



COMPREHENSIVE MAPPING OF TRADITIONAL ARCHITECTURE RESEARCH PRODUCTIVITY FORM DATA INDEXED IN SCOPUS DATABASE

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ABSTRACT

Background: Traditional housing architecture status can be directly affected by geography and climate conditions and it was given much more intention in the world over the past decade. However, no study to date has mapped the trend and development of the research productivity. Therefore, we performed a bibliometric study to assess traditional architecture research through the top 100 cited articles.

Methods: We searched the Scopus database to June 23, 2021, using the terms “traditional architecture” including title. Bibliometric characteristics including publication year, number of citations, authors, countries, and journals, were retrieved and analyzed.

Results: The total number of citations for the 100 cited were published by 279 Authors, with 0.358 Authors per Document, 28 countries, and published in 28 Journal during the period 1981 to 2020. Top three journals with the most publications on traditional architecture were Sustainability (Switzerland), Building and Environment, and Journal of Cultural Heritage. Most published articles were received 75 citations score. China, India, USA are most productive countries in the world.

The most active author was Dili AS and Naseer MA. The most frequently used substantive terms included architecture” (30), followed by “architectural design”(23)times, “traditional architecture”(14) times.

Conclusions: China, India, and USA made the greatest contribution to traditional architecture research. The current traditional architecture research mainly focused on architectural design and traditional architecture. Furthermore, we believe some research collaboration is required in enhanced and development of the research in area of traditional architecture in the world.

Keywords: traditional architecture, Bibliometrics, Scopus

INTRODUCTION

The concept of traditional housing architecture is not new it is use to provide safe place to live and create appropriate positions with coordinate to its environment. Although the traditional housing architecture status can be directly affected by geography and climate conditions and use of economical traditional housing [1], beside Culture and tradition are vital constituents of traditional architecture [2].

"Traditional architecture, which has evolved in harmony with the natural environment and the rhythms of a daily life far removed from industrialized society, is currently inspiring an awakening of interest throughout the world[3].

In addition, geographical and environmental conditions were two of the most important factors on the design and construction of traditional architecture [4].The origin of these different traditional building body associates with the natural materials availability to the local builders as well as religious belief, cultural and taboos [5].

The concept of traditional housing architecture is that people built their houses in harmony with the environment, while also optimally utilizing the building materials available locally [6]. Taken in to account the architectural design which is based on environmental aspects for the purpose of ,sustainable architecture [7]. While others people applying traditional materials which have less effect on environment and also reduce amount of energy caused to increase the environmental sustainability and rise durability of buildings [1].

Traditional architecture term is reported describes building constructions and construction methods in which local materials and building traditions are used in order to fulfill specific building tasks [8].

In the current study the presents a bibliometric analysis of global research output on Traditional architecture indexed in the Web of Science. A bibliometric approach has been adopted in numerous research[9]-[11] to expand empirical evidence. The present study aims to assess

Traditional architecture research to provide comprehensive review on the trends and growth and most cited articles and authors. The study also highlights research progress, top research and funding institutions, and factors associated with the citation of Traditional architecture research. Thus, evidence may offer to support future research direction, policy, and funding that may helps to shows the progress done in the Traditional over past years.

METHODS

We used Scopus database (<https://www.scopus.com/s>) to searched for records on traditional architecture using the keywords ""traditional architecture*" available in title, abstract and keyword fields. We exclude others document types. Only original research article and review paper were included. Documents published in English were included while others language was excluding form analysis. Retrieved data were included all bibliometric analysis charctristics such as year of publications, author's, number of citations, institutions, countries or origin, keywords, and organizations. Two researchers were identifying the 100 top cited papers on traditional architecture to ensure consistency based on the title in order to avoid publications bias. Ethical approval was not necessary, since the data were downloaded from the public databases.

Data analysis and mapping research themes:

Data were analysed by using Bibliometrix, an R package[12] P-values less than 0.05 were considered to be significant.

RESULTS

A total of 474 records were retrieved from Scopus using the query discussed in the methodology. The characteristics of the 100 top cited articles on traditional shows in (Table 1).

Description	Results
Timespan	1981:2020
Sources (Journals, Books, etc)	78
Country	28
Documents	100
Average years from publication	8.49
Average citations per documents	10.18
Average citations per year per doc	1.308
References	3212
Document Types	
Article	95
Review	5
Document Contents	
Keywords Plus (ID)	670
Author's Keywords (DE)	371
Authors	
Authors	279
Author Appearances	298
Authors of single-authored documents	25
Authors of multi-authored documents	254
Authors Collaboration	
Single-authored documents	25
Documents per Author	0.358
Authors per Document	2.79
Co-Authors per Documents	2.98
Collaboration Index	3.39

Table 1: Characteristics of Metadata

Characteristics of study:

The main characteristics of 100 top cited articles on traditional architecture are presented in Table 1. A

total of 279 Authors, with 0.358 Authors per Document, and 28 Journal sources were contributed. The annual growth trends of publications and average of citations regarding on traditional architecture are shown in Figure 1. There is a steady increase in number of publications after year 2010, There is significant correlation between the number of citations per year of publication number ($r=0.450$, $P<0.001$).

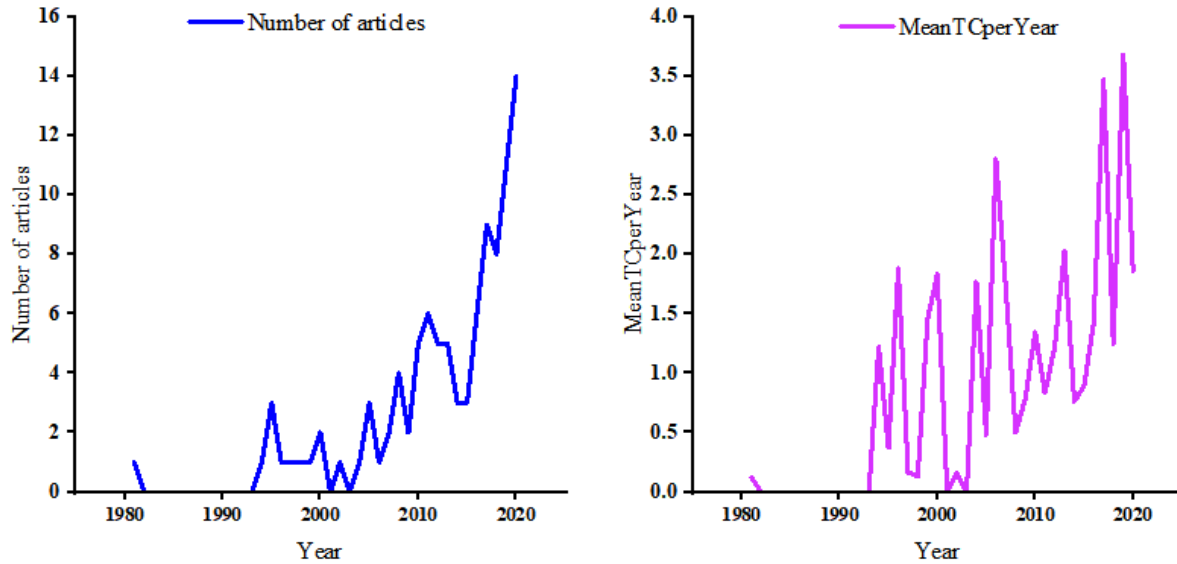


Figure 1: The annual growth trends of publications and average of citations on traditional architecture research (1981 to 2020)

Analysis of the 100 Most Cited Articles:

Analysis of the 100 Most Cited Articles on traditional architecture were published 1981 to 2020. The first top cited articles was published in 2000 under title “Complexity, Liking And Familiarity: Architecture and Non-Architecture Turkish Students’ Assessments of Traditional And Modern House Facades” which has evolved in harmony with the natural environment and the rhythms of a daily life far removed from industrialized society[14]. Where other 100 top cited articles were presented in table 2.

Rank	Title	Year	TC
1	Complexity, Liking And Familiarity: Architecture and Non-Architecture Turkish Students' Assessments of Traditional And Modern House Facades	2000	75
2	Differential Adaptations of Muscle Architecture to High-Velocity Versus Traditional Strength Training In Cerebral Palsy	2013	47
3	Leaf Architecture of South American Nothofagus (Nothofagaceae) Using Traditional and New Methods In Morphometrics	1996	47
4	Evaluation of Traditional Architecture In Terms of Building Physics: Old Diyarbakār Houses	2007	45
5	Traditional Earthquake Resistant Techniques For Vernacular Architecture And Local Seismic Cultures: A Literature Review	2017	43
6	The Natural Environment Control System Of Korean Traditional Architecture: Comparison With Korean Contemporary Architecture	2006	42
7	Application of A Smart City Model to A Traditional University Campus With A Big Data Architecture: A Sustainable Smart Campus	2019	35
8	Passive Control Methods of Kerala Traditional Architecture For A Comfortable Indoor Environment: A Comparative Investigation During Winter And Summer	2010	34
9	The ""Urf" And Its Role In Diversifying The Architecture Of Traditional Islamic Cities	1994	33
10	Passive Control Methods For A Comfortable Indoor Environment: Comparative Investigation of Traditional And Modern Architecture of Kerala In Summer	2011	32
11	Residential Visual Privacy: Traditional And Modern Architecture And Urban Design	1999	32
12	Spider Glue Proteins Have Distinct Architectures Compared With Traditional Spidroin Family Members	2012	30
13	Analytical study of traditional decorative materials and techniques used in Ming dynasty wooden architecture. The case of the drum tower in xi'an, p.r. of china	2004	30
14	Crescent Pyramid And Drop-Set Systems Do Not Promote Greater Strength Gains, Muscle Hypertrophy, And Changes On Muscle Architecture Compared With Traditional Resistance Training In Well-Trained Men	2017	26
15	Drug-likeness analysis of traditional chinese medicines: 2. Characterization of scaffold architectures for drug-like compounds, non-drug-like compounds, and natural compounds from traditional chinese medicines	2013	22
16	Housing Design In Relation To Environmental Comfort: A Comparison Of The Traditional Malay House And Modern Housing Including Work In The Tripartite Programme Between Universiti Sains Malaysia, The Welsh School Of Architecture And The Uk Building Research Establishment	1995	16
17	Wind-Driven Ventilation Improvement With Plan Typology Alteration: A Cfd Case Study Of Traditional Turkish Architecture	2017	15
18	Traditional Wisdom For Disaster Mitigation In History of Japanese Architectures And Historic Cities	2016	15
19	Passive Control Methods Of Kerala Traditional Architecture For A Comfortable Indoor Environment: Comparative Investigation During Various Periods Of Rainy Season	2010	15
20	Understanding Traditional Residential Architecture In Anatolia	2005	15
21	The Wisdom of Mediterranean Traditional Architecture Versus Contemporary Architecture - The Energy Challenge	2010	14
22	Re-Interpretation Of Traditional Architecture For Visual Comfort	2009	14
23	Questioning The ""Prototype Dwellings"" In The Framework of Cyprus Traditional Architecture	2008	14
24	Refined Architecture of The Wasp-8 System: A Cautionary Tale For Traditional Rossiter-Mclaughlin Analysis	2017	13
25	Optimizing Traditional Urban Network Architectures To Increase Distributed Generation Connection	2012	13
26	A Comprehensive Study On Traditional Ai And Ann Architecture	2019	12

27	Regional Heritability Advanced Complex Trait Analysis For Gpu And Traditional Parallel Architectures	2014	12
28	Comparison Between Traditional Strength Training And Complex Contrast Training On Repeated Sprint Ability And Muscle Architecture In Elite Soccer Players	2016	11
29	Rational Design of Sno ₂ -Based Electron Transport Layer In Mesoscopic Perovskite Solar Cells: More Kinetically Favorable Than Traditional Double-Layer Architecture	2017	10
30	Contemporary Versus Traditional Styles In Architecture And Public Space: A Virtual Reality Study With 360-Degree Videos	2020	9
31	Integration of An Algorithmic Bim Approach In A Traditional Architecture Studio	2019	9
32	Assessment Of The Efficiency Of Traditional Earthquake Resistant Techniques For Vernacular Architecture	2018	9
33	Intelligent Transportation System Architecture To Address Challenges Of Traditional Shipping Operations (Pelra)	2018	9
34	Reinventing Traditional Technologies For Sustainability: Contemporary Earth Architecture Of Sri Lanka	2010	8
35	The Economics Of Style: Measuring The Price Effect Of Neo-Traditional Architecture In Housing	2017	7
36	Assessing Ecotourism Potential Of Traditional Wooden Architecture In Rural Areas: The Case Of Papart Valley	2016	7
37	Vernacular Architecture And Traditional Rural Landscape In New Socio-Economic Realities - A Case Study From Central Poland	2015	7
38	Evolution of Persian Traditional Architecture Through The History	2015	7
39	The Fortunate Dimensions of Taiwanese Traditional Architecture	1995	7
40	The Quest For A Traditional Style: Architecture And Heritage Processes In A Pyrenean Valley	2017	6
41	Study of Climate Responsive Passive Design Features In Traditional Hill Architecture of Khyah Village In Hamirpur, Himachal Pradesh, India For Indoor Thermal Comfort	2013	6
42	The Grammatical Basis Of Chinese Traditional Architecture	1995	6
43	Texture Segmentation: An Objective Comparison Between Five Traditional Algorithms And A Deep-Learning U-Net Architecture	2019	5
44	The Influence Of Geographical Factors In Traditional Earthen Architecture: The Case Of The Iberian Peninsula	2019	5
45	'Vernacular' Accommodations: Wordplay In Contemporary-Traditional Architecture Theory	2012	5
46	Climate Responsive Traditional Architecture of Chettinadu Housing In Tamilnadu, India - A Qualitative And Quantitative Analysis During Summer	2011	5
47	The Open And Adaptive Tradition: Applying The Concepts of Open Building And Multi-Purpose Design In Traditional Chinese Vernacular Architecture	2011	5
48	Earthquake Safety Elements In Traditional Koti Banal Architecture of Uttarakhand, India	2009	5
49	Timber Orientation In The Traditional Architecture of Indonesia	2008	5
50	Kotaview: Simulating Traditional Korean Architecture Interactively And Intelligently On The Web	2005	5
51	Nepal's Traditional Settlement: Pattern And Architecture	1981	5
52	An Investigation Of House Designs In Lahore: Transformation of Residential Architecture From Traditional To Modern	2019	4
53	Assimilation of Traditional Architecture Influenced By The Imported Styles	2018	4
54	Sustainable Desert Traditional Architecture of The Central Region of Saudi Arabia	2016	4
55	Environmental behavior of semi-open spaces in Mediterranean vernacular architecture. The case of rural traditional dwellings of Cyprus	2016	4
56	The Adoption of Central Courtyard As A Traditional Archetype In Contemporary	2013	4

	Architecture of Iran		
57	Evaluation of Traditional Architecture In The Coastal Region of Nagappattinam Using Mahoney Tables	2012	4
58	The Use Of The Module, Metric Models And Triangular Tracing In The Traditional Architecture of Northern Greece	2011	4
59	Traditional Environmental Architecture In Re-Use: The ""Courtyard of Miracles"" In Athens, Greece	2008	4
60	Bhubaneswar: Contrasting Visions In Traditional Indian And Modern European Architecture	1997	4
61	A Multimodal Deep Architecture For Traditional Chinese Medicine Diagnosis	2020	3
62	The Practice Of Hausa Traditional Architecture: Towards Conservation And Restoration Of Spatial Morphology And Techniques	2019	3
63	Full Genetic Analysis For Genome-Wide Association Study of Fangji: A Powerful Approach For Effectively Dissecting The Molecular Architecture Of Personalized Traditional Chinese Medicine	2018	3
64	Column-Leaning Displacement of Korean Traditional Wooden Architecture: 3d Scanning Data of Columns of Sungryeoljeon In Namhansanseong	2017	3
65	An Overview of Iranian Ice Repositories, An Example Of Traditional Indigenous Architecture	2012	3
66	The Influence of Rainfall on Hausa Traditional Architecture	2010	3
67	Reinterpreting traditional Chinese architecture in the office building and skyscraper: the architecture of c. Y. Lee	2008	3
68	Green Architecture - Traditional And Modern	2007	3
69	Traditional Architecture In Tibet: Linking Issues of Environmental And Cultural Sustainability	2005	3
70	Alumina Blast Titanium For Japanese Traditional Architectures	2002	3
71	Traditional Architecture, Building Materials And Appropriate Modernity In Chilean Cities	1998	3
72	Semantic Segmentation Of Hela Cells: An Objective Comparison Between One Traditional Algorithm And Four Deep-Learning Architectures	2020	2
73	In-Plane Static Tests On A Structural Timber Frame System Proposal (Trarom) Inspired From Traditional Architecture And Using Local Materials	2020	2
74	Traditional Architecture: The Role Of Traditional Festival In Islamic Historic District To Achieve Local Community Wellbeing	2019	2
75	Cultural Sustainability And Vitality of Chinese Vernacular Architecture: A Pedigree For The Spatial Art Of Traditional Villages In Jiangnan Region	2019	2
76	Generative Design Method Of The Facade Of Traditional Architecture And Settlement Based On Knowledge Discovery And Digital Generation: A Case Study Of Gunanjie Street In China	2019	2
77	Bioclimatic Strategies Of Traditional Earthen Architecture	2019	2
78	History Matters: The Origins Of Biophilic Design Of Innovative Learning Spaces In Traditional Architecture	2018	2
79	Daylighting And Architectural Concept Of Traditional Architecture: The Tongkonan In Toraja, Indonesia	2017	2
80	The Survey Of The Color And Light Psychological Effects In Iranian Traditional Architecture (Case Study: Tabatabaâ€™Ees House)	2016	2
81	Challenges For Safe And Secure Community Development In Traditional Architectures Preservation Districts Â€” A Case Study On Tochigi District	2015	2
82	Feature-Based Analysis Into The Trend Of Software Technologies From Traditional To Service Oriented Architecture And Saas Cloud	2014	2
83	A Survey On Sustainability Of Central Courtyards Of Iran Traditional Architecture	2014	2
84	Transitions In Marketing Communications From Traditional Architectures To Social	2013	2

Network Patterns					
85	impacts of traditional architecture on the use of wood as an element of facade covering in Serbian contemporary architecture	2011	2		
86	Assessment Of Behavior Of Two-Shelled Domes In Iranian Traditional Architecture: The Charbaq School, Isfahan, Iran	2011	2		
87	The Meaning Of 'Style' In Traditional Architecture: The Case Of Gothic	2000	2		
88	Block chain Reference System Architecture Description For The Isa95 Compliant Traditional And Smart Manufacturing Systems	2020	1		
89	Comparing Deep-Learning Architectures And Traditional Machine-Learning Approaches For Satire Identification In Spanish Tweets	2020	1		
90	Agile Vs Traditional Project Management Approaches: Comparing Human Resource Management Architectures	2020	1		
91	Art Inheritance: An Education Course on Traditional Pattern Morphological Generation In Architecture Design Based On Digital Sculpturism	2020	1		
92	Rational And Aesthetic Principles of Form-Making In Traditional Chinese Architecture As The Basis of Restoration activities	2020	1		
93	The Sedentary Process And The Evolution of Energy Consumption In Eight Native American Dwellings: Analyzing Sustainability In Traditional Architecture	2020	1		
94	Innovative Multidisciplinary Methodology For The Analysis of Traditional Marginal Architecture	2020	1		
95	Traditional multi-story house (tower house) in Sana'a city, Yemen. An example of sustainable architecture	2020	1		
96	Traditional Building Knowledge: Contemporary Relevance For Architecture Education In India	2020	1		
97	Influence of Traditional Building Practices In Seismic Vulnerability Of Bhutanese Vernacular Rammed Earth Architecture	2020	1		
98	Music, Architecture And Mathematics In Traditional Iranian Architecture	2018	1		
99	Evaluation of Innovative Sustainable Design Techniques From Traditional Architecture: A Case Study For The Cold Dry Climatic Region In Turkey	2018	1		
100	Open Source In Urban Planning And Architecture: Experiences And Guidelines From Traditional Cultures, Participatory Processes And Computer Science	2018	1		

Table 2: The Top 10 Most Cited Articles on traditional architecture

TC: total citations

Country	N	TC	SCP	MCP	MCP_Ratio
China	9	51	5	4	0.444
India	9	105	9	0	0.000
USA	8	246	8	0	0.000
Iran	6	19	6	0	0.000
Spain	6	16	5	1	0.167
Malaysia	5	26	2	3	0.600
United kingdom	5	39	4	1	0.200
Italy	4	46	1	3	0.750
Turkey	4	68	3	1	0.250
Indonesia	3	13	3	0	0.000

Table 3: Top 10 Corresponding Author's Country on traditional architecture research

N: Number of publications; TC: total citations; AAC: Average Article Citations;

SCP: Single Country Publications, MCP: Multiple country Publications

Corresponding Author's Country:

The analysis of Corresponding Author's countries shows that China was most productive county (N=8) articles, followed by India (N=9), and USA (N=8) articles. The analysis based on the term of single Country publications (SCP) and multiple countries publications (MCP) were presented in Table 3.

Author (n=279)	h_index	g_index	TC	NP	PY_start
Dili AS	3	3	81	3	2010
Naseer MA	3	3	81	3	2010
Chiou S-C	2	2	13	2	1995
Correia M	2	2	52	2	2017
Garcãa -Soriano L	2	2	7	2	2019
Karabaäy C	2	2	7	2	2019
Krishnamurti R	2	2	13	2	1995
Mahdavinejad M	2	2	6	2	2011
Mlleto C	2	2	7	2	2019
Ortega J	2	2	52	2	2017

Table 4: Top 10 authors on traditional architecture research

NP: Number of publications; TC: total citations;

Most active authors on traditional architecture research:

Approximately 279 authors were listed with mad fundamental contributions to the development on traditional architecture research field. DILI AS was the top most active author with published 3 articles, followed by Naseer MA with published 3 articles, and Chiou S-C with published 2 articles. Thus, the raking of authors based on the number of citations times for research and h_index are reported in Table 4.

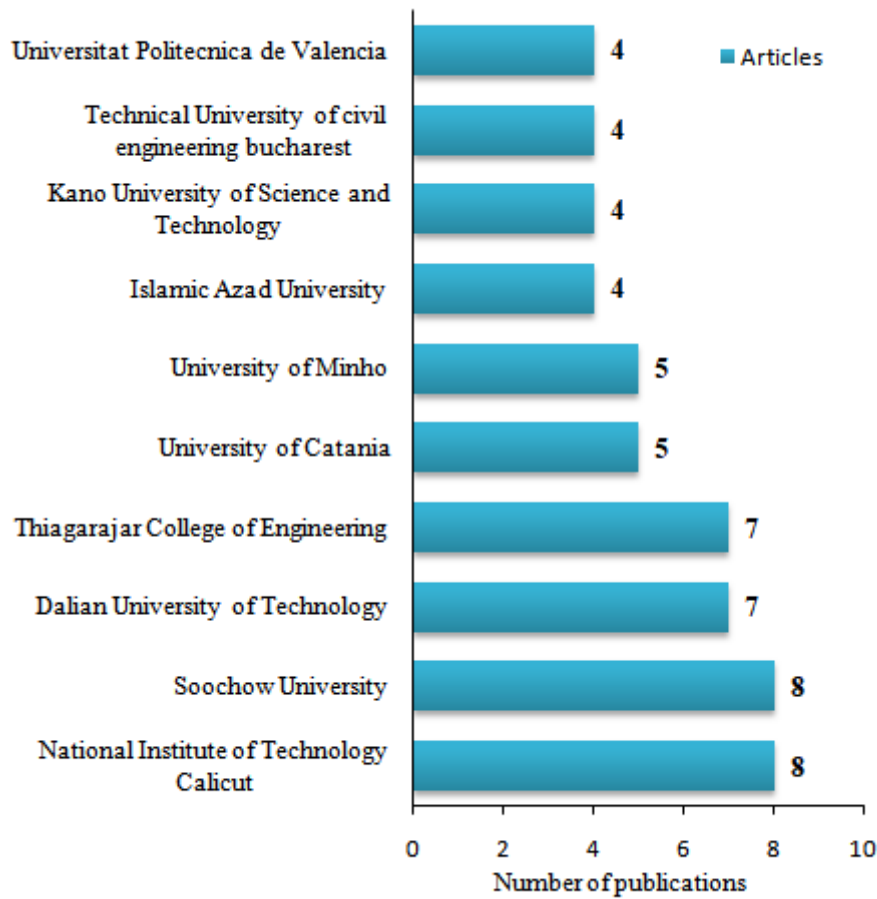


Figure 2: Top 10 most relevant affiliations on traditional architecture research

Top 10 most relevant affiliations:

Approximately 122 affiliations were contributed in 100 top cited articles on traditional architecture research. The National Institute of Technology Calicut and Soochow University was the top rank affiliations with published eight articles for each (Figure 2).

Source (n=78)	h_index	g_index	TC	NP	PY_start
Sustainability (Switzerland)	3	7	52	7	2016
Building and Environment	6	6	164	6	2006
Journal of Cultural Heritage	3	3	88	3	2004
Journal of the Faculty of Architecture	2	2	6	2	2017
Archnet-Ijar	1	1	3	2	2018
Engineering Structures	2	2	11	2	2018
International Journal of A Heritage	1	1	3	2	2019
Journal of Architecture	2	2	17	2	2000
Journal of Asian architecture and Building Engineering	2	2	8	2	2011
Journal of Design and Built Environment	2	2	6	2	2019

Table 5: Top 10 most productive journals

Top 10 most productive journals:

A total of 87 journals were contributed on 100 top cited articles on traditional architecture research (Table 5). Sustainability (Switzerland) was the top most productive journal (NP=7), followed by Building and Environment (NP=6) articles, and Journal of Cultural Heritage with published (NP=3) articles.



Keyword Plus analysis on traditional architecture research using WordCloud for top 100 occurrences keywords:

Analysis of most topic covered on traditional architecture based on the keywords analysis were includes “architecture” (30), followed by “architectural design” (23) times, “traditional architecture” (14)

times, “houses” (8) times, “sustainable development” (7) times, and “sustainability” (6) times as shows in figure 3.

DISCUSSION

Herein, we identified and analyzed the 100 most cited papers related on traditional architecture research published from 1981 to 2020. The study show that countries like China, India, USA, Iran, Spain, Malaysia, United Kingdom, Italy, Turkey, and Indonesia are the most top 10 contributed countries on traditional architecture research productivity in the world. It is likely that the more common research on traditional architecture were focus China and India than others countries in other countries. This country knows with the large number of population and culture diversity in traditional architecture.

Based on the analysis of the most influence articles was published in year 2000 with cited 75 times. The articles offer comprehensive analysis of Traditional And Modern in Turkish[14]. After year 2010 the number of traditional architecture research productivity were increased after year 2010. Thus an indicator that much more intension is given to the area of the traditional architecture fields.

According to the results of keyword co-occurrence, the 100 most cited papers covered the main topics of traditional architecture research, including its applications and common research methods on architectural design, traditional architecture, houses, sustainable development, and sustainability.

Similarly, Imamoglu, 2000 analyzed 100 most cited papers in Assessments of Traditional and modern Housing [14] and other scholar discuss the traditional architecture and sustainable smart campus[15]. Our study has some advantages. First, to the best of our knowledge, this is the first study using the bibliometric method to summarize the status and development of the top

100 cited articles on traditional architecture. Second, the top 100 cited articles give a clear overview of the research direction during the past years. However, it had limitations similar to those of other bibliometric studies, namely, the limited search involving only the Scopus database, where others databases such as Web of Sciences, Google scholar, not searched. Only articles published in English were included which mean that many articles are missing due to the language.

CONCLUSION

A bibliometric study was performed for the top 100 cited articles on traditional architecture. These papers were published from 1981 to 2020 in various journals, by many authors from different countries and insituation. Base on the geographical distribution of the publication China, India and the USA published the most highly cited articles on traditional architecture. Dili AS and Naseer MA were the most published author in year 2010. Generally, this bibliometric study provides, for the first time, insights into the historical developments and research status of on traditional architecture studies, and we suggest that more research is required on traditional architecture in the world with collaboration between authors.

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