Mapping the Knowledge Domain of Planning

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Abstract

As we know, the field of urban planning is far reaching in breadth and depth. This is due to the complex nature of cities, regions, and associated development patterns. Referring to the ambitious field of urban planning, Aaron Wildavsky famously remarked, "If planning is everything, maybe it's nothing" (Wildavsky, 1973). Is planning everything? And what does that mean for someone trying to understand planning? Using the recent Guide to Undergraduate and Graduate Education in Urban and Regional Planning (20th Edition, dated 2013) published by the Association of Collegiate Schools of Planning, we examined the question of "what is planning?" by analyzing the areas of expertise and interests for over 900 regular faculty listed in the Guide. These are self-reported areas of teaching and research interests that can be used to characterize contemporary aspects of planning. Rather than just reporting the frequency of topics mentioned across planning faculty, network analysis was used to illustrate the range and interconnections between topics. The results are used to report the knowledge domain of U.S. planning faculty.

Introduction

Underlying Wildavsky's (1973) discussion about the breadth of urban planning is a recognition that urban development is very complex and multi-faceted, far too much for a singular definition or approach. This includes social, economic, technological, environmental, and political systems that are the most sophisticated and expansive in human history, where understanding these systems requires extensive inter-disciplinary knowledge at the scale of one (or more) academic fields. This is not unique to planning. But at the same time, the standard practice of academic promotion and tenure systems is to reward expertise in narrowly defined fields of study. This means that scholars often specialize due to institutional norms, which serves to fragment fields of study like planning. Just as medical expertise and specialists focus on particular body parts or functions, so does the education and training of urban planners. Like general practitioners in medicine, there are planning practitioners with an overall understanding of the planning process, who then defer to professionals with specialized training like engineers, lawyers, landscape architects, etc. A planning professional's career path would likely involve moving from a specialty area to a more general approach that may involve management activities. However, this is not generally the case for academics.

The debate about the wide range of topics considered by planning educators and practitioners are often based on varying definitions of "planning" and modes of planning practice. Definitions differ in how planning considers place and process as well as the objectives and intended outcomes of planning efforts. This may make planning appear to be diffuse and incoherent. Wildavsky acknowledged the challenges of planning in its all-encompassing dimensions where he stated, "Planning requires the resources, knowledge, and power of an entire people" (p.152). It was also in the same issue of *Policy Sciences* that the Wildavsky article appeared (1973, No.4), that Rittel and Webber, described how planning problems are inherently "wicked" where solutions are often elusive due to their complexity and lack of scientific rules. Later comments by Alexander (1981), Reade (1982), and Klosterman (1985) reiterate that "planning" has several definitions depending on philosophical and ideological perspectives (Wadley and Smith 1998). Both Levy (1992) and Lucy (1994) were concerned over the legitimacy of planning where again differences in definitions and ideologies provide evidence of much needed reflection by those within the profession. Beauregard (2001) drew many of this points

together by stating that “rather, planners need to accept the fuzzy boundaries of planning, the endemic incompleteness of professional control, and healthy and relentless internal criticism” (p.439). Just recently Godschalk (2014) drew the distinction between planning practice and education from his personal experiences over a 50-year span. Like the other planning scholars previously mentioned, he alludes to the wickedness of planning as having “complex problems with no perfect solutions” (Godschalk, 2014, p.83).

The question “What is planning?” also relates to the question, “What is a discipline?” Davoudi and Pendlebury (2010) mention that to be a discipline, among other things, there should be a recognized realm of discourse and connection to a profession, problem recognition, and institutional context. One can argue that planning meets these criteria, however, this would lead to a longer discussion beyond the scope of this paper. Another approach would be to use urban planning curricula to describe planning, but this would likely neglect a variety of topics that are not taught, either because they are very specific, do not fit an academic format, or lack demand by students. While urban planning curricula vary depending on faculty composition and specializations. In the U.S., Planning Accreditation Board (PAB) guidelines create a degree of homogeneity across programs through core requirements. Planning is unlikely to have “any guiding principle or central paradigm” (Beauregard, 1990) with a very large number of concepts to master, along with societal dynamics, like other social sciences.

One way to understand the domain of planning is to assess the record of publications by planning scholars. Academic scholarship represents a “sample” of planning thought. Some planning academics and practitioners would argue that there is a mismatch between planning education and practice, despite ongoing cooperation and communications among and between the academic and professional planning organizations such as the American Planning Association (APA), the Association of Collegiate Schools of Planning (ACSP), the American Institute of Certified Planners (AICP), and the Planning Accreditation Board (PAB), the challenge is to link educational objectives and professional needs. There will likely remain an on-going tension among academics and planning professionals due to their different business models and professional objectives. The disconnect between planning education and practice was noted by Alonso in 1986, attributing it to the lack of professional orientation (Stiftel 2009). This debate continues with a lack of agreement between planning education and planning practice (Basson and Dowling, 2013).

An objective of this paper is to consider the question "what is planning?" by analyzing the self-reported research and teaching interests of faculty from ACSP member schools. These member schools are primarily located in North America which means that the planning issues identified are likely biased to this region of the world. It is true that faculty teaching in North American planning schools come from around the world, and several focus on global/ international issues that are directly applicable to the non-North American issues. However, faculty with degrees from U.S. or Canadian schools represent most of these planning programs. In addition, many planning faculty in the U.S. and Canada conduct research and teach about issues facing cities and regions around the world. This means that while the sample is from North American schools, international planning issues are likely represented. Further research that includes international planning scholars would provide a more comprehensive analysis.

The Urban Planning Knowledge Domain

A primary hypothesis is that among the interests of urban planning faculty, there exists a set of identifiable and cohesive clusters of research topics. When viewed as a network and using graph theory, we expect that the results will help to identify the knowledge domain or research "footprint" of urban planning. As previously mentioned, because the sample is drawn from North American planning academics, the resulting domain structure will probably represent a particular context and not necessarily be generalizable to planning academics around the world. However, delineating research topic areas can provide insights are relevant to the definition of planning. The results of the analysis can shed light on whether U.S. planning research focuses on better understanding cities and regions with a focus on advancing how we improve planning practice and outcomes. The actual answers to these questions are outside of the scope of this paper, but subsequent research can further explore the meaning and direction of planning's knowledge domain.

Most knowledge domain mapping involves publication co-citation and co-word analysis, where ours is similar by using faculty areas of interest (i.e., as keywords). We feel that the self-reported interest areas are valid for the intended purposes because the data are collected from individual faculty members using their own terms, and not pre-defined categories. Therefore these data are uncoerced and use voluntary terminology similar to open-ended survey questions.

The analysis includes planning faculty with little experience and those with 40 or more years of experience. This means topics that may be considered as "traditional" are considered along with perhaps more "contemporary" topics that have been recently researched in-depth through dissertation activities. It is likely that terminology has changed over time and while an academic may be working on the same topics today as they did 40 years ago, new terminology may make the topics seem more "current" than what it might have been called before. While not directly related, temporal co-citation analyses have been used by others to examine similar dynamics (see for example Morris et al., 2003). Along with terminology, research specialties can also evolve over time as academics become interested in new, or more narrowly defined topics within their sub-disciplines.

Another issue is with how faculty self-identify areas of interest, with some being more specific than others. This becomes a classification issue that could affect the results of the analysis. This depends on the level of analysis and level of detail provided in research interest areas. For instance, "transportation" may be reported as an academic's area when in fact their specialty is "public transportation", "freight movement", or "travel modelling". The titles of published works are likely more specific compared to self-reported interest areas. An alternative approach would be to analyze publication topics, keywords, or titles instead of interest areas. Knowledge domains are often analyzed this way with bibliometrics using networks or clusters of authors, papers, or references" (Boyack, Klavans, and Borner (2005, p. 351). However, a challenge is reclassifying or clustering titles so that they can be more easily grouped and analyzed. To simplify the categories and hence, the complexity of the network, describing domains and sub-domains could be reliably accomplished by re-surveying planning faculty to have them confirm re-categorization. It is not clear that this would necessarily provide improved data for this particular analysis.

Methodology

For exploring networks' organization and connectivity, graph theory has been used across a wide number of disciplines including information and computer science, management, economics, sociology, architecture, and planning (See Foulds, 1992; Linehan, Grossa, & Finnb, 1995; Minor & Urban, 2008; Wilson, 1976; Yamada, 1996; Zetterberg, Mörtberg, & Balfors, 2010). Graph theory

informs network analysis by exploring parameters that influence network connectivity, including the number of nodes and links between them in the network, the number of separate networks (clusters) within the network, and the distance between the nodes and clusters (Linehan et al. 1995). In addition, network visualization is increasingly attract scholar's attentions because of its power in identifying network structure, and specifically sub networks or communities within networks (Bruns, 2012; Bastian & Heymann, 2009).

In this study, network analysis methods are used to examine how different areas of expertise mentioned by faculty members in the field of urban planning are connected. The analysis is performed by using raw areas of faculty expertise reported by planning faculty in the latest edition of ACSP education guide (Guide to Undergraduate and Graduate Education in Urban and Regional Planning 20th Edition, 2014). The following table translates the graph components to the purpose of our study.

Table 1. Graph components in planning and design field (See Wilson, 1979; Minor & Urban, 2007)

Terms	**Definition**	**Translation in the network created in this study**
Node	The main component of a graph	A single word used by a faculty member as an expertise. For example, if a faculty member have mentioned "community development" as their area of expertise, the two words of "community" and "development" are considered as single nodes in the network.
Edge	Establishes connectivity between nodes	Connects the faculty's expertise. An edge is created between the areas of expertise (nodes) if they are mentioned by one or more than one faculty members.
Path	Connects two or more edges through a sequence of edges in the network.	Connect different expertise that are connected together through two or more edges.
Degree	The number of edges that are connected to a single node.	Shows the number of times that each area of expertise is connected to the other areas. In another word, it shows how many times an area of expertise is mentioned by different faculty members.
Density	The ratio of the number of edges to the probable number of edges in the network.	Presents the density of the network based on how the faculty's areas of expertise are connected divided by the highest possible ways of connectivity.

Modularity	A measure of network structure. The power of division of a network into different modules	Shows how faculty's areas of expertise cluster and create domains of expertise.

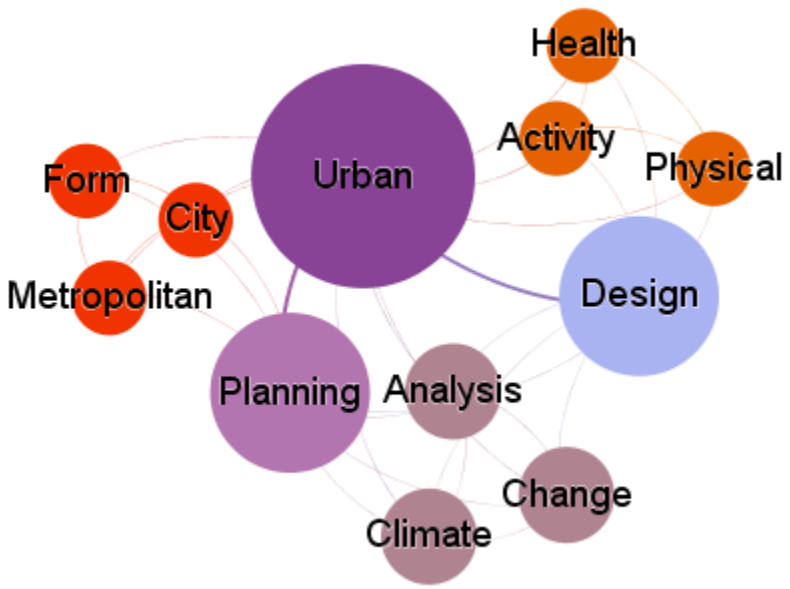
Gephi, an open source network analysis and visualization tool, is used for analyzing and visualizing the faculty research interest data. Gephi is powerful and scalable for visualizing, filtering, and clustering network datasets like that used in this analysis. Although several network analysis packages can be helpful in analyzing our dataset, Gephi's power in visualization and analysis, beside its active community of open source developers, makes it quite useful for this study.

Using data management methods, we sorted the nodes and edges in the network created based on the data set. To explore whether and how different faculty expertise cluster, we computed the network density, degrees, and modularity based on three resolutions (0.3, 0.4, 0.7). The modularity is computed considering the weights of the edges and the randomized distribution of the nodes. The three resolutions affected the size of the faculty's expertise clusters. The lower resolutions provided smaller groupings and as a result, greater numbers of communities within the network. These communities helped us with defining specific planning sub-domains by exploring how different faculty interests or areas of expertise cluster. The example below shows the network that would result from three faculty members shown in Table 1 and Figure 1.

Table 2. Example faculty interest data

Professor X	Professor Y	Professor Z
Urban Planning Design Climate Change Analysis	Urban Design Physical Activity Health	City Planning Urban Form Metropolitan

Figure 1. Example faculty interests network



Results

It is no surprise that the terms "planning" and "urban" have both the highest degree and betweenness centrality of terms mentioned by planning faculty (see Tables 3). In fact, the lists are quite similar with the exception of the terms "sustainable" and "international" on the degree centrality list. Because high degree centrality indicates that the terms or concepts are core to planning research activities. Betweenness centrality indicates bridges or connections among nodes on the network, but since they are virtually the same in this case it suggests a very high level of density among these topics. If the list with high betweenness centrality were significantly different, then we would expect to see multiple clusters among the core topics being linked by the topics most often lying in between. This is not the case among the top 20 terms. A total of 540 terms act as links with the remaining 609 being considered non-core or beyond the central cluster of planning topics. Figure X shows an example of some of these outlying topics or terms.

Table 3. Top 20 degree and betweenness centrality

Rank	Topic	Degree	Rank	Topic	Betweenness
1	Planning	707	1	Planning	108669
2	Urban	594	2	Urban	70272
3	Development	554	3	Development	57889
4	Policy	437	4	Policy	33290
5	Community	408	5	Design	28374
6	Design	388	6	Community	26070
7	Environmental	386	7	Public	25501
8	Public	380	8	Land-use	24903
9	Land-use	380	9	Environmental	23271
10	Management	334	10	Management	19160
11	Transportation	302	11	Transportation	16281
12	Economic	300	12	Analysis	15730
13	Theory	285	13	Economic	14817
14	Analysis	285	14	Theory	12801
15	Housing	279	15	Environments	12643
16	Regional	266	16	Housing	11283
17	Sustainable	258	17	Social	9900
18	Social	252	18	GIS	9371
19	Methods	235	19	Methods	8820
20	International	222	20	Regional	7751

Figure 2. Network of top 50% faculty research topics

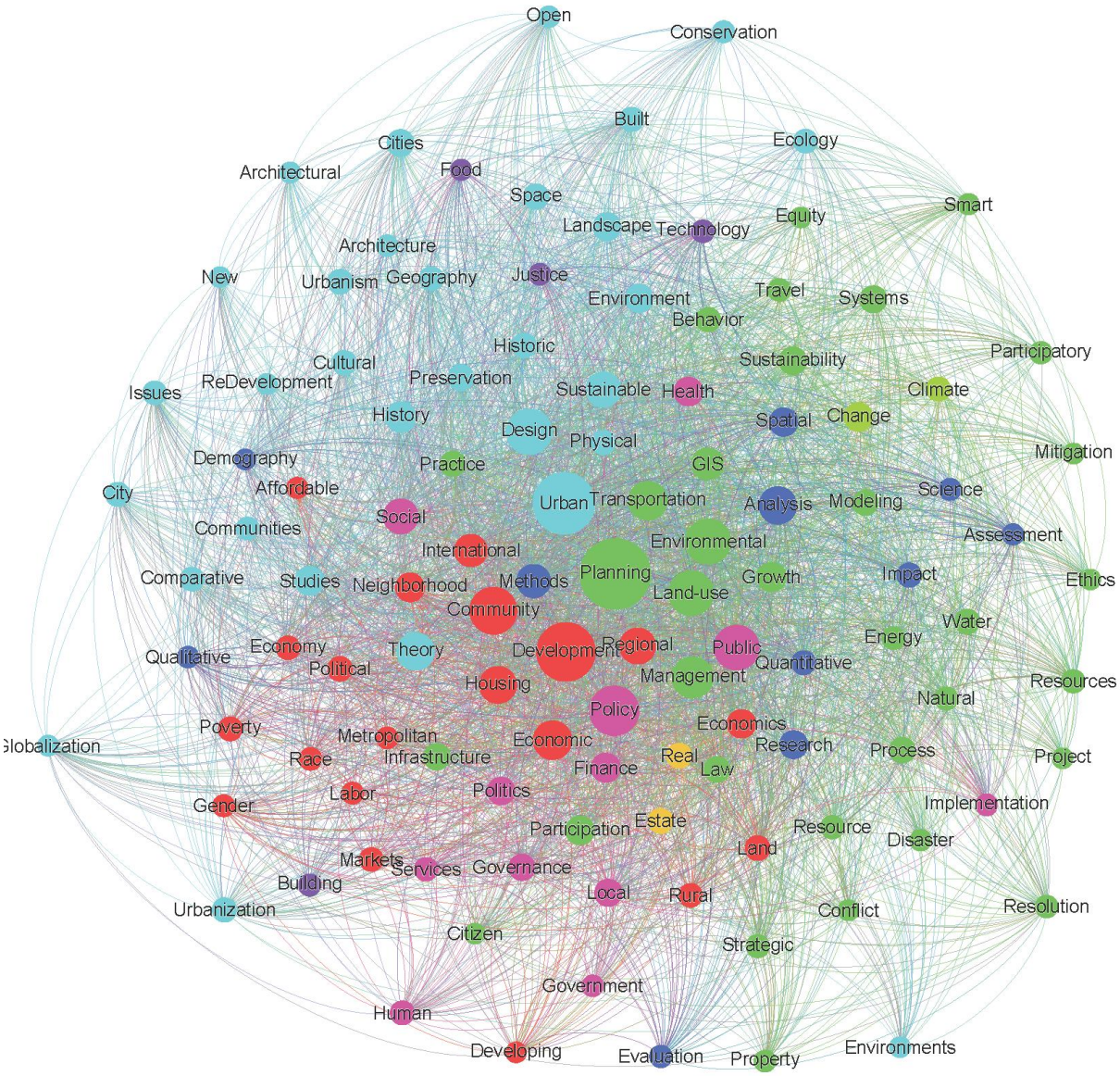
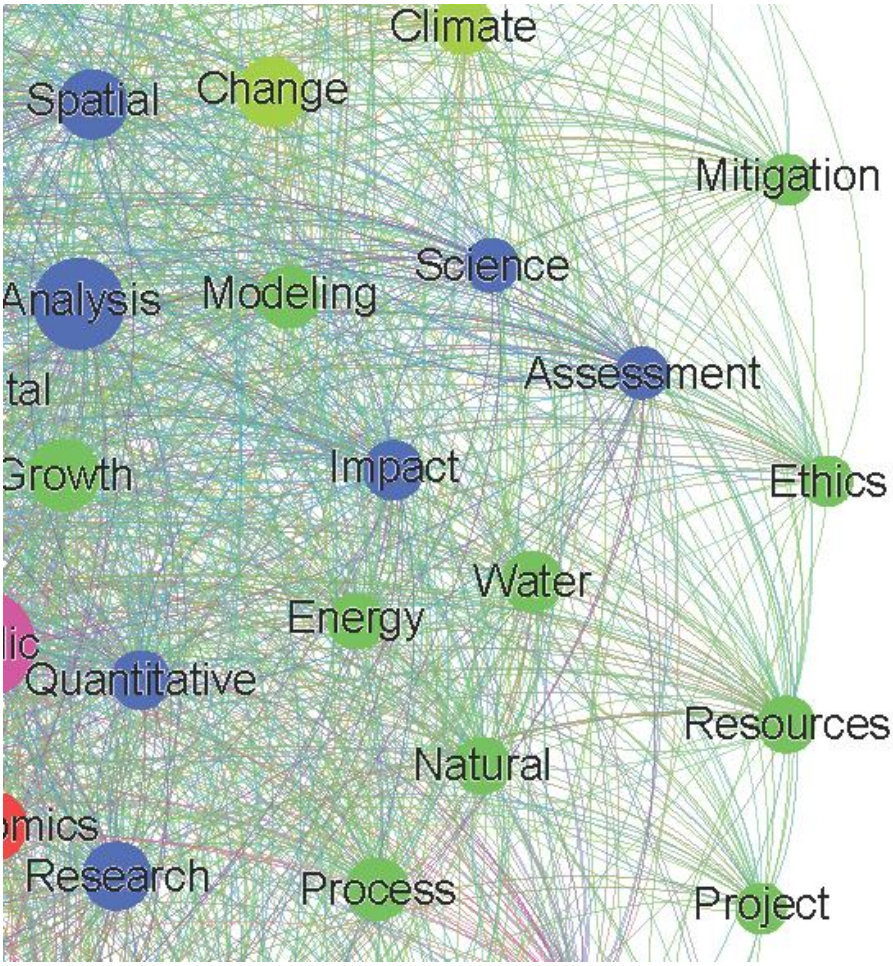


Figure 3. “Edge” topics of the network



To look for clusters among planning topics the network analysis provided evidence of linkages and sub-domains. Clusters or sub-domains of planning topics, were identified using the modularity analysis. Modularity in Gephi looks for nodes that exhibit stronger connections or greater density compared to the rest of the network. Increased modularity (i.e., a greater number of modes or clusters) may be expected in more dispersed or varied networks compared to that mentioned to analyze the 119 topics included in this analysis. The process of reducing the number of total topics included could hide some of the clustering occurring at the periphery, but we chose to focus on the core topics of planning, knowing that sub-domains would still be present, especially given the diversity of planning related topics. The challenge of the modularity analysis (like any cluster analysis) is determining the appropriate threshold or boundary between modes or

clusters. Therefore we tested two different parameters for the modularity analysis which resulted in 8 and 25 modes. Further sensitivity analysis can be performed to see how topics realign themselves and populate the sub-domains.

The network analysis was then used to analyze the top 119 topics which represented the top 50 percent of topics identified by faculty (see Figure 2). The clustering of topics is a function of the frequency that they are co-mentioned by faculty. Topics frequently mentioned by groups of faculty were assumed to constitute sub-domains or specialties of planning research. The method that distinguished 25 modes is more fine grained than the 9 mode model. In both cases the clusters of topic titles were consolidated into more summary themes to more easily visualize faculty interests. This is a similar process to that of principal component analysis where statistical attributes are interpreted to create classes. The data reduction process is easier in some cases compared to others, especially cases with many clustered terms. For instance, the first two clusters in the 25 mode model were classified as "History & Theory" and the second as "Urban Design". "History & Theory" included two strongly bound terms and "Urban Design" included nine (see Table 4).

Table 4. "History & Theory" and "Urban Design" topics

History & Theory	**Urban Design**
History	Urban
Theory	Design
	Urbanism
	Architecture
	Ecology
	Physical
	Landscape
	Space
	Cultural

This same process was used for each of the 25 modes and for the 8 modes, resulting in the networks shown in Figures 4 and 5. The topics for each are shown in Table 5.

Figure 4. 25-mode network

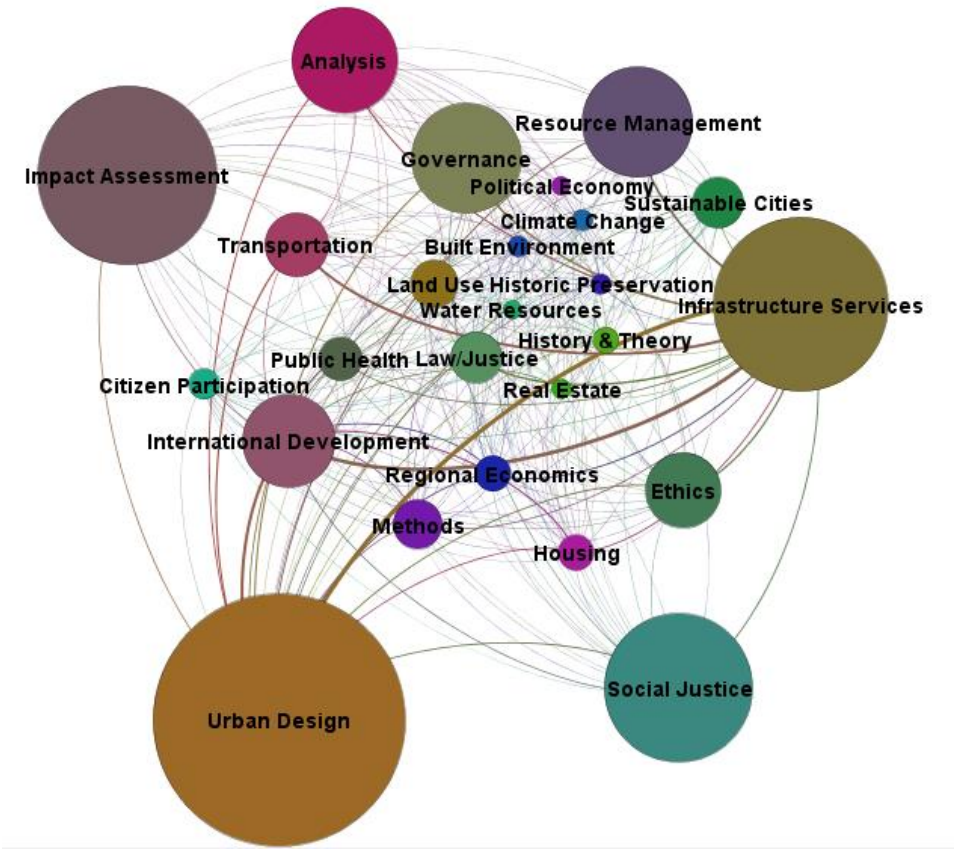


Figure 5. 8-mode network

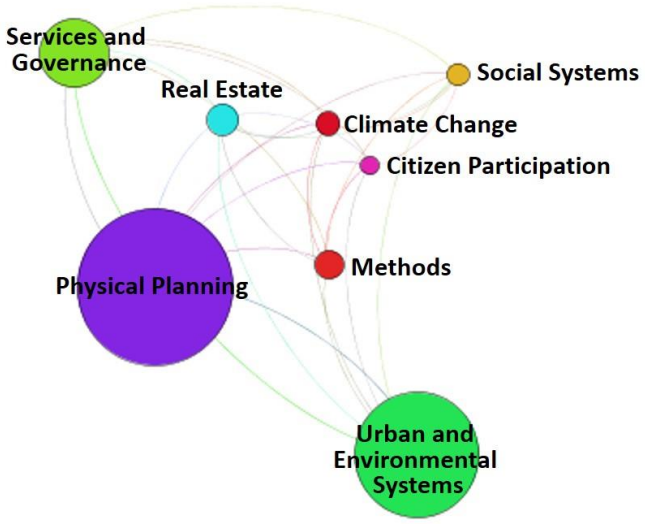


Table 5. Topics for 8-mode and 25-mode networks

Mode	Theme	Mode	Theme
0	Physical Planning	0	History & Theory
1	Urban and Environmental Systems	1	Urban Design
2	Services and Governance	2	Social Justice
3	Social Systems	3	Infrastructure Services
4	Climate Change	4	Law/Justice
5	Methods	5	Political Economy
6	Real Estate	6	International Development
7	Citizen Participation	7	Housing
		8	Governance
		9	Regional Economics
		10	Ethics
		11	Impact Assessment
		12	Analysis
		13	Public Health
		14	Methods
		15	Sustainable Cities
		16	Climate Change
		17	Water Resources
		18	Resource Management
		19	Transportation
		20	Land Use
		21	Real Estate
		22	Historic Preservation
		23	Citizen Participation
		24	Built Environment

The results of this analysis suggest that the research interests of urban planning faculty are represented by a dense and cohesive core. Using the top 50 percent of topics mentioned by faculty may have influenced this finding because it might be expected the most popular topics would produce at least a small number of dense clusters. On the other hand, the strength of connections among these core topics is significant and suggests that for a large proportion of urban planning faculty, the focus of teaching and research interests do in fact represent an interconnected knowledge domain. These topic areas compare to APA's list of planning specialty areas noted on their web site at: https://www.planning.org/aboutplanning/whatisplanning.htm and shown below:

- Community Activism/Empowerment
- Community Development
- Economic Development
- Environmental/Natural Resources Planning
- Historic Preservation
- Housing
- Land Use & Code Enforcement
- Parks & Recreation
- Planning Management/Finance
- Transportation Planning
- Urban Design

The pattern of topics illustrates the nature of planning, and appears to be in general agreement about what is relevant to urban planning research today. The question remains whether urban planning practitioners see these same topics as being central to their professional needs. This is a topic for future research.

References

Alexander, E. R. (1981). If planning isn't everything, maybe it's something. *Town Planning Review*, *52*(2), 131.

Beauregard, R.A. (1990). Bringing the city back in. *Journal of the American Planning Association* 56 (2): 210-15.

Beauregard, R. A. (2001). The multiplicities of planning. *Journal of planning education and research*, *20*(4), 437-439.

Godschalk, D.R. (2014). A Planning Life, *Journal of the American Planning Association*, 80(1): 83-90.

Basson, M., & Dowling, D. (2013). What do planners do? Define Your Discipline to drive undergraduate curriculum renewal. In *Proceedings of the 49th International Society of City and Regional Planners Congress (ISOCARP 2013)*. International Society of City and Regional Planners (ISOCARP).

Bastian, M., & Heymann, S. (2009). Gephi : An Open Source Software for Exploring and Manipulating Networks, 361–362.

Bruns, A. (2012). Information , Communication & Society How Long Is A Tweet ? Mapping Dynamic Conversation Networks on Twitter Using Gawk And Gephi. *Information, Communication & Society*, *15*(9), 1323–1351.

Boyack, K. W., Klavans, R., & Börner, K. (2005). Mapping the backbone of science. *Scientometrics*, *64*(3), 351-374.

Davoudi, S., & Pendlebury, J. (2010). Centenary paper: The evolution of planning as an academic discipline. *Town Planning Review*, *81*(6), 613-646.

Foulds, L. (1992). *Graph Theory Aplications*. Springer.

Klosterman, R. E. (1985). Arguments for and against planning. *Town planning review*, *56*(1), 5.

Levy, J.M. (1992) What Has Happened to Planning?, *Journal of the American Planning Association*, 58:1,81-84

Linehan, J., Grossa, M., & Finnb, J. (1995). Greenway planning : developing a landscape ecological network approach. *Landscape and Urban Planning*, *33*(1-3), 179–193.

Lucy, W.H. (1994). If Planning Includes Too Much, Maybe It Should Include More, *Journal of the American Planning Association*, 60:3, 305-318

Minor, E. S., & Urban, D. L. (2007). Graph theory as a proxy for spatially explicit population models in conservation planning. *Ecological Applications : A Publication of the Ecological Society of America*, *17*(6), 1771–82.

Minor, E. S., & Urban, D. L. (2008). A graph-theory framework for evaluating landscape connectivity and conservation planning. *Conservation Biology : The Journal of the Society for Conservation Biology*, *22*(2), 297–307.

Morris, S. A., Yen, G., Wu, Z., & Asnake, B. (2003). Time line visualization of research fronts. *Journal of the American society for information science and technology*, *54*(5), 413-422.

Reade, E. (1982). If Planning isn't Everything... A Comment. *Town Planning Review*, *53*(1), 65.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy sciences*, *4*(2), 155-169.

Stiftel, B. (2009). Planning the paths of planning schools. *Australian Planner*, 46(1), 38-47.

Wadley, D., & Smith, P. (1998). If planning is about anything, what is it about? *International Journal of Social Economics*, *25*(6/7/8), 1005-1029.

Wildavsky, A. (1973). If planning is everything, maybe it's nothing. *Policy sciences*, *4*(2), 127-153.

Wilson, R. (1979). *Introduction to graph theory* (Longman Gr.). Kent State University Press.

Yamada, T. (1996). A network flow approach to a city emergency evacuation planning. *International Journal of Systems Science*, *27*(10), 931–936.

Zetterberg, A., Mörtberg, U. M., & Balfors, B. (2010). Making graph theory operational for landscape ecological assessments, planning, and design. *Landscape and Urban Planning*, *95*(4), 181–191.