KNOWLEDGE CITIES, CREATIVE CITIES AND PLACE: CONCEPTS AND CONNECTIONS

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Abstract

The article seeks to show the relationships between two different approaches to urban development in information age: “knowledge cities” and “creative cities”, grounding these broad concepts around another construct: “place”. “Knowledge cities" is a term associated with Knowledge Based Development (KBD) and, more specifically, Knowledge Based Urban Development (KBUB). The term “creative cities” became popular after Richard Florida’s 2002 book, *The Rise of the Creative Class*. Finally, place is a piece of spatial information, frequently geographic in nature, but often used for describing the phenomenon of attachment, leading to concepts of character, authenticity, genius loci and sense of place. A bibliometric study was conducted on the subject terms (knowledge, cities, creative, place), identifying the main authors, sources, and documents on the theme. A science mapping exercise was then performed with the objective to show the structure of knowledge in the field, through cluster analyses made in the software VOS Viewer, identifying main streams of research and the connection between them. The cluster analysis also identified that “knowledge” and “urban planning” are central to the field, with supporting literature that can be divided in three broadly defined related themes: “innovation and creativity”, “economy and entrepreneurship”, and “people and place”. Limitations to this piece of research and future contributions are identified.

Keywords: 1. Knowledge 2. Cities 3. Creative 4. Place

Paper type - Academic Research Paper

Introduction

The information age has brought us a new economy, often called knowledge economy. Before the industrial revolution, the control of land and labour were the most important means of

wealth generation. Progressively from the industrial age, knowledge has taken place as the main asset in the capitalist system. This movement was dramatically accelerated with the popularization of computers from the 1960s and 1970s.

This article aims to show the relationships between two different approaches to urban development in information age: "knowledge cities" and "creative cities", grounding these broad concepts around another construct: "place".

A brief historical background

The capital shift from land to knowledge took place primordially in cities. Since the first industrial revolution, cities changed their size and configuration dramatically, growing faster than they could adjust without systematic urban planning. Since then, many attempts on controlling and regulating urban form populate the history of urban planning and design. From the hygienists like Haussmann in nineteenth century Paris, passing by garden cities in the UK that later inspired American suburbia, to the modernist movement that tried to establish central planning to city functions in predetermined zones. Flourishing first in Europe in the early twentieth century and later all over the world, the modernism wanted to bring architecture and urbanism up to speed with the "age of the machine"(Choay, 1979; Le Corbusier, 1924; Mumford, 1961).

One of these machines had a profound impact on the transformation already in place: the automobile. The popularization of the individual car significantly changed the use of streets and its width requirements, as well as creating an endless need for parking space. As a result, vitality of the common street, walkability and life on the footpath, passive community surveillance and security, just to name a few, started to decrease. The city was once again in crisis. Among the first voices calling for cities that prioritize people instead of cars was the American journalist Jane Jacobs, in her seminal 1969 book *The Death and Life of Great American Cities* (Jacobs, 1961). Later in her life, she warned that new generations would not get to know the kind of vibrant kind city people used to live in, because they were being demolished to build roads and viaducts (Jacobs, 2004), and could not miss what was not known. She was afraid this ignorance would cause a dark age in urban life.

A reaction to the modernist "age of the machine" started to gain traction since the 1960s, and there has been a steady movement in academia towards valuing pedestrian activity, increased

compacity and density as well as diversity (Calthorpe et al., 1988; Gehl, 2010; Jacobs, 1961; Norberg-Schulz, 1980; Y.-F. Tuan, 1983). This has had practical implications in urban planning and design, for example the dissemination of "new urbanism" in North America, the promotion of Gehl Architects practices in Europe following the implementation success in Copenhagen (Gehl, 2010) the emergence of practices of Transit-Oriented-Design as it happened in Curitiba (Rogers, 1998). Additionally, sustainability has become central to urban planning to tackle the climate emergency, as well as securing prosperity, equity, and environmental balance (Clos, 2015; *The New Urban Agenda*, 2016; *World Cities Report 2016*, 2016).

Article Structure

It is in the context presented above that the knowledge and creative cities are placed. Although the terms "knowledge" and "creative" could be used interchangeably when describing the transformation caused by this shift from physical to intellectual capital, the literature on cities shows different streams of research for each of them. A panoramic view of the field is intended, and to achieve that the article is structured as follows:

a. A brief overview on the constructs of knowledge cities, creative cities, and place, is presented.
b. Methodological procedures are discussed.
c. A Bibliometric study is carried out and described, followed by its illustration using network cluster diagrams. Clusters are analysed and interpreted identifying the main authors, sources, documents, and concepts in the field.
d. Results are discussed and interpreted, synthetizing main themes that emerged within the field.

Theoretical Background

On the one hand "knowledge cities" is a term associated with Knowledge Based Development (KBD) and, more specifically, Knowledge Based Urban Development (KBUB). On the other hand, "creative cities" was made popular in great part by Richard Florida 2002 book, *The Rise of the Creative Class* (Florida, 2002). Finally, for "place" the Oxford Learner's Dictionary gives 15 definitions. The first three are the ones that are related to a spatial information, and that reflect the meaning found in the bibliometric analyses, as we will see in a later section.

They are: *(1) a particular position, point or area, (2) a particular city, town, building, etc. (3) a building or an area of land used for a particular purpose.* That is, place is a spatial piece of information, frequently geographic in nature.

These concepts are discussed briefly in the following sections.

Knowledge Cities

As we indicated in the introduction, the information age uses knowledge as its fundamental form of capital, in what came to be known as the knowledge economy. Most activity of knowledge production has been done in cities, which have been critical agents of development (Yigitcanlar, 2014).

As with innovation, creativity and knowledge-based production in general tend to be highly concentrated geographically (Adler et al., 2019; Florida et al., 2017; Yigitcanlar, 2014). This creates a highly competitive environment, with cities promoting themselves to attract talent and investment(de Jong et al., 2015). Because of this, knowledge Cities have become a brand of city used for that attraction and retention of knowledge workers, capital, and ideas (Yigitcanlar, 2014). In 1996, Delft, in the Netherlands, became the first to use "knowledge city" as city branding (Yigitcanlar & Inkinen, 2019).

For Carrillo, (Carrillo, 2006) "the concept of knowledge city is very broad and may refer to all aspects of social, economic, and cultural life of a city". He also considers "knowledge cities" as a subfield of Knowledge Based Development, being a convergence of Urban Studies and Planning with knowledge management"(Carrillo, 2006)

Among the definitions that could characterize the concept, we selected four from the extensive list made by (Yigitcanlar & Inkinen, 2019):

- "A knowledge city is a city that aims at a knowledge-based development, by encouraging the continuous creation, sharing, evaluation, renewal and update of knowledge. This can be achieved through the continuous interaction between its citizens themselves and at the same time between them and other cities' citizens. The citizens' knowledge-sharing culture as well as the city's

appropriate design, IT networks and infrastructures support these interactions." (Ergazakis et al., 2004, p. 4).

- Knowledge cities are "cities that create the right conditions that act as a magnet for research institutes and highly-educated knowledge workers, not only by offering an attractive working environment, but also by creating a favourable living environment, one that attracts and manages to retain creative talent. Places where talented employees are found—pools of creative talent—are becoming increasingly decisive in determining where businesses choose to locate". Musterd and Deurloo (2006, p. 92)
- Knowledge cities are localities that are "tailored to the needs of a knowledge economy where ideas rule and there are infinite recipes for innovation and wealth creation. Their growth is based on the generation of value using common assets with the purpose of achieving sustainability". Yigitcanlar (2009, p. 239)
- Knowledge cities are the engines of innovation and growth, and "the association of the terms 'knowledge' and 'city' conveys the conglomeration of technological, academic, cultural, scientific, and innovation capabilities in cities and regions operating as engines of economic growth". Carrillo (2015, p. 1)
- Finally, a knowledge city is a "city that searches for the creation of value in all its areas and develops high standards of life, cultural support and economic development, among other aspects including higher level of income, education, training and research, at the same time it is a regional knowledge economy driven locality with high value-added exports created through research, technology, and brainpower and purposefully designed to encourage the nurturing of knowledge". Yigitcanlar (2015, p. 7484),

In addition, as de Jong et al. (2015) show, the concept of knowledge cities is "effectively interchangeable with conceptions of 'knowledge-based urban development' (KBUD)".

KBUD is "a policy targeting of building a place to form perfect 'climates' for 'business, people, space/place and governance', striving to achieve balance and integration between

these aspects of development" (Yigitcanlar, 2014; Yigitcanlar & Lönnqvist, 2013). Figure 1 illustrates these four climates:

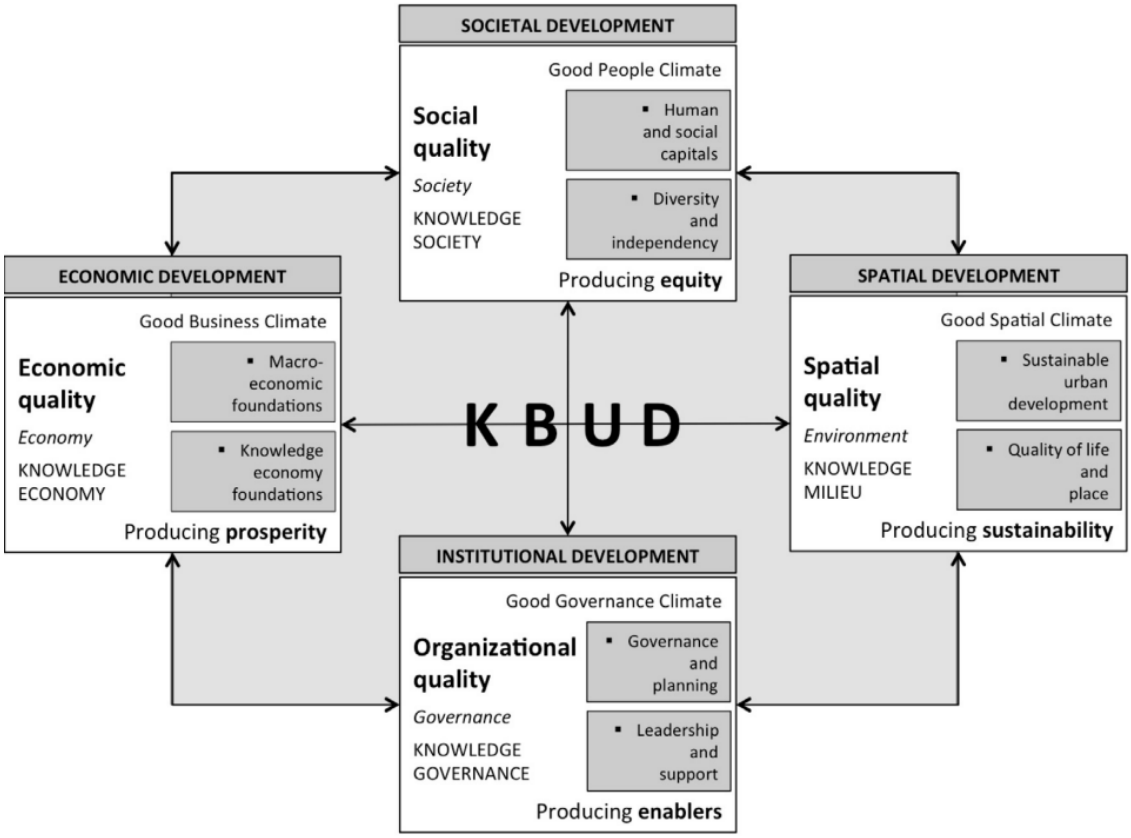

Figure 1 - Knowledge Based Urban Development framework (Yigitcanlar & Lönnqvist, 2013)

Carrillo et al. (2014) have provided a description for each of these perspectives - see also Yigitcanlar (2014) for a detailed discussion.

Economic development perspective of the KBUD policy (…) aspires to build a knowledge economy producing prosperity achieved through strong 'macroeconomic' and 'knowledge economy foundations', and thus, forming a good 'business climate'. *Societal* development of the KBUD policy (…) seeks to form a knowledge society producing social equity achieved through strong 'human and social capitals', and 'diversity and independency', and thus, forming a good 'people climate'. *Spatial* development of the KBUD policy (…) pursues to develop a knowledge milieu producing sustainability achieved through 'sustainable urban development' and 'quality of life and place', and thus, forming a good 'spatial climate'. *Institutional* development of the KBUD policy (…) focuses on generating knowledge governance producing

enablers achieved through strong 'governance and planning' and 'leadership and support', and thus, forming a good 'governance climate' (Carrillo et al., 2014).

In sum, the concepts of "knowledge cities" and "knowledge based urban development" seem to be deeply linked and, to a certain point, interchangeable. Although there are strong examples of knowledge cities worldwide, "the lack of efficient and effective KBUD planning, implementation and management processes is a reason for the limited success in knowledge city formation efforts" (Yigitcanlar, 2014; Yigitcanlar & Lönnqvist, 2013)

Creative Cities

The "creative city" seems to have been more popular among policy makers, and more criticized among academics than knowledge cities. Although research in the area exists since the 1980s (Grodach, 2017), it was with Richard Florida's The Rise of the Creative Class (Florida, 2002) that the term gained international traction and adoption.

For Florida, the creative class was comprised at its core as including:

> people in science and engineering, architecture and design, education, arts, music, and entertainment whose economic function is to create new ideas, new technology, and new creative content. Around this core, the Creative Class also includes a broader group of creative professionals in business and finance, law, health care, and related fields. These people engage in complex problem solving that involves a great deal of independent judgment and requires high levels of education or human capital.(Florida, 2002).

Florida's key factors to attract and retain the Creative class are the "three T's: *technology, talent, and tolerance.*

> The first and also the least controversial of the T's is technology (…) The second T is talent. Economists agree that skilled, ambitious, educated, and entrepreneurial people—whom they refer to as human capital—are a central force in economic progress. (…) Tolerance is the third T. Economists have long recognized that diversity is important to economic performance. (Florida, 2002)

As an indicator for tolerance, Florida suggests the number of gay people (gay index) in a given area, as well as the number of amenities (bohemian index). He points out the correlation

of these indicators with places where high economic development occurs through creative activities.

Critics argue that "instead of targeting and developing the creative industries, policy prioritizes quality of life amenities and consumption opportunities to attract the creative class" (Grodach, 2017). Much of the new entrepreneurialism have been criticized for not taking in account residents that are not part of the creative class, such as service and labour workers (Peck, 2005), with displacement and gentrification as collateral damage of the aesthetics and entertainment provided for tourists, investors, and the highly mobile knowledge workforce Allen & Crookes, 2009).

For example, criticism on the adoption of Florida's work has been done in the context of "place shaping" policies in the North of England:

> Richard Florida's book, The Rise of the Creative Class (Florida, 2002), has been hugely influential in the way local and regional authorities go about changing urban environments, with the intent to "reinvent themselves as desirable destinations for work, home and leisure in order to court, attract and retain a new creative class" (Allen & Crookes, 2009). While the benefit of such approach is clear to the attraction of ideas, talent, and capital (Adler et al., 2019; Florida et al., 2017), it also causes concern over gentrification and displacement of local communities (Allen & Crookes, 2009)

Place

Three decades ago, Agnew & Duncan (Agnew & Duncan, 1989) summed up the main approaches to a geographical concept of place:

1) Emphasis on location, mainly by economists, as the spatial distribution of social and economic activities.
2) Concern with locale, as the setting for "everyday routine social interaction", especially by microsociologists and humanist geographers.
3) Interest in the "sense of place" or "identification with a place by living in it", adopted by anthropologists and cultural geographers.

While “space” is something that holds more abstract references, which are not yet provided of value, it is transformed into “place” once we know it better and then give it value (Y.-F. Tuan, 1983). Spaces turned into places become then substance and repository for meaning (Naruse, 1997). Also, place is often used for describing the phenomenon of spatial attachment, leading to concepts of character, authenticity, genius loci and sense of place (Jivén & Larkham, 2003).

If globalization has reduced the importance of spatial location, it has also increased its meaning (Bauman, 2001). Associated economic changes diminish “the experience of belonging somewhere special” but increase “people's commitments to geographic places like nations, cities, and localities” (Sennett, 1999). The Covid-19 pandemic has accelerated many of these changes, and the shifts in the meaning of spaces is yet to be determined.

Space has also been described as representing the freedom to come and go, while place as provider of security (Buchebuan & Signori, 2019; Y.-F. Tuan, 1983). It can be argued that if one wants security, she should give up her freedom, or at least a good chunk of it (Bauman, 2001, p. 10). This dichotomy, between freedom of movement and security of community, has been part of critique to place-making like initiatives, including those that are intended to stimulate the development of knowledge and creativity. For example, Allen & Crookes (2009) argue that:

> planners need to rethink their views about who cities are being planned for. Place shaping, as the latest expression of entrepreneurial planning, is too concerned with surface appearances and the tastes and fleeting orientations of young, highly mobile, transient knowledge workers and visiting investors and tourists who crave exciting experiences amid spectacular ‘urban playscapes’ (…) and aesthetically pleasing dwellingscapes.

In addition, (Lewicki, 2011) offers a classification of scales for places: home, neighbourhood, city, region, country, continent. Although they vary in characteristics and meaning, she remembers Tuan (1975) , for whom “homes and parts of homes such as fireplace or bed, are certainly places, but ‘cities’ are the perfect exemplification of the place concept e the ‘centres of meaning’ (p. 156)”. The city as a scale of place is interesting to the purpose of this paper, given the other terms of interest that are being investigated: ‘knowledge’ and ‘creative’ cities.

Method

A bibliometric study was conducted on the subject terms (knowledge, cities, creative, place), identifying the main authors, sources, and individual publications on the theme. A science mapping exercise was then performed with the objective to show the structure of knowledge in the field (Pizzi et al., 2020), through cluster analyses made in the software VOSviewer, identifying main streams of research and the connections among them.

To start, a search was performed in Scopus database on August 7, 2021, for the term "knowledge cit*", to include results from both "city" and "cities", resulting in 82671 documents. Within the results, "creative" was searched, refining the results to 3688 documents. Finally, within these results a search for "place" was performed, returning 1484 documents. This search can be re-done with the following search string:

(TITLE-ABS-KEY (*knowledge* AND *cit**)) AND ((*creative*)) AND (*place*)

There was no restriction on type of document, since important texts in the area include both articles and books, and neither by date, to allow the classics in the field to be included. The search, though, did not return books or older documents as results among the most cited, as we will see in the next section, but classic authors did show in the cluster analysis for co-citation (like Michel Foucault, Jane Jacobs, and Manuel Castells).

All search results were then exported from the Scopus database into a CSV file, including citation information, abstract and keywords, and references. The data was then analysed in the software VOSviewer, with network diagrams based on the relatedness of items. Two main graphs were done to analyse the data resulting from the search. Firstly, a co-citation analysis by author, indicating the authors that were cited together in the set of documents. Second, a co-occurrence map showing author and index keywords of the selected documents.

VOS viewer is a free software, where VOS stands for *visualization of similarities* (Eck & Waltman, 2007; Fellnhofer, 2018). The program produces "distance-based maps (…) in which the distance between two items reflects the strength of the relation between the items. A smaller distance generally indicates a stronger relation" (van Eck & Waltman, 2010). Because of this representation of link strength as distance in the map, it is possible to identify different clusters of related data. Also, for this graph, the bigger the circle, the more co-occurrence for a given word.

A qualitative analysis of the maps followed, with the objective to identify main authors and main themes discussed. Finally, a conceptual framework was suggested, as synthesis of this science mapping exercise.

Results and discussions

Bibliometric data

Our expectation was to see some older documents in the search, something that was not confirmed (although they were later found in the co-citation cluster analysis). When looking at the 20 most cited documents in Table 1, one can see that the older document in the list is from 1995, followed by documents from 2004, 2007 and 2009. All others are from 2010 or newer, suggesting it is a theme of growing interest.

Table 1. Most cited papers on *knowledge*, *cities*, *creative* and *place*, according to Scopus.

	Authors	Title	Year	Source	Cit
1	Caragliu A., del Bo C., Nijkamp P.	Smart cities in Europe	2011	Journal of Urban Technology	1402
2	Bettencourt L.M.A., Lobo J., Helbing D., Kühnert C., West G.B.	Growth, innovation, scaling, and the pace of life in cities	2007	Proceedings of the National Academy of Sciences of the United States of America	1224
3	Mccann E.	Urban policy mobilities and global circuits of knowledge: Toward a research agenda	2011	Annals of the Association of American Geographers	545
4	Evans G.	Creative cities, creative spaces and urban policy	2009	Urban Studies	470
5	Haase D. et al.	A quantitative review of urban ecosystem service assessments: Concepts, models, and implementation	2014	Ambio	444
6	Ashworth G., Page S.J.	Urban tourism research: Recent progress and current paradoxes	2011	Tourism Management	387
7	De Jong M., Joss S., Schraven D., Zhan C., Weijnen M.	Sustainable-smart-resilient-low carbon-eco-knowledge cities; Making sense of a multitude of concepts promoting sustainable urbanization	2015	Journal of Cleaner Production	379
8	Mcfarlane C.	Learning the City: Knowledge and Translocal Assemblage	2011	Learning the City:	369

				Knowledge and Translocal Assemblage	
9	Asheim B., Coenen L., Vang J.	Face-to-face, buzz, and knowledge bases: Sociospatial implications for learning, innovation, and innovation policy	2007	Environment and Planning C: Government and Policy	362
10	Richards G.	Creativity and tourism. The state of the art	2011	Annals of Tourism Research	354
11	Angelidou M.	Smart cities: A conjuncture of four forces	2015	Cities	323
12	Nevens F., Frantzeskaki N., Gorissen L., Loorbach D.	Urban Transition Labs: Co-creating transformative action for sustainable cities	2013	Journal of Cleaner Production	310
13	Allwinkle S., Cruickshank P.	Creating smart-er cities: An overview	2011	Journal of Urban Technology	297
14	Napier A.D. et al.	Culture and health	2014	The Lancet	287
15	McCann E., Ward K.	Relationality/territoriality: Toward a conceptualization of cities in the world	2010	Geoforum	286
16	Bason C.	Leading public sector innovation: Co-creating for a better society	2010	Leading Public Sector Innovation: Co-Creating for a Better Society	252
17	Batten D.F.	Network cities: creative urban agglomerations for the 21st century	1995	Urban Studies	251
18	Markusen A., Gadwa A.	Arts and culture in urban or regional planning: A review and research agenda	2010	Journal of Planning Education and Research	206
19	Amin A., Thrift N.	Cultural-economy and cities	2007	Progress in Human Geography	190
20	Malecki E.J.	Jockeying for position: What it means and why it matters to regional development policy when places compete	2004	Regional Studies	186

The interest in the subject can be confirmed with the graph generated by Scopus with the publication year of the articles found in the search, as seen in Figure 2. As we can see, there has been a consistent and significant increase in published documents in the last ten years.

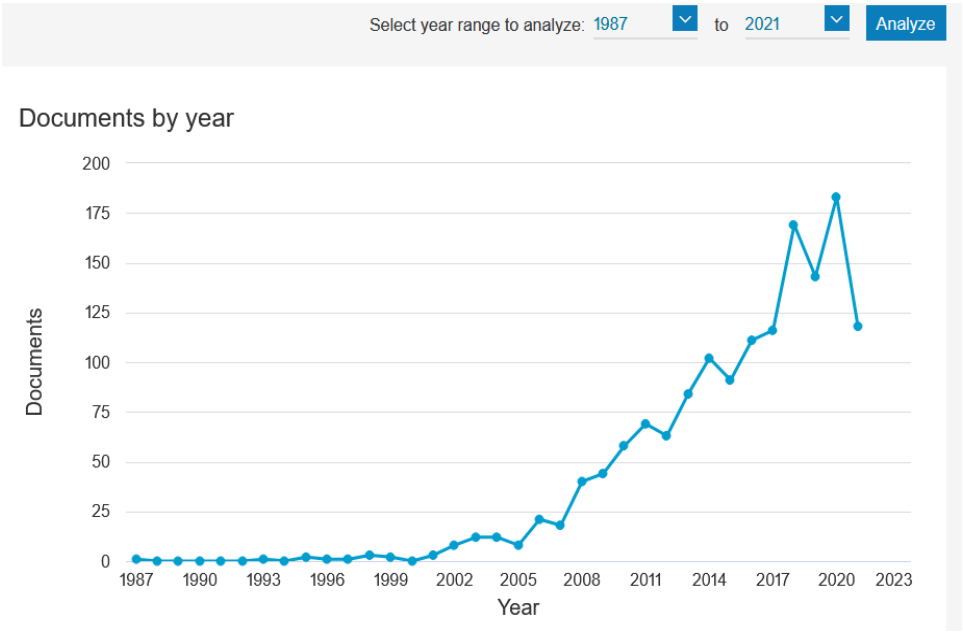

Figure 2: Graph showing the year of publication of documents found in the search in the Scopus database. Note that the search was made in August 2021, so by the end of the year it is reasonable to expect the 2021 graph will be at least at a similar level of previous years.

The most cited articles in the last five years can be seen on Table 2. The high number of citations in recent articles also confirms the interest in the field. Smart cities, complexity, mobility, nature-based solutions, co-working spaces, knowledge cities, rural-urban links; are among of the themes that have demonstrated interest by researchers.

Table 2. Most recent papers on *knowledge, cities, creative* and *place*, according to Scopus.

	Authors	Title	Year	Source	Cit
1	March H., Ribera-Fumaz R.	Smart contradictions: The politics of making Barcelona a Self-sufficient city	2016	European Urban and Regional Studies	112
2	Angelidou M.	The Role of Smart City Characteristics in the Plans of Fifteen Cities	2017	Journal of Urban Technology	97

3	Wiig A.	The empty rhetoric of the smart city: from digital inclusion to economic promotion in Philadelphia	2016	Urban Geography	90
4	Newig J., Challies E., Jager N.W., Kochskaemper E., Adzersen A.	The Environmental Performance of Participatory and Collaborative Governance: A Framework of Causal Mechanisms	2018	Policy Studies Journal	90
5	Balland P., Rigby D.	The Geography of Complex Knowledge	2017	Economic Geography	90
6	Ramírez M.-S., García-Peñalvo F.-J.	Co-creation and open innovation: Systematic literature review	2018	Comunicar	81
7	Leitner H., Sheppard E.	Provincializing Critical Urban Theory: Extending the Ecosystem of Possibilities	2016	International Journal of Urban and Regional Research	80
8	Murray M.J.	Taming the Disorderly City: The Spatial Landscape of Johannesburg after Apartheid	2017	Taming the Disorderly City: The Spatial Landscape of Johannesburg after Apartheid	78
9	Andrienko G., Andrienko N., Chen W., Maciejewski R., Zhao Y.	Visual analytics of mobility and transportation: State of the art and further research directions	2017	IEEE Transactions on Intelligent Transportation Systems	70
10	Mariotti I., Pacchi C., Di Vita S.	Co-working Spaces in Milan: Location Patterns and Urban Effects	2017	Journal of Urban Technology	64
11	Berka A.L., Creamer E.	Taking stock of the local impacts of community owned renewable energy: A review and research agenda	2018	Renewable and Sustainable Energy Reviews	59
12	Artmann M., Sartison K.	The role of urban agriculture as a nature-based solution: A review for developing a systemic assessment framework	2018	Sustainability (Switzerland)	57
13	Chang D.L., Sabatini-Marques J., da Costa E.M., Selig P.M., Yigitcanlar T.	Knowledge-based, smart and sustainable cities: A provocation for a conceptual framework	2018	Journal of Open Innovation: Technology, Market, and Complexity	50

14	Mayer H., Habersetzer A., Meili R.	Rural-urban linkages and sustainable regional development: The role of entrepreneurs in linking peripheries and centers	2016	Sustainability (Switzerland)	48
15	Ardito L., Ferraris A., Messeni Petruzzelli A., Bresciani S., Del Giudice M.	The role of universities in the knowledge management of smart city projects	2019	Technological Forecasting and Social Change	48
16	Mora L., Deakin M., Reid A.	Combining co-citation clustering and text-based analysis to reveal the main development paths of smart cities	2019	Technological Forecasting and Social Change	46
17	Moisio S.	Geopolitics of the knowledge-based economy	2018	Geopolitics of the Knowledge-Based Economy	42
18	van Waart P., Mulder I., de Bont C.	A Participatory Approach for Envisioning a Smart City	2016	Social Science Computer Review	40
19	Durose C., Needham C., Mangan C., Rees J.	Generating 'good enough' evidence for co-production	2017	Evidence and Policy	39
21[1]	Zook M.	Crowd-sourcing the smart city: Using big geosocial media metrics in urban governance	2017	Big Data and Society	37

The author that contributes most to the field in number of published documents, is Ygitcanlar, T. with 37 articles, followed by Guaralda M., Musterd, S., and Stock, W.G. with 11 each, as we can see in Figure 3- Authors with more published documents in the field.

1 The document placed in muber 20, with 39 citations, was "Virtual verses face-to-face clinical simulation in relation to student knowledge, anxiety, and self-confidence in maternal-newborn nursing: A randomized controlled trial" and was removed because was not related to the subject of this article.

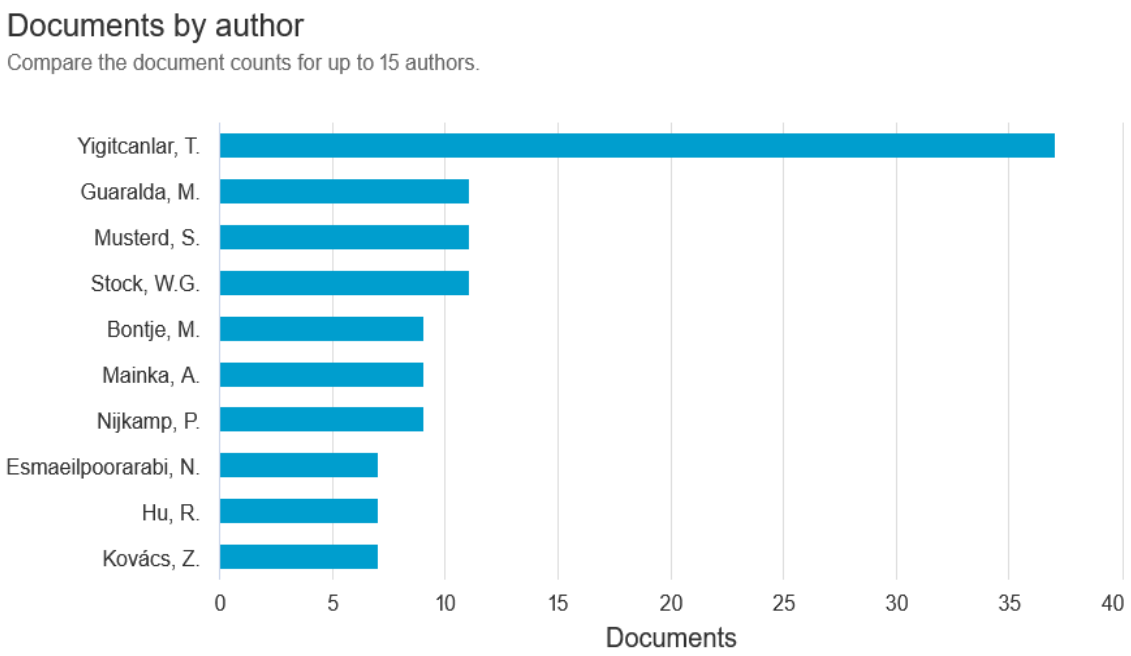

Figure 3- Authors with more published documents in the field

Network Analysis of Bibliometric Data

Following the quantitative bibliometric analysis, further qualitative examination was made by producing relationship maps in VOSviewer.

Co-citation Analysis

A co-citation analysis was conducted in VOSviewer, where "the relatedness of items is determined by the number of times they are cited together", as described on the VOSviewer software dialog box. Therefore, this analysis looks to the references these articles are citing, and that is the reason many classics show up here while not appearing in the most cited list of documents.

A threshold of minimum 20 citations by each author was set, with 925 results. For clarity and synthesis, another limitation was set, to show only the 50 authors with the greatest link strength. The resulting graph can be seen in Figure 4, with three main clusters identified by colour. Richard Florida showed as one of the most prominent references in the co-citation analysis (red cluster), alongside with Tan Ygitcanlar (blue cluster). This seems to be consistent with the research streams around "knowledge-based development", more commonly associated with Ygitcanlar and "creative cities" usually associated with Florida. The green cluster shows classic

authors on urbanism, geography, sociology, and philosophy that did not appear in the most cited lists but emerged here, like Michel Foucault, Jane Jacobs, Manuel Castells, David Harvey, and Pierre Bourdieu. Taking in consideration that these come from older references, the green cluster seems to relate to authors that are basal to the field of study.

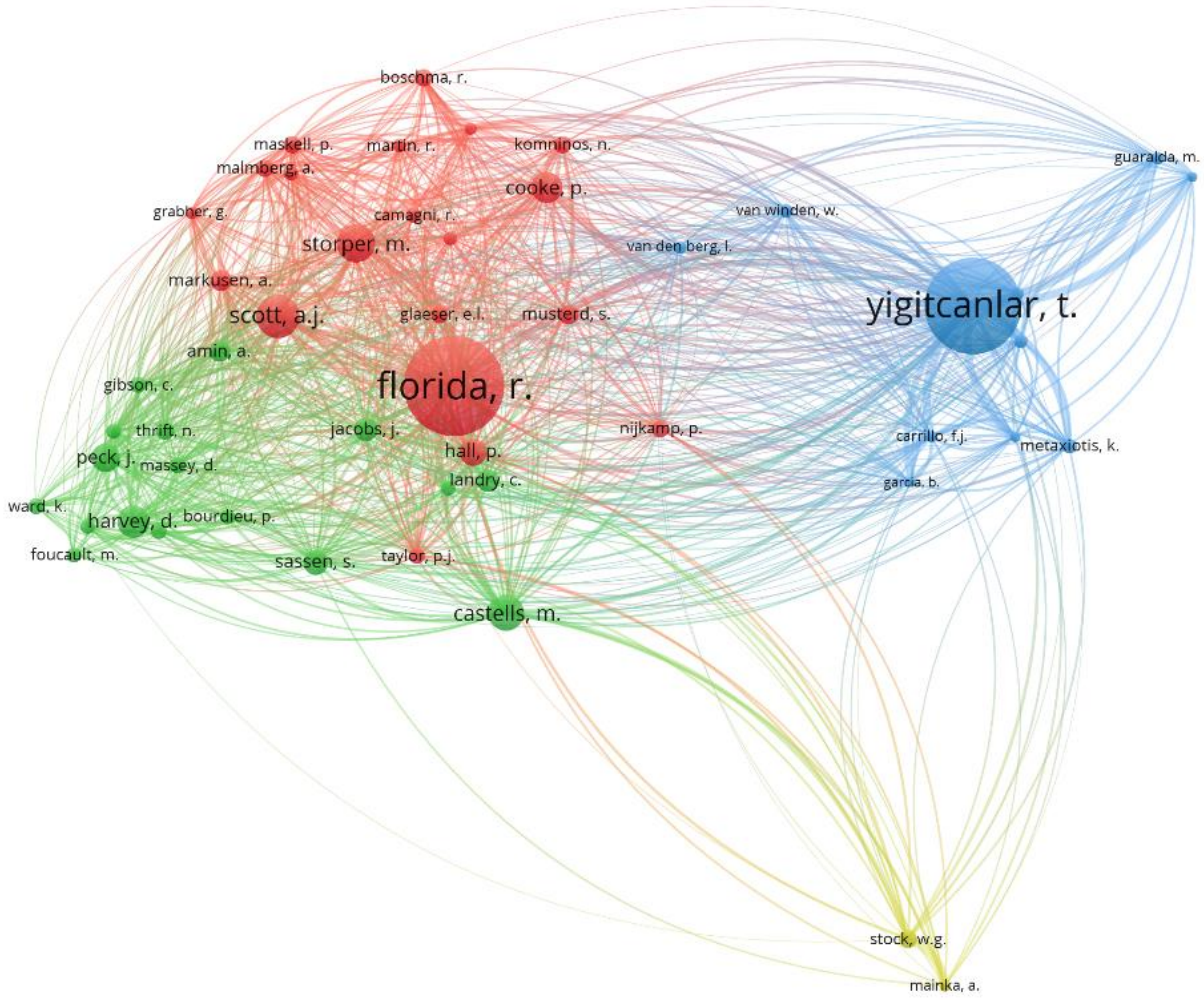

Figure 4 - co-citation analysis of the set of documents, reduced sample showing only the 50 authors with the most link strength in VOSviewer

The results suggest two streams of research, knowledge cities in the blue cluster and creative cities in the red cluster. Although they share a common interest and have a considerable amount of connections, the distance between them illustrates they are relatively separate groups.

Keyword network map

A co-occurrence map was produced with all the 1484 references, to indicate which documents share the same keywords (including both author and index keywords). A minimum threshold

of 10 occurrences of a keyword was set, with 160 words form a universe of 6573 words meeting this requirement. The map is shown in Figure 5:

Six clusters were identified in the word co-occurrence map, with "knowledge" having the larger

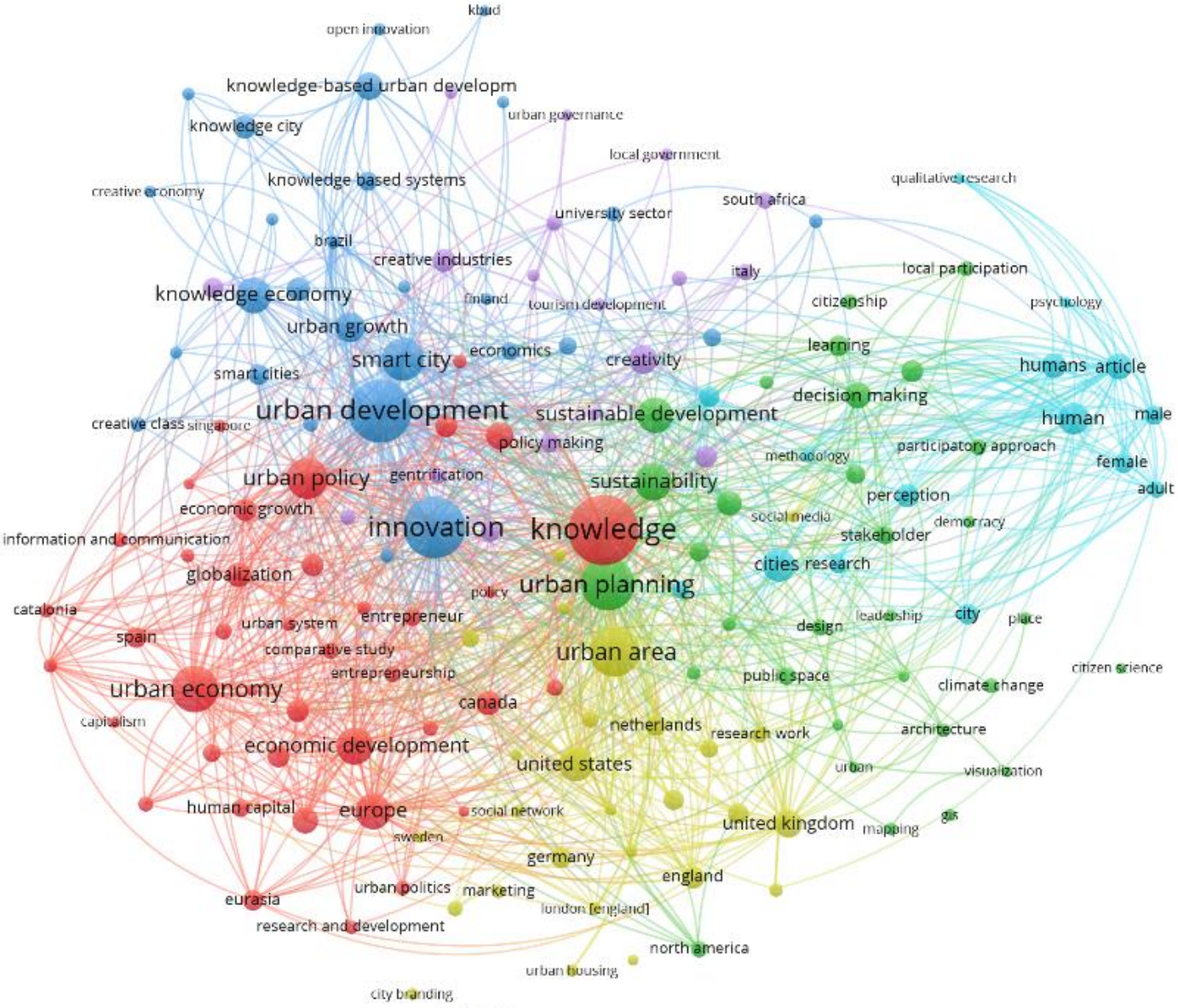

Figure 5 - clusters identified by colour

occurrence and being in the middle of the diagram, indicating it is literally a term that is central to the theme, right next to "urban planning" as seen in Figure 5. Other frequent terms that emerged from the data include "innovation", "urban development", followed by "urban area", "smart city", "urban economy" and "urban policy".

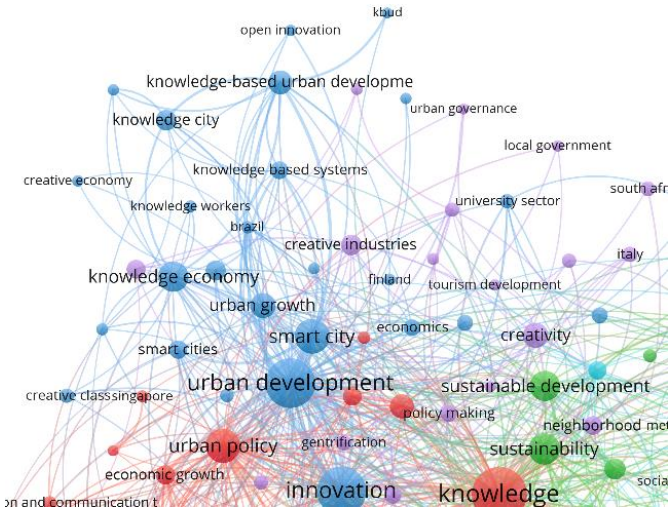

Figure 6 - zoom in blue and purple clusters: innovation and creativity

In Figure 6 we can see an enlargement of the blue cluster, with several keywords that have a high co-occurrence in the document set, especially "innovation" and "urban development", but also "smart city", "urban growth", and "knowledge economy". "Knowledge based urban development" and "knowledge city" appear more at the edge of the map, but with a reasonably significant co-occurrence, suggesting they contribute to the field, but are not central to other views (as would be "innovation" for example, which makes sense since it is a broader term). Going clockwise, the purple cluster is much smaller, and relates closely to the blue one, with terms like "creativity", "creative industries", "tourism". We nicknamed the group of these two clusters "innovation and creativity".

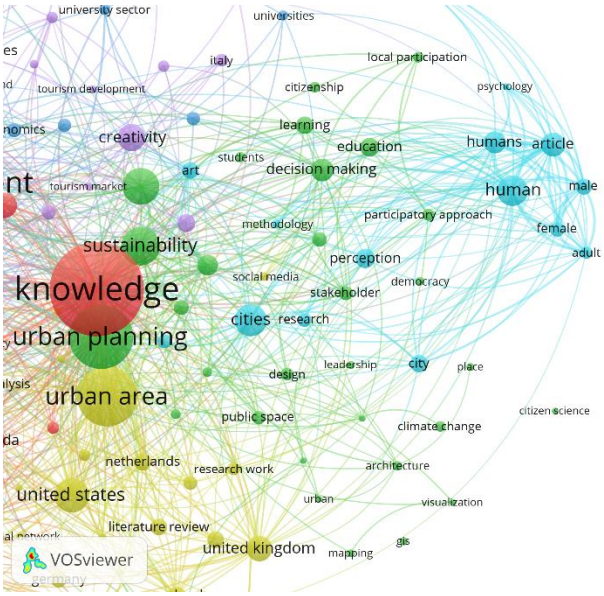

Figure 7 - zoom in green and cyan clusters (people) and yellow cluster (place)

In Figure 7, the green cluster has "urban planning" at the centre of the map, and involves the cyan cluster, suggesting they are closely related. In the cyan group, we see "human(s)", "male", "female", "perception", "city", "cities". In the green cluster, from "urban planning" we see a top branch with "people" related items like "decision making", "learning", "citizenship", "local participation", "stakeholder", and a lower branch which seems more related to "place", with words as "neighborhood", "design", "public space", "architecture", "place", and "climate change". Still in Figure 7, the yellow cluster has "urban area" more to the centre, and then several cities or countries, with some other themes appearing marginally such as "urban housing" and "place branding" and "city branding" and, a bit more centrally, "marketing". We regarded this (yellow) cluster as the geographical

regions that are more active in the field, namely Europe and North America, although Australia, Brazil and China appeared in other clusters of the map. We nicknamed the group of these three clusters (green, cyan, and yellow) "people and place".

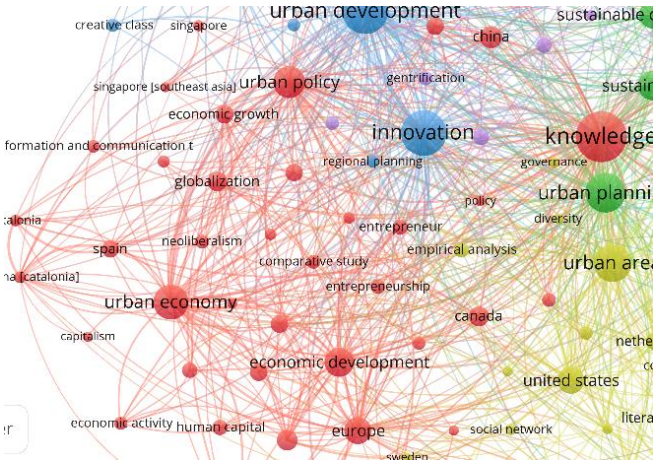

Figure 8: zoom in red cluster - economy and entrepreneurship

Finally, the red cluster (Figure 8) seems related to economy, with "urban economy" central to the cluster. Other relevant terms include "urban policy" and "economic development". Less prominent, but more specific terms include "entrepreneur", "entrepreneurship", "human capital", "globalization", "regional development", "metropolitan area". Bordering with this cluster, inside the blue one, we find also "knowledge economy" and "creative economy". We nicknamed this cluster "economy and entrepreneurship".

It has been argued before that it is not reasonable to expect a completely unbiased research view, but rather be aware of such biases and its implications (Wolfswinkel et al., 2013). As the authors have an interest on spatial aspects of development, bias can exist in this direction. As such, we initially considered the possibility that inclusion of "place" in the research would bring more discussion on the physical aspects of cities. However, "urban design", "art" and "perception", appear marginally on the word graphs, and with lower weights when compared to other subjects. "Neighbourhood" on the other hand, although less frequent, is more central to the graph. This suggests, in line with the literature on urban design (Del Rio, 2004; Jivén & Larkham, 2003) that design itself is a part of the planning process and must not be done in isolation.

Based on the exposed, we could sum up word cluster analysis in three themes related to each other, that revolve around the central theme of knowledge and urban planning: "innovation and creativity", "economy and entrepreneurship" and "people and place", as we can see in Figure 9:

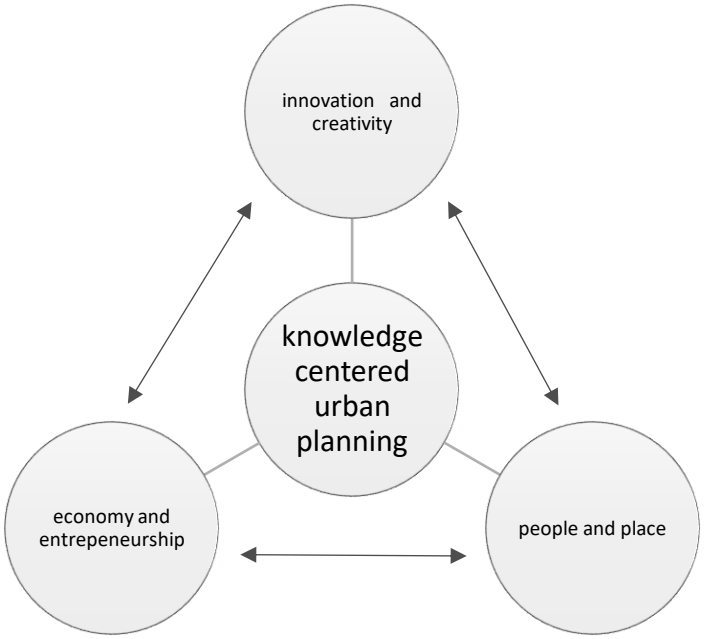

Figure 9: relationship between clusters and themes, suggesting dimensions of the field.

Conclusions

This study contributes to give an overview of important authors and themes in the subject of study. It identified that "knowledge" and "urban planning" are central to the field, with supporting literature that can be divided in three broadly defined themes: "innovation and creativity", "economy and entrepreneurship", and "people and place".

The results also resemble the ubiquitous definition for sustainable development having economic, social, and environmental aspects (Purvis et al., 2019). We can also relate these clusters to the four dimensions of Knowledge Based Urban Development (KBUD): economic, socio-cultural, institutional and enviro-urban.

Research limitations include inferences made on quantitative bibliometric data, and the qualitative interpretation of the network maps presented. Further analyses on the content of documents with a systematic review on the literature appointed in this bibliometric study would be useful to further understand these relationships.

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