Key indicators of structural and dynamics of networks analysis used in information studies: the case of Information Science in Brazil

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Introduction

Information scientists study networks under several aspects, especially regarding to the quotation, co-quotation, co-authorship, collaboration structures and other forms of social interaction (Otte & Rousseau, 2002). The social network analysis lends a methodological tool that allows great flexibility in proposing the actors and relationships in the network, supplementing the resources available for bibliometrics analysis (Silva, Matheus & Parreiras, 2006). It is an approach that may help and support new analytical mechanisms in the network modeling which interest the Information Science.

In Brazil, the area is attracting interest since the late 90's and early 2000. Understanding how the field of Information Science over the last decade, is considering the methodology of network analysis by the type of metrics and indicators on its studies allows an analysis of the status of implementation of the technique in Brazil, and possible improvements and potentiality to be considered.

Key indicators of network analysis

The major objective of the new science of networks is to understand how the structure of a network operates on a global level dependent of dynamic processes that operate locally. It is a vision that seeks to integrate macro and micro analysis, considering and integrating indicators of structural and dynamic patterns, it can operates in three distinct levels of analysis: the network level, mapping the context and its evolution in which a network is inserted, group level, mapping how the structure of a network is formed and how it evolves over time, actor level, mapping out the structural specificity and dynamics of the actors directly involved in the network (Raider & Krackhardt, 2001).Questions related to how an emerging patterns occurs, how frequently they occur and with what consequences are points that can be solved by joining the dynamic and structural approach, as well as the relationship between the both (Newman, Barabasi & Watts, 2006, p. 7).

We have mapped the key indicators of networks analysis proposed by Nooyi, Mrvar & Batagelj (2005) and Barabasi, Jeong, Neda et al (2002) organized by level and by type. See as bellow table 1.

Table 1. Key indicators of networks.

Levels	Indicators	Type
Network	Density	Structural
	Diameter	Structural
	Affiliation	Structural
	Probability distribution	Dynamic
	Developments in the average degree of centrality	Dynamic
	Clustering coefficient	Dynamic
	Developments in the average distance between nodes	Dynamic
	Evolution of the structural pattern	Dynamic
Groups	Center and periphery	Structural
	Components	Structural
	Strong components	Structural
	Weak components	Structural
	Clicks	Structural
	m-slices	Structural
	k-core	Structural
Actors	Distance	Structural
	Centrality degree	Structural
	Closeness degree	Structural
	Betweenness degree	Structural
	Structural equivalence	Structural
	Brokers	Structural

Methods and materials

Aiming to map how the social network analysis has been developed in Brazil in the area of Information Sciente, Marteleto (2010) surveyed in the journal of Information Sciences classified in categories A and B in the list Qualis da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), researching the topics - information and social networks - no date restriction. In total, there were 41 papers from 2001 until 2009. From 41 papers only 11 (26.8%) used some type of indicator and analysis of patterns, and most papers aimed to discuss issues of conceptual character, not working directly with data samples. From 11 papers that used data samples for their research, only 3 (7.3% of total) included in his discussion some dynamic aspect of social networks, in terms of indicators and benchmarks presented earlier.

We performed a review of the 41 papers in order to assess what the key indicators used.

Method and Materials

In Figure 1 we presented a summary of the number of papers that uses the structural and dynamic indicators presented above.

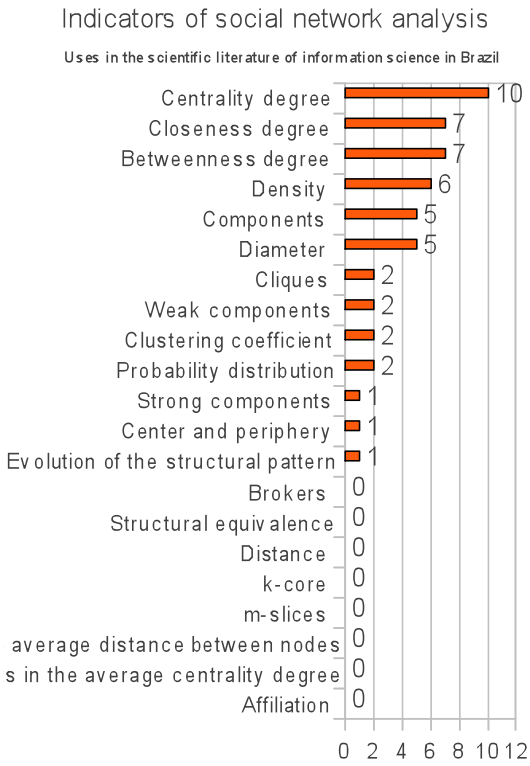

Figure 1. Distribution of indicators of network analysis Information Science papers in Brazil.

Discussion

Most of the scientific production uses only the structural network analysis, from the 11 papers that used data samples, 10 used indicators of centrality degree as the basis for their argument. Studies have generally used small samples of data, the largest database used consisted of 1812 papers for analyzing networks of co-authors (Silva & Parreiras et al., 2006), which explains in part the low use of dynamic analysis, which makes sense when we have large quantities of data for the analysis of evolutionary patterns. The number of studies and type of applications developed in the country may still be considered rare, and did not build a community issue and a comprehensive research, indicating the need for increasing the scope and scale of the studies.

Conclusion

We believe that one of the factors that helps to explain this investment even still partially in the use of network analysis is related to the types of data that researchers use in the Information Science in Brazil. The review lof the papers leads us to conclude that information scientists use small databases that do not generally represent expressive samples and have no major historical series. Another factor relates to training in the use of social network analysis. A certain number of researchers use the basic features of the structural analysis of networks, not yet incorporated into their repertoire of research new methods of analysis and characterization of dynamic patterns.

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