knowledge Distribution of Authorship	B	
	Improving Economy, Environment, Society and Culture Conditions	A	
	Finding Historical, Social, Cultural, And Symbolic Facts of Form	E	
	Social Construction, Organization, and Distribution of Knowledge	B	
	Cities as «Concentrations of Social Interactions in Space»	B	
	Reshape Understanding into Sociology of Knowledge Production	H	
	Shift from Centralized toward socially Distributed Knowledge	E	
	Connecting Actions/ Cultural Value/ People/ Social Constructionist/ Social Foundations/ Social Spaces/ Social Theory		
Components	The Inquiry Epistemic Component	H	
	Define Urban Design by Considering Society and Space Structures	B	
	Redefine Reason and Be Aware of Its Limitations	H	
	Identify Correlated Items of Image and Identity Indicators	E	
	The Disciplinary Component	I	
	Approach/ Concept/ Evidence/ Experience/ Foundations/ Framework/ Goals/ Information/ Knowledge/ Landscape/ Logic/ Nature/ Perspective/ Philosophy/ Principal/ Problem/ Process// Product/ Program/ Rule/ Scale// Scenarios/ Shape/ Sights/ Social/ Solution/ Sounds/ Space/ Subject/ Type/ Value/ Common Set/ Differentiation/ Material/ Module/ Rule of Thumb/ Scaling Law		
Conceptualization	Instrumentalization an Operationalization or Conceptualization of a Map	E	
	Clear Theoretical Rules, Analytical Techniques, Architectural Ideas	D	
	Centralization on the Class-Based Concept in Urban Planning	A	
	Elements of Substantial Image and Identity Features in Context	D	
	Overcoming Theoretical Woes by Concept of Knowledge Production	H	
	Concept of Knowledge-Based Urban Development (Kbud)	B	
	Conceptual Field for Interferences Between Facts and Scales	A	
	Theory Concepts on Behalf of the Community for Now or Decide	D	
	Drawing Information from Architecture and Urban Planning	H	
	Increase Architectural Culture Trends to Make Images of Context	D	
	Mathematical Model of Wholeness, Together with Its Topological	G	
	Different Conceptions of Scientific Method	E	
	Execution Concept of Learning Techniques in Theoretical Subject	H	
	Conceptualizing and Addressing ‘Nature’ In Practice and Research	B	
	Develop Approaches to Understanding the Concept of Virtual City	E	
	Integration/ Intersections/ Justifications/ Perception		
Contextualism	Shifting Urban Theories Towards Dynamic and Interconnected View	H	
	Understanding Creation Shift by Study on Learning of Knowledge	B	
	Examining Links Among Micro-Level Factors and Spatial Contexts	B	
	Content Processes and Methods Form of Architectural Education	E	
	Relation to the Geography of Innovation and Economic Activity	A	
	Open Up Architecture to Other Discipline Parts Based on Themes	H	
	Context Perspectives of Architecture and Urbanism Studies	G	
	Content and Form of Architectural Education Area	E	
	Local Context Values for Sustainable Identity and Culture Image	D	
	Strategy/ Structure/ Theory/ Urban/ Assigning Value/ Metaphorical Connection		
Design Performance	Measurable Knowledge in Innovation Systems Production of Design	E	
	Improving Design Performance by Genuine Methods and Techniques	H	
	Unite Structure with Phenomena to Integrate Design and Building	A	

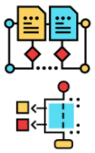
	Need for More Relational Knowledge to Avoid Miscegenation It	H	
	Customizing Classic Processes to Offsite Building Part Assembly	I	
	Architectural Reply to Technology and Socio-Economic Progress	H	
	Computerize Drawing and Automate Design with Computer-Aided Tools	B	
	Tools for Upgrading Abilities of Theoretical Facts of Concept	H	
	Decision-Making and Diagnosis Process as a Planning and Action	E	
	Efficient/ Management/ Modeling/ Rational/ Architectural Idea/ Development Goals/ Formulate/ Innovative/ Low Energy System/ Predictable/ Real Time		
Design Theories	Position of Design Theory	D	
	Reduce the Gap Between Architecture Theory and Design Projects	B	
	Transferring Teaching-Learning Design Theories to Architects	I	
	Design a Logical Continuation of the Past Space	B	
	Application of Design Theories in Design Practical Subjects	B	
	Reading Human Thinking and Reasoning Means in the Design System	B	
	Growth, Decline, And Possible Revitalization of Spatial Clusters	E	
	Knowledge Balancing by Post-Positivist Styles in Policy-Making	H	
	Contextual and Structural Factors That Influence Human Behavior	G	
	Design Theory and Design Approaches	H	
	The Transformation of Cities into Knowledge Cities (Kcs)	E	
	The Concept of Knowledge-Based Urban Development (Kbud)	D	
	Problems Solving Involves Preferred Situations Design	E	
	Analytical/ Climatic/ Collaborative/ Cultural/ Divergent/ Efficiency/ Heuristic/ Logical/ Morphological/ Passe/ Pedagogical/ Pragmatist/ Smart/ Societal/ Supernatural/ Computational/ Conceptualization/ Decision Theory/ Evidence-Based Design/ Formalism/ Landscape Design/ Landscape Planning/ Morphological Definition/ Nature-Based/ Supernatural Foundations		
Development Idea and Plan	Urban Innovation and Growth as Advancement of Aspects in Cities	H	
	Evolutionary Knowledge Creation at City, Area, Or Nation Levels	A	
	Geographical Location Influence of Innovational Tacit Knowledge	H	
	Generated and Used Applied Knowledge in Urban Development Plans	I	
	Describe the Document and Activities of Design Governance Models	G	
	Develop a Transdisciplinary Platform for Human Development	D	
	Potential Application of Knowledge-Based Urban Development	H	
	Develop Learning Knowledge of Strategic Domains of Urban	B	
	Extract Local Urban Planning and Knowledge-Based City Indicator	E	
	Systematic and Interaction Analysis Regarding Urban Innovation	H	
	Key Knowledge and Innovation for Urban Rise and Competitiveness	H	
	Link Among Geographical Knowledge and Innovation Process	B	
	Different Growths and Development Patterns of Cities	D	
	Multiple Disciplines to Develop Solutions in Economic World Issue	H	
	Making Urban Structure Crucial and Natural Subsurface Function	A	
	Cities as Nuclei for Innovation, Expertise, And Opulence	H	
	Deeper Knowledge of the Variety and Complexity of Urban Spaces	B	
	Natural Factors as Prerequisite for Urban Innovation and Growth	H	
	Key Factors Necessary for Developing Knowledge-Based Cities	G	
	Role of Complex Systems and Social Sciences as City's Web Items	B	
	Link Among Local Knowledge Base and Form of Co-Inventor Network	H	
	Innovation, Agglomeration, Feedback, And Migration Flow of City	H	
	Shifting Architecture Theory to Social Issue Solution Paradigm	D	
	Understanding the Development of New Towns Building Objects	G	
	Spatial and Climatic Considerations Need for Achieving Kbud	D	
	Webs of Cities Formal Theories Based on Growth Static Models	D	
	Vision of the Knowledge Transfer and Usage in Spatial Context	H	
	Expert and Experiential Knowledge in Planning and Policy-Making	A	
	Coherent Policy of Desirable Knowledge-Based City Indicator	D	

	Technological/ Traditional/ Adaptation to Climate Change/ Digital Twin/ Effective Strategy/ Future Shape/ Growth of City/ Logical Argumentation		
Ecological & Environmental Formations	a New Perspective on Urban Areas as Ecological Formations	A	
	Focuses on the Value of Receptivity and Status of the Climate	G	
	Manage Policy and Legislation to Build New Planned Communities	D	
	Support the Qualities of the Urban Environment	A	
	Climatic Scenarios/ Eco-Village/ Possibility/ Potential/ Public Realm/ Regenerative		
Education Theories	Expanding the Scope of Engineering Education and Design Courses	B	
	Education and Culture	A	
	Technical and Technological Methods in Research and Teaching	E	
	Study Methods for Developing Study Results and Skills in Architect	E	
	Usage of Digital City Model for Use in Architectural Education	B	
	Improvement Study Methods for Problems' Efficient Solutions	H	
	Collaborative Design Practice and Constructivist Education	B	
	Teaching Approach to Integration Between Theory and Practice	I	
	Collaborative Learning/ Cooperative Learning/ Defining/ Describing/ Practice Theory		
Efficiency	Modes of Regulation in Understanding Urban Spaces	E	
	Improved Energy Efficiency	I	
	Changes in Architecture By movements such As Industrialization	H	
	Relation Between Analysis/Synthesis in Conjecture/Analysis	B	
	New Urbanization Development by Technology and Ecological Phase	G	
	Knowledge-Based Models Bridge the Gap Among Spatial Options	H	
	Engineering, Architectural, Multidisciplinary, and Organization	H	
	Filling Divide Between Educational and Executive Environment	H	
	Useful and Complex Tactic in Architectural and Urban Planning	G	
	Digital Tool Impacts in the Architectural Field by Virtual Reality	H	
	Digital Developing Construction	H	
	Decrease fragmentation by spatial analysis: Projective, Performative	G	
	Manage Theoretical Subjects to Harmonize Design Efficiency	B	
	Interdisciplinary Study Performance by Feasible and Desirable	B	
	activation/ Argumentation/ Assigning/ decision/ definition/ Development/ Guideline/ Practice/ systems/ technique/ Virtual/ visual/ 3D City Model/ context/ fragmentation/ operationalization/ planning thought		
Existing Design Theories	Adaptation of Global Patterns and Methods to Local Development	A	
	Kinds of Proximity and Creating Competitive City Knowledge	E	
	Main Important Knowledge's Pattern and Intelligent Use of It	E	
	Design Process, Innovative Ideas, And the Principles of Urbanity	H	
	constructionist/Learning/Biophilic design/explicit theory/general theory/information management		
Flexibility	The feeling of Factors Such as the Discipline, Balance, Flexibility	A	
	Pragmatic Approach to More Affordable Residential Development	D	
	An Integral Involvement Through Different Levels of Urban System	G	
	Inner Architecture Capable of Reflecting the Spirit of Times	G	
	Response to Growing Environmental Challenges	H	
	Teaching to Architects Who Must Be Touch in With Life	I	
	Theoretical Fact as a Guarantee for Urban Geography Flexibility	B	
	Theory Reply to the Technological and Socio-Economic Progress	H	
	Consideration of the Issue of Adaptation to Climate Change (Acc)	H	
	Science of Structure, Foundations, and Impact of Decision Theory	D	
	Architectural Discipline of Possibilities to Use Digital Method	D	
	construct/ design/ methodology/ planning/ science/ architectural construct/ building process/ efficient solution/ formation/ instrumentalization/ knowledge integration		
Form Process	Process of the Modern Change in Principle of Architecture Form	H	
	How the Theories Shaping the Form of Architecture and the City	B	
	Specific Form of Urban Governance: Cultivated, Feral, And Wild	A	
	Technical Level of Architectural Practice About Reasonable Form	H	
	I understand the relationship between formalism And the Concept of Form.	B	
	Reasonable Architectural Form Based on Technical Conditions	H	

	Space, Volume, Perceptual, And Real Form in Architecture Aesthetic	H	
	Paying Attention to Multiple Meanings and Concepts of the Form	B	
	adherence/ connection/ deep/ dynamic/ growth/ Models/ spatial/ systemic/ thinking/ Measuring space/ natural foundations		
Information Management	Case-dependent Research and Evidence Gathering	D	
	Ability to Integrate Knowledge, Analytical, and Communication	H	
	Technical Obstacles in Information Management	B	
	Experience and Direct Connection Dimension of Tacit Knowledge	H	
	The Provision of Data with Information Management	E	
	technology/ A1-aided/ Building Information Modeling/ soft systems		
Making Framework	Reading Architectural Knowledge and Its Inner Set and Relations	H	
	Goal-Driven Planning Policy to Provide New Towns Program	E	
	Functionality, Structure, Social, And Cultural Aspects of Form	D	
	A Framework for Theorizing Construction Theory in Design	H	
	Understanding the Whole Aspects of Things by Systems Theory	A	
	Biology-Inspired Framework for Analyzing Urban Dynamics	D	
	Parallel Focus on the city's External and Internal Layer and Factor	D	
	Utilization of Data from Asset Planning, Design and Construct	E	
	configuration/ education/ pedagogy/ construction management/ knowledge structure/ reflection framework/ solutions		
Merging Design with Knowledge	Merging Urban Design and Planning with Knowledge of Subsurface	D	
	Creative Aspect of Architect in Theoretical and Actual Creation	H	
	Role of Knowledge in Models of Everyday Spatial Decision-Making	G	
	Evaluating and Merging Mode for Expert and Practical Knowledge	E	
	Focusing on the Integration of Lands and Their Flanking Areas	D	
	Focusing on Functionalist Ideas Between Theory and Practice	B	
	Representing Scientific Architecture from an Artistic Outlook	H	
	Knowledge Exchange Between Research and Practice	D	
	Defining Proper Perception of Presidents in Architecture Design	B	
	Ever-Changing Interpretation of Knowledge Between Locations	D	
	Using Interactive Thinking Like a Pedagogic Approach in Design	H	
	body of knowledge/ planning theory		
Method of Definition	Explore, Examine, Discuss, Advance to a Shared General Definition	H	
	Credit Systems, Competencies, And How Those Competencies Are Too	H	
	Shift Focus from a Theoretical Doctrine to an Open-Ended Approach	D	
	Definition of Wholeness by Mathematical and Topological Model	E	
	Redefine Urban Design as an Independent Field by Social Theory	G	
	Define and Understand Architecture Transdisciplinary Components	B	
	Consideration Both Functional and Emotionally Impactful	H	
	Categories of Morphological Definitions and the Public Realm	D	
	Architecture as a Form of Human Talent and a Sign of Progress	E	
	Values and Principles of Architecture Theory and Paradigms	D	
	Common Definition, Theories, And Knowledge	E	
	Modern Setup of Social, Technological, And Historic Backgrounds	D	
	Shift Focus from a Historical Progress to a Fragmented Approach	E	
	Defining and Describing Urban Design as City Building Processes	B	
	Analysis/ Philosophy of Design/ Pre-Suppositional		
Method of Design	The Dominance of Science in Thinking About Method of Design	D	
	Conservative Thinking in the Role Process of Contemporary Masters	H	
	Determining Quantity and Quality of Relations About Innovation	H	
	Set of Common Methods and Expectations	E	
	Techniques and Methods of Design	H	
	Design-oriented Structure of Knowledge and Design Spaces' Logic	H	
	Design Theory By analyzing and understanding how Things Work and Why	B	

	Managerial, Academic, and Professional Experience in the Design	E
	Methodology in Teaching Theory Courses and Brainstorm Technique	E
	Design-Theoretical Concepts	H
	Design Repeatedly Items in Every Architecture and Urban Plan	I
	Interpreting Private and Public Space in Terms of Urban Design	B
	Understand Nature, Social, and Cultural Rules by Tacit Knowledge	A
	Join Architectural Design Thinking and Teaching Theory Courses	H
	Production to Support Social Analysis Among Effects in Theory	B
	Analyzing the Main Idea and Concept of Theories in Architecture	B
	Brainstorming/ Pragmatist Philosophy/ Science-Based Approach/ Design Creativity/ Design Education/ Design Guideline/ Design Knowledge/ Design Practice/ Design Principle/ Design Problem/ Design Process/ Design Programs/ Design Research/ Design Science/ Design Studio/ Design Theory	
Pedagogical Strategies	Sharing Knowledge, Ideas, Viewpoints, And Skills	I
	Revising Our Knowledge About Spatial Manifestation of Phenomena	H
	Improving Existing Study Systems in Studies and University	D
	A Rigorous Top-Down Approach Including Simplistic Urban Models	H
	Cooperative/ Learning Efficiency/ Pedagogical Underpinnings	
Philosophical Idea and Origins	Study the Philosophical Idea and Origins of Formalism in Design	F
	Theoretical Basis for Architecting Based on Systems of Ideas	A
	Giving a Review of Architecture by Philosophy and Cultural Fact	G
	Citing Political Effects of Philosophy Styles in Architecture	G
	Ideological Role and Basic Value in Public Architecture Process	A
	Offering a New Perspective on the Architectural Theory by Culture	A
	Foundation Process of Intervention for Building Restoration	D
	Promoting Forms with Respective Literary Origins and Meanings	F
	Expanding View of Architecture into Cultural Anthropology	A
	Categorization Value for Scholars Based on Phenomena Relations	C
	Original Value in Social Form, Production Relations, And Artful	C
	Understanding the Philosophy's Origins of Architecture	C
	Making Architecture Fact by Philosophers and Cultural Theorists	F
	Merging Varied Kind of Knowledge Beside Field-Tied Epistemology	A
	The Cognitive-Philosophical Component;	D
	Evaluating Ethically Concept of Human Progress	G
	Foundation/ Mainstream/ Transdisciplinary/ Deep Theory	
Research Models	Making Map of Bodies of Knowledge as Field of Research Models	D
	Using Action Research and a Case Study as Collect Data Strategy	I
	Integrate Related Subjects and Put Emphasis on Study Modules	H
	Heuristic Analytical Theory and Critique Construction Framework	H
	Reasons for Developing a Theory	D
	Scholar Issues in Classification for Interdisciplinary Research	E
	Develop Interdisciplinary Study by Feasible and Desirable Mode	E
	The Cohesiveness of Competencies of Graduates in Global Architect	I
	Interdisciplinary Analysis by Classification Critical Aspects	H
	Epistemological and Practical Matter on Interdisciplinary Study	H
	Extracting Origin Knowledge for Perception of Value and Method	F
	Solving Grouping Conflicts by Deductive and Inductive Methods	E
	Case Study/ Heuristic Analytical/ Novel Methodology/ Scientifically	
Space Geometry	Practice Geometry and Employ It for Design and Communication	D
	Concepts for Planning Virtual City Environments	G
	Spatial Factor Configuration of Land Uses for Sustainability	A
	Broadening and Deepening Urbanism Based on Its Spatial Products	A
	Distinguishing Space According to Spatial and Transpatial Structures	H
	Map of/ Network/ Spatial Analysis/ Spatial Configuration/ Spatial Map/ Spatial Network	
Stakeholders Rule	Applicability Both Discretionary and Constrained Behaviors	H
	Framework for a Design-Theoretical Epistemology	H
	Reflection Stakeholders Rule in Urban Planning	H

	Client Faith, Marketing, And Costs Benefits of Mass Customization	D	
	Formulating and Making Explicit an Implied «Discursive Whole»	D	
	A General Theory That Reflects Share Principles of Approaches	D	
	Principles and Criteria of Architecture and Urban Design	G	
	Explicating Various Types of Knowledge and Actors in City	G	
	Dynamic and Evolving Process Concept of Wholeness	D	
	Theoretical Framework for Architectural Associated Land Design	H	
	Actions/ Specialization/ Stakeholder		
Standardization	Modern Manifest Factor for Standardization, Design, And Building	H	
	Imply of Information Technology in the Environment of Construction	I	
	System of Knowledge Relations Among Regional Innovation Systems	H	
	Activities Based on the Discipline, Actor, And Expert Knowledge	I	
	Architectural Understanding of Form, Aim, Material, and Skill	E	
	Factor/ Criteria/ Discipline/ Indicator/ Structural Engineers		
Strategies	Stakeholders and Strategies for Establishing Energy-Efficient	I	
	Assess Energy and Water Consumptions of Urban Planning Project	I	
	Identifying Superior Strategies for Interdisciplinary Research	E	
	Design and Planning Strategies Are Effective in Today's Problems	H	
	Strategies and Methods for Sustainable Landscape Planning	D	
	Effective Strategy for Organization Virtual City's Information	H	
	Shift of Focus Planning from the Physical Qualities to Land Use	H	
	Typology Reading of Links Between Architecture and the City	H	
	Changes in Architecture by Moving from Patterns into Regulation	E	
	Architecture and Urban Planning Strategies	H	
	Decline and Preventing Task in Theoretical Conflict and Vacuum	H	
	Growing Aesthetic by Historical Analytic and Theoretical Method	H	
	Common/ Measuring/ Conjunctive/ Disciplinary/ General Definition/ Guidebook/ Mainstream Logic/ Manual/ Mitigation/ Orientation		
Sustainable Design	Innovation Importance for Sustainable Urban Development	A	
	Scientific Foundation of Sustainable Design	G	
	Biopic Design Contributes to the Sustainable Architecture	D	
	Making Sustainable Patterns of Architecture by Tacit Knowledge	D	
	Satisfying Real Needs to Achieve the Product of Science and Art	D	
	Sustainable Energy Development at Two levels: Components, System	H	
	Biopic Design as a Theoretical Framework to Interpret Nature	H	
	Strategy of Sustainable Development of a Knowledge-Based City	B	
	International Sustainability Policy Goal in Planning Dimension	G	
	Detailed Analysis of Energy-Efficient Construction	I	
	Pragmatism and a Spectrum of Sustainability	I	
	Following Different Climatic Scenarios	A	
	Urban Sustainable Function in Climate, Energy, Economy, Health	A	
	Theory of Sustainable Landscape Planning and Apply in Framework	A	
	Service/ Sights and Sounds/ Smart City		
Theory Conditions	Knowledge Flows and Collaboration Among Multi-Scale Associations	H	
	Scientific Knowledge of Progress of Human Phenomena in History	F	
	Achieving the Distinct Architectural and Urban Design Theory	A	
	Sufficient and Potential Theory Conditions in Construction	D	
	Joining Theories and Methods of Analysis	H	
	Filling the Gap Between Theory and Practice by a Wider Thinking	H	
	Separating Among Educational and Research-Based Case Studies	E	
	Design Principle Patterns of Building's Quality and Creativity	H	
	Uncovered Theoretical principles In the Logic of Generativity	D	
	Pre-Suppositional Hierarchy of Assumptions That Underline Theory	H	
	Highlighting the Interactions Between Humans and Non-Human Elements	H	
	Theoretical Principles of Design	B	

	Values and Principles of Architecture Theory and Paradigms	G	
	Epistemology the Architecture by Differ Forms of Knowledge in Architecture	A	
	The Relationship Between Theory and Critique	G	
	Effective/ Flexibility/ Rational Foundations		
Theory Informed	Theory Informed by Science, Technology, Cultural & History, and Anthropology	D	
	Epistemology, Theoretical Perspective, Methodology, Representation	F	
	Exploring the Concepts and Methods of Theory Building in Cities	H	
	Criteria for the Improvement of Digital City Models	B	
	Understanding the Complexity of the World to Achieve Future Progress	A	
	Expanding Architecture Aspects from Individual to Social	G	
	Methodological Roots of Design Models in Philosophy of Science	F	
	Cultural Anthropology Views, Making Practice Architecture Theory	F	
	Knowledge Construction of Urban Participatory Spatializes	A	
	Meaning Different Things and Involve Varied Activities	F	
	Architecture Principal with Cultural Interaction of Society	A	
	Theorization Environments of Architecture and Urban Planning	H	
	Explicit/ Future/ General/ Common Type/ Key Factor		
Theory of History	Merging Explicit Theory of History with Studies of Design Rule	H	
	Merging Historical Theories Studies and Ethnographic Analysis	A	
	Link Among History and Theory in Architectural Periodicals	D	
	Understanding the Theoretical Perspectives Behind Architecture	B	
	Decision to Action Model for Restoring Architectural Heritage	A	
	Anthropology/ Evolution/ Architectural Education/ Cultural Anthropology		
Type of Interventions	Grouping of Documents Based on the Phenomena, Method and Theory	C	
	Analytical Theory Based on Rules of the Architecture's Space	A	
	Geographical Relying on Differ Types of Knowledge Base of Region	G	
	Differ Types of Knowledge With Distinct Attributes by Transmit	D	
	Reconfiguration's Permanent and Strategies of Urban Spaces	H	
	Public/ Regional Planning		
Urban Challenges	Conductive Knowledge of Dealing with Urban Challenges	A	
	Climate Change/ Construction/ Consumptions/ Energy/ Providing/ Realm/ User/ Actors/ Dynamics of City/ Energy Efficiency/ Evolution of City/ Facility Management		
User Experience	Knowledge Domain, Experience, and Expertise	H	
	Effects of Space on Organizations of Human Behaviors	D	
	Beneficial for Clients and in the Changing Business Environment	D	
	Meaning of Reason and Application of It in City Design and Development	G	
	Human Beings' Rule in Culture and Thus in Architecture Identity	A	
	Reflection/ Image/ Interface		
User Livability	Live in Large Groups, Think in Abstraction, Link Up Actions	H	
	Digital City Models for a Broader Base of Users	G	
	Livability Studies at the Standpoint of Urbanization Development	A	
	Finding Out Aim of Architecture by Revival of It Like a Live A	A	
	Contact Network of Lifestyle and Living Environment Factor	E	
	Human-Centered Livability for City's Appeal and Competition	H	
	Modes of Regulation for Creating Sustainable and Livable Cities	G	
	Shift from Merely Pursuing Technology to True Needs of People	I	

To complete the final phase of the research methodology, it is essential to assess the similarity between the findings and the sources (as illustrated in Figure 15) by identifying the extent of overlap between the findings and the content of the sources (as indicated in Chart 1, delineating the Proportion of the

Type, Number, and Subject Area Discussion). Put simply, this entails ensuring that the research findings are derived from the utilized sources, maintaining a high standard of quality and originality. Furthermore, it involves examining the degree of connectivity between the content and the sources to ascertain which areas are interconnected. This is accomplished by leveraging artificial intelligence to quantitatively and qualitatively measure the extent to which the main areas in Table 3 are interconnected and overlap with each other. This assessment is crucial as the relationship between these fields hinges on the specific words that define and describe them. These keywords are presented both in a general format (Figure 13) and separately (in the central part of Table 5).

As these disciplines have gained greater significance in people's lives, owing to the proliferation of functional roles and layers, designers and planners have encountered challenges in effectively harnessing theoretical ideas across various domains. Consequently, the lack of comprehensive study in this regard manifests a deficiency in theorization over time. Theory, being the cornerstone for advancing frameworks to facilitate the comprehension of ideas and the strategic planning of creative and organized construction, assumes paramount importance. Therefore, the keyword "theory" holds significant explanatory power in elucidating the principles across different facets of these disciplines.

Changes in content have profoundly influenced the evolution of environmental styles and design principles. The transition from an industrial-era society to a post-industrial society has precipitated a shift in architecture, emphasizing not only physical design but also social ideals and strategic objectives. Moreover, the emergence of diverse theoretical design paradigms, such as shape grammar and space syntax, has paved the way for the potential externalization of a universal language for interpreting environmental artifacts.

Thus, the theoretical principles crucial for comprehending the significance of architecture and urban planning encompass several key areas. These include the examination of architectural thought as a cultural phenomenon, the development of concepts that reflect the evolution of architectural scholarly knowledge, and the representation of this knowledge as a cohesive system. Furthermore, urban planning theory has evolved over time, initially driven by social issues and the challenges posed by the Industrial Revolution. Urban design is recognized as a subset of both architecture and urban planning, dedicated to shaping the built environment in a way that meets the needs and values of the community.

Decision analysis proves less effective in addressing planning problems, leading to the proposal of a planning tool called the "decision network." This tool aids planners in making multiple interconnected decisions when dealing with multiple stakeholders who have multi-attribute preferences. Ultimately, the epistemological foundation of urban planning logic encompasses planning justice and planning impartiality, which aim to correct the misdirection of environmental design (Table **6**).

The emergence of digital design has significantly influenced the development of new discourses and design concepts, transitioning digital technology from a descriptive to a conceptual role. Analyzing written content has facilitated the tracking of the evolution of these concepts, their emergence or misuse, and the interrelations among various concepts in the field of computer-aided architectural design. Overall, these changes in content have fostered a more holistic and thoughtful approach to architectural design, integrating social, strategic, and digital aspects into the discipline.

It appears that the built environment is shaped by a complex interplay of various aspects of architecture and theoretical principles. This underscores the importance of development and construction as a critical phase in realizing environmental planning and design, highlighting the necessity for specificity and alignment with real-world conditions. Consequently, the mainstream scenarios of theoretical principles in environmental science encompass multiple facets of reality, as illustrated in the following table.

Theoretical principles in architecture and urbanism can indeed inform the processes of designing, planning, and implementing environmental interventions. This highlights the importance of collaboration, learning, flexibility, and leadership in the implementation of sustainable urban design. Finally, this research provides a framework (Chart 2) for the retrofitting process, emphasizing the need for an integrated approach that considers all scenarios (see Table 6) and principles categories (see Figure 15).

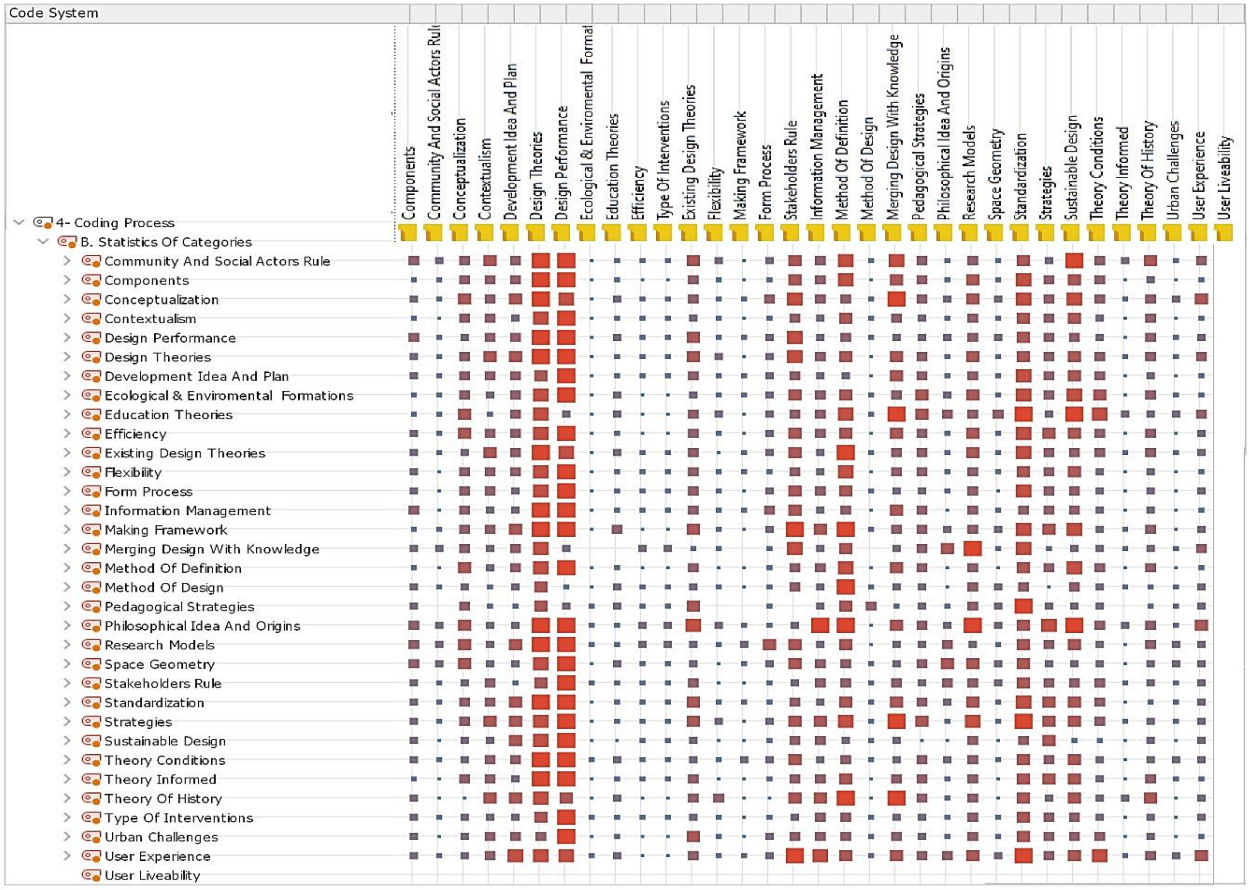
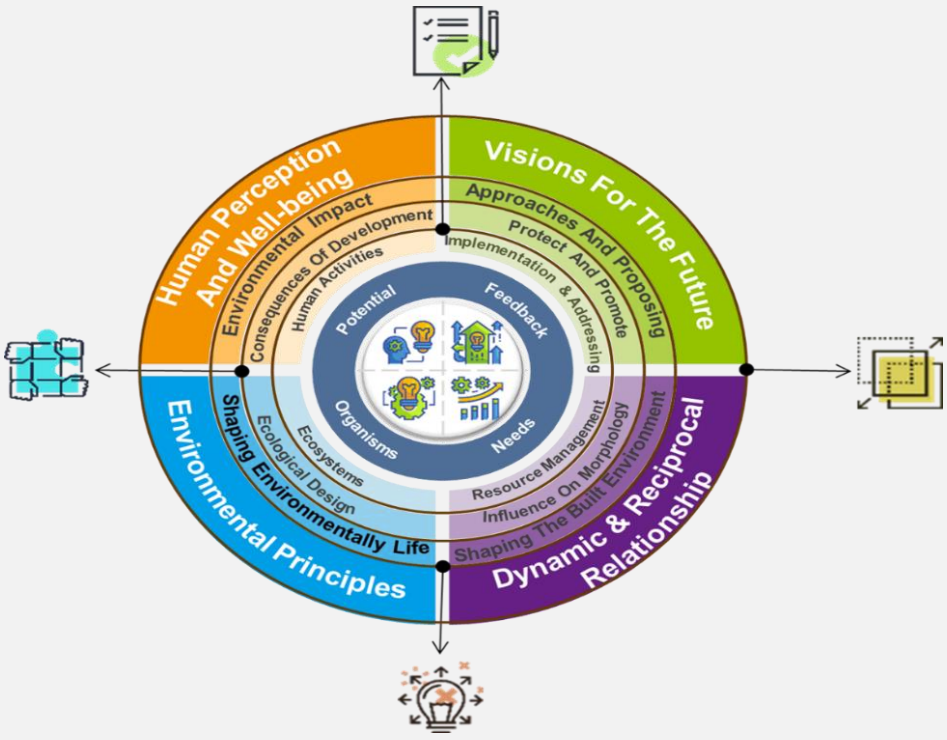


Fig 15. Examining the quality and originality Of Categories (left column) by relationship indicator to sub codes of each other (top row) (Source: MAXQDA software output)

Table 6. Implementing various mainstream of theoretical principles in environmental science for making a decision network (Source: authors based on research findings)

Scenarios	Environmental Theories aspects	Description in the architecture and urban planning	
Ecological systems theory	is a fundamental concept, focusing on the interrelationships between organisms and their environment, including the study of ecosystems, biodiversity, and ecological design. It emphasizes the role of architectural and urban design in shaping environmentally life and the need for a deeper understanding of their environmental principles.	This scenario emphasizes the connection between humans and nature in the built environment. It suggests that incorporating natural elements, such as natural light, greenery, and natural materials, into architectural and urban design can improve human well-being and connection to the environment.	Environmental Eco-Friendliness actions
Environmental impact assessment	is another crucial foundation, involving the evaluation of potential environmental consequences of human activities, such as infrastructure development or industrial projects. It highlights the potential impact of the environment in architecture and urbanism on human perception and well-being.	This scenario promotes compact, mixed-use development that encourages walking, cycling, and the use of public transportation. By focusing on creating walkable, transit-oriented communities, smart growth aims to reduce urban sprawl, preserve green spaces, and	Challengable intervention

	Sustainability	is a core principle, emphasizing the need to meet present needs without compromising the ability of future generations to meet their own needs, considering aspects like resource management, conservation, and renewable energy. It examines the evolution of this discipline's theories and their influence on morphology and collectively underscores the dynamic and reciprocal relationship between architectural and urban theories in shaping the built environment.	promote sustainable urban development. Also, it emphasizes creating mixed-use, pedestrian-friendly neighborhoods that promote community interaction, reduce car dependency, and enhance quality of life. It focuses on designing human-scale, vibrant urban environments that are socially, economically, and environmentally sustainable.	
			Sustainable scenario focuses on minimizing the environmental impact of buildings and urban areas by reducing energy consumption, using environmentally friendly materials, and incorporating renewable energy sources. The goal is to create buildings and cities that are energy-efficient, resource-efficient, and environmentally responsible	Sustainable development
	Environmental policy and governance	play a significant role, in addressing the development and implementation feedback of regulations, laws, and strategies to protect the environment and promote sustainable practices. It explores the divide between planners and architects in their approaches to urban form and design, with each group proposing different visions for the future.	policy and governance scenario aims to create buildings and urban areas that can adapt to changing environmental conditions, such as climate change, natural disasters, and resource scarcity. It involves designing structures and communities that are flexible, durable, and able to withstand and recover from environmental challenges.	Smart Growth



Scenarios	Environmental policy and governance	Sustainability	Environmental impact assessment	Ecological systems theory	Table 7
Function	Functional factors	External Validity Factors	Internal Validity Factors	Fundamental factors	Figure 14
Structure	Mediation role	Separation role	Completion & confirmation role	Giving details role	Table 5
Foundation	Cognitivism	Actualism	Essentialism	Methodology	Theorizing	Table 3
Appearance	**Categories**	(1)Community And Social Actors Rule (2)Components (3)Conceptualization (4)Contextualism (5)Design Performance (6)Design Theories (7)Development Idea And Plan (8)Ecological & Environmental Formations (9)Education Theories (10)Efficiency (11)Existing Design Theories (12)Flexibility (13)Form Process (14)Information Management (15)Making Framework (16)Merging Design With Knowledge (17)Method Of Definition (18)Method Of Design (19)Pedagogical Strategies (20)Philosophical Idea And Origins (21)Research Models (22)Space Geometry (23)Stakeholders Rule (24)Standardization (25)Strategies (26)Sustainable Design (27)Theory Conditions (28)Theory Informed (29)Theory Of History (30)Type Of Interventions (31)Urban Challenges (32)User Experience (33)User Livability				Table 1

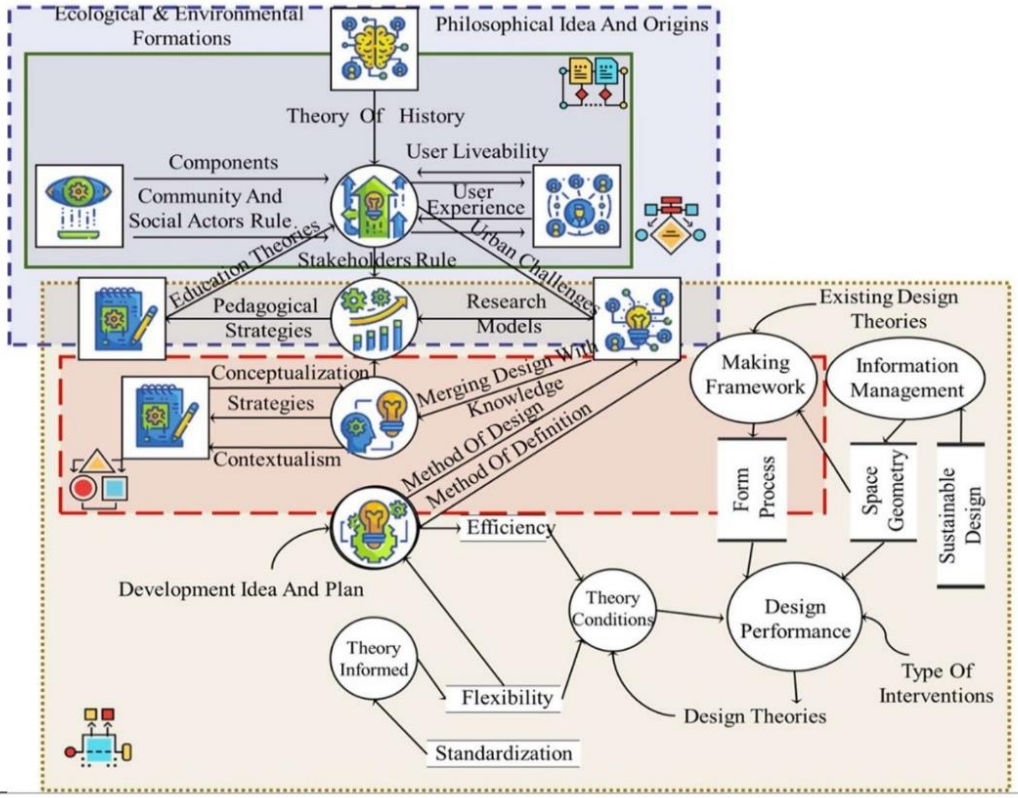


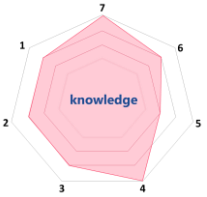
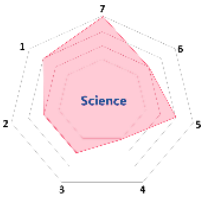
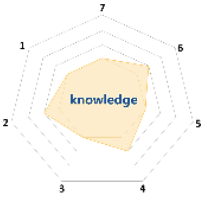
Chart 2. Systematic framework of the relationship of theoretical principles layers in environment-oriented disciplines (Source: authors based on research findings)

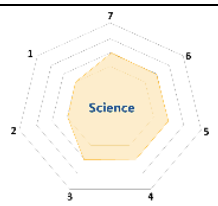
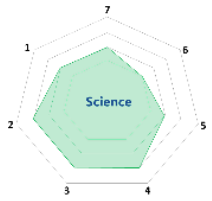
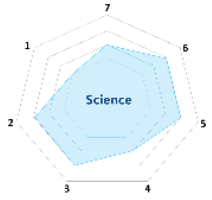
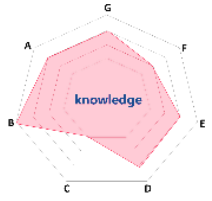
6. CONCLUSIONS

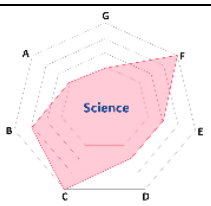
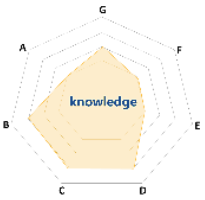
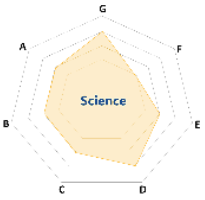
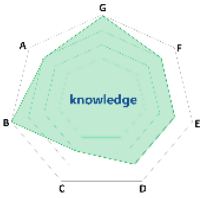
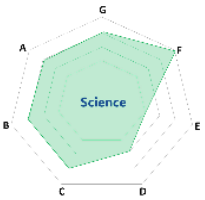
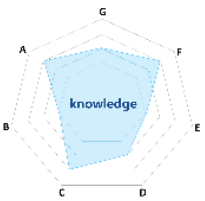
In summary, theoretical principles are fundamental in guiding the practices of architecture and urban planning, shaping the built environment to meet diverse societal needs. In both fields, the application of theoretical foundations serves various essential goals that contribute to innovation, sustainability, cultural preservation, social inclusivity, functionality, and efficiency of architectural structures and cities. Architects leverage theoretical principles to create innovative and sustainable designs by integrating concepts such as passive design strategies and green technologies. Theoretical frameworks also aid in preserving cultural heritage by informing design decisions that reflect local traditions and history. Additionally, theory promotes social inclusivity within architectural projects by considering accessibility requirements and designing spaces that foster community engagement.

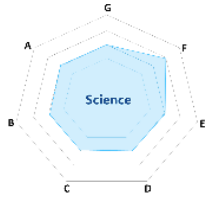
In urban planning, theoretical foundations are instrumental in creating livable, resilient, and equitable cities. By applying urban planning theories, professionals can address challenges such as population growth through efficient land use strategies and transportation needs via integrated mobility solutions. Additionally, theoretical principles guide city planners in mitigating the impacts of climate change by promoting green infrastructure and sustainable development practices. In conclusion, integrating theoretical foundations into architecture and urban planning practices is paramount for achieving successful outcomes in these fields. By striving towards goals such as innovation, sustainability, resilience, cultural preservation, and social inclusivity, professionals can shape environments that not only meet current needs but also effectively anticipate future challenges.

Table 7. Theoretical aspects of actions in architecture and urban planning
(Source: authors based on research findings)

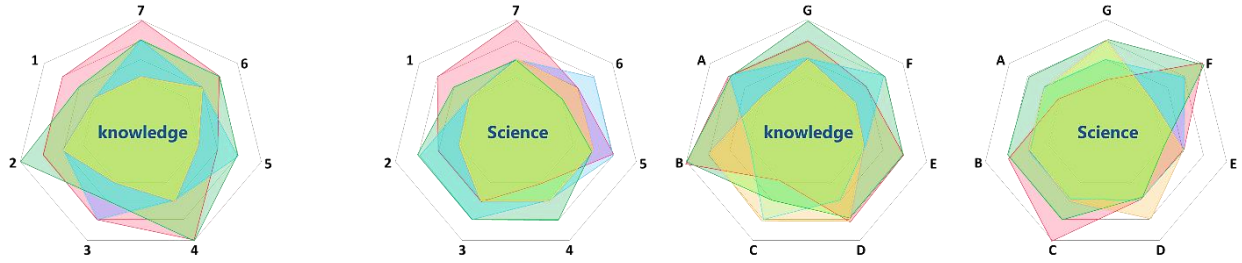
Actions▼	Theories▼						Relationship Model▼
	Table 6	Fig 14	Table 2	Table 2	Fig 1		
	Scenarios	Functios	Foundations	Structures	Knowledge	Science	
Work Missions							
1- Design and Aesthetics					S ◕	◕	
					W ◔	◔	
					O ◑	◑	
					T ◔	◔	
	Creating visually appealing and functional spaces that enhance the quality of life for inhabitants						
New suggested role ▶	- Designing spaces that are accessible to people with diverse needs - Promoting universal design principles - Creating equitable urban environments						
2- Sustainable Design and Development					S ◕	◑	
					W ◑	◔	
					O ●	◕	
					T ◑	◕	
	This involves creating buildings and urban spaces that minimize environmental impact, use resources efficiently, and contribute to a healthy ecosystem. It includes the use of renewable energy sources, green building materials, and designs that promote energy and water conservation.						
New suggested role ▶	- Exploring new architectural typologies and forms - Reimagining urban streetscapes and public spaces - Maximizing urban density and walkability						
3- Safety and Compliance					S ◕	◑	
					W ◔	◑	
					O ◑	◕	
					T ◕	◕	
	Ensuring that all structures meet safety standards and comply with local building codes and regulations to achieve the Urban Resilience and Disaster Mitigation						
New suggested role ▶	- Designing resilient infrastructure systems - Implementing flood control measures and climate adaptation strategies - Preparing for and mitigating the effects of natural disasters						

4- Community Engagement	 S ● ◔ W ◑ ◑ O ● ◕ T ◑ ◑	
	Involving the community in the planning process to ensure that the needs and desires of residents are met	
New suggested role ►	- Creating inclusive urban planning policies - Promoting diversity and equal opportunity - Ensuring accessibility for all citizens	
5- Public Health and Well-being	 S ◑ ◕ W ◔ ◑ O ◕ ◑ T ◕ ◕	
	Designing spaces that promote physical and mental health, including access to green spaces, healthy food options, and designs that encourage physical activity	
New suggested role ►	- Creating healthy and inspiring environments - Promoting mental and physical activity - Designing spaces for social interaction and community engagement	
6- Public Engagement and Participation	 S ◕ ◑ W ◑ ◑ O ◕ ◔ T ◑ ◕	
	Involving communities in the planning and design process to ensure that the built environment meets the needs and desires of its users. This can lead to more successful and sustainable projects including Urban Economics and Finance, Eco-friendly design	
New suggested role ►	- Designing sustainable financial systems for urban areas - Exploring new models of urban investment - Promoting equitable and inclusive economic development - Designing energy-efficient and climate-responsive buildings - Implementing sustainable material selection and construction practices - Exploring resilient architectural design principles for disaster preparedness	
7- Innovation	 S ● ● W ◔ ◑ O ◕ ◑ T ◕ ◑	
	Incorporating new technologies and materials to improve building performance and user experience for creating the Smart Cities & Digital Infrastructure and making the Future	
New suggested role ►	- Utilizing data analytics and sensors for urban planning and management - Creating connected and autonomous urban systems - Optimizing traffic flow and public transportation systems - Exploring emerging trends and technologies - Forecasting future trends and predicting the impact of technological advancements on urban life - Shaping the design and planning of future cities	
Scientific Missions		
A. Environmental Impact Studies	 S ◕ ◔ W ◔ ◑ O ◕ ◕ T ◕ ◑	
	Researching the effects of buildings and urban development on the environment and finding ways to mitigate negative impacts for Ensuring that spaces are accessible, safe, and welcoming to all individuals, regardless of their background, is a critical mission. This involves designing inclusive public spaces, affordable housing, and ensuring that urban development does not displace vulnerable communities.	

New suggested role ▶	- Evidence-based policymaking - data analytics informing for land use policies - affordable housing strategies - initiatives transportation networks	
B. Urban Dynamics	 S ● ◕ W ◕ ◑ O ● ◕ T ◔ ◑ Studying how people interact with urban spaces to improve city planning and infrastructure for Encouraging development patterns that support sustainable economic growth, preserve open spaces, and reduce the need for automobile dependency. This includes promoting mixed-use developments, transit-oriented design, and walkable communities	
New suggested role ▶	- creation and continuous refinement of building codes, sustainability frameworks - creating, updating and upgrading industry standards grounded in scientific principles - tackle complex design challenges and advance the state of the practice	
C. Material Science	 S ◔ ● W ◕ ◑ O ◑ ◕ T ◕ ◑ Investigating new building materials that are more durable, sustainable, and cost-effective for Creating buildings and infrastructure that can withstand natural and man-made disasters, ensuring that communities can quickly recover from such events	
New suggested role ▶	- test new materials, prototype novel building systems - test new pilot emerging technologies	
D. Energy Efficiency	 S ◕ ◑ W ◕ ◕ O ◕ ◑ T ◑ ◑ Developing methods to reduce energy consumption in buildings through better design and technology	
New suggested role ▶	- Performance-based design by computational modeling, simulation, and post-occupancy evaluation - optimize building and urban systems for factors like energy efficiency, thermal comfort, daylighting, acoustics, and occupant well-being	
E. Historic Preservation and Cultural Sensitivity	 S ◕ ◑ W ◔ ◑ O ◕ ◔ T ◔ ◑ Preserving the architectural and cultural heritage of a place while integrating modern needs and technologies. This involves balancing the desire for new development with the importance of maintaining historical and cultural landmarks	
New suggested role ▶	- Documenting and preserving historical architectural heritage - Restoring and repurposing historic buildings - Promoting the adaptive reuse of historic structures	

F: Digital Technology and Urban Informatics		S ◑ ● W ◔ ◔ O ◕ ● T ◕ ◕	
	Utilizing digital tools and data analysis to inform design decisions, improve urban management, and enhance the livability of cities. This includes the use of Building Information Modeling (BIM), Geographic Information Systems (GIS), and smart city technologies		
New suggested role ►	- Computational modeling and simulation of urban systems - Data-driven analysis of urban development patterns - Building performance analysis and sustainability assessments - Research on human-centric design and urban livability		
G. Resilience and Adaptation		S ◕ ◔ W ◑ ◕ O ● ◕ T ◑ ◑	
	Architects and urban planners are tasked with designing structures and cities that can withstand the impacts of climate change, such as rising sea levels, extreme weather events, and heatwaves. Additionally, there is a focus on reducing the carbon footprint of buildings and urban infrastructure to mitigate climate change		
New suggested role ►	- Engaging residents, community groups, and stakeholders in the planning and design process - Design strategies that focus on the protecting people and property - integration of residential, commercial, and recreational spaces within urban areas to create vibrant, walkable communities that promote social interaction and economic activity - Planning and design strategies that prioritize public transportation, pedestrian, and cycling infrastructure The promotion of designs that are accessible to all individuals, regardless of physical ability, age, or socio-economic status		

New Relationship Model of Work Missions ▼ **New Relationship Model of Scientific Missions ▼**



From Out to in: High Importance ●◕◑◔ Low Importance

A successful integration of both science and knowledge in architecture and urban planning (Table 7) allows us to capitalize on their strengths and minimize their weaknesses. The collaboration of science and knowledge leads to informed decisions based on data and insights that acknowledge the complexities of context. A well-balanced approach in design and planning also facilitates innovation, enhances user-centricity, and promotes long-term sustainability. Ultimately, understanding the distinction and interaction between science and knowledge is essential for ensuring that architectural and urban design and planning approaches are comprehensive, resilient, and effective.

On the other hand, science in architecture and urban planning is grounded in objective evidence and empirical research, while knowledge encompasses a broader range of information and understanding that may be more subjective and experiential. Both disciplines aim to create spaces that are functional, aesthetically pleasing, sustainable, and resilient. Therefore, both science and knowledge are crucial for creating successful and sustainable built environments. In architecture and urban planning, the integration of science and knowledge is essential for informing design decisions and creating successful built environments. Utilizing scientific principles and methods allows architects and urban planners to

analyze data, test hypotheses, and make evidence-based decisions to ensure the structural integrity and sustainability of buildings and urban spaces.

7. ACKNOWLEDGMENTS

The authors declare that, to properly utilize artificial intelligence in MAXQDA Software, the collection of library resources has been compiled independently of the sources of the original article, with the list provided in Appendix I. According to the research method, the application of artificial intelligence encompasses various modes, as reported in Chart 3. The authors provide detailed information on the usage of artificial intelligence (in Appendix II), ensuring maximum clarity and transparency about the comprehensive and meticulous methodology employed in writing this research.

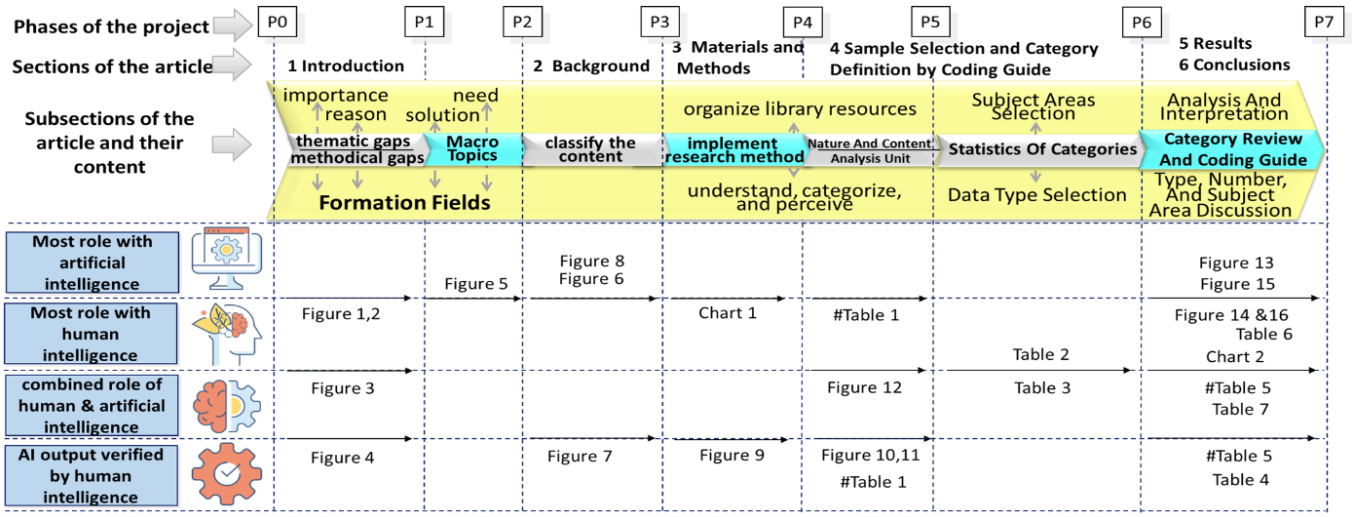


Chart 3. Declaring the role of Artificial Intelligence in the part's formation of this research in the form of phasing (source: authors)

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