Methods of analysis of social networks in economic activity

Specialty 054 - Sociology	*Institute* Institute of Social and Humanitarian Technologies
Educational program Sociological Support of Economic Activity	*Department* Sociology and Public Administration (305)
Level of education Master's level	*Course type* Special (professional), Elective
Semester 1	*Language of instruction* English, Ukrainian

Lecturers and course developers

Biryukova Marina Vasylivna
Maryna.Biriukova@khpi.edu.ua
Doctor of Sociology, Professor, Associate Professor of Sociology and Public Administration Author of 120 scientific and methodological works, including three individual monographs and textbooks. Lecturer in disciplines: "Mathematical Methods in Sociology", "Workshop on Analysis of Sociological Data", "Computer Technologies for Organization of Sociological Disciplines", "Technologies of Social Design", "Methods of Multidimensional Analysis of Sociological Data". Work experience - 33 years..
More about the lecturer on the department's website
https://web.kpi.kharkov.ua/sp/profesors-ko-vikladats-kij-sklad/

General information

Summary

Social network analysis methods are necessary for identifying and understanding structural relations between various actors (individuals, organizations, countries, etc.) in modern society. These methods gained special importance with the development of Internet communications and the global spread of social networks. The course aims to acquaint students with the possibilities and theoretical and methodological foundations of social network analysis methods and to form basic skills in conducting network analysis in practice using special software (Pajek, Gephi, R or UCINET programming languages).

Course objectives and goals

Students' assimilation of the theoretical and methodological foundations of modern methods of social network analysis (social network analysis) in economic activity and the development of their research competencies.

Format of classes

Lectures, practical classes, independent work, consultations. Final control - test.

Competencies

GC05. Ability to estimate and support quality of the performed work.
SC01. Ability to analyze social phenomena and processes.

SC02. Ability to detect, diagnose and interpret social problems of Ukrainian society and the global community.

SC04. Ability to collect and analyze empirical data with the use of present-day sociologic research methods and digital technologies.

SC05. Ability to discuss the outcomes of social research and project in Ukrainian and a foreign language.

Learning outcomes

PR01. To analyze social phenomena and processes using empirical data and present-day concepts and theories in sociology.

PR02. To perform diagnostics and interpretation of social problems of Ukrainian society and the global community, of the causes for their arising and their consequences.

PR04. To apply scientific knowledge, sociological and statistical methods, digital technologies, specialized software for solving complex tasks in sociology and conterminal knowledge areas.

PR05. To carry out search for, to analyze and estimate the needed information in scientific literature, databases and other sources.

PR09. To plan and carry out scientific research in the field of sociology, to analyze its outcomes and substantiate the conclusions..

Student workload

The total volume of the course is 90 hours (3 ECTS credits): lectures - 16 hours, practical classes - 16 hours, self-study- 58 hours.

Course prerequisites

To successfully pass the course, you must have knowledge and practical skills in the following disciplines: "Mathematical methods in sociology", "Practical course on computer processing of sociological data", "Modern sociological theories", "Sociology of management", "Methodology and methods of sociological research" .

Features of the course, teaching and learning methods, and technologies

During the practical classes of the academic discipline, it is envisaged to explain the algorithm of performing practical tasks and their working out. The following methods of learning are used: explanatory-illustrative; reproductive (working out certain algorithms of data analysis); partially-search or heuristic method (when performing individual tasks). The project approach to learning, gamification, attention is focused on the use of information technologies in the organization of sociological research: project and team work, peer-to-peer, cases..

Program of the course

Topics of the lectures

Topic 1. The concept of social networks in modern sociological theory
The connection of network approaches in sociology with other modern sociological theories. The formation of the network form of interaction is a historical response to the situation of communication surplus. Society, in which networks are beginning to play a key communicative role, freely forms associations of people and interest groups. Unlike traditional social structures, networks are able to perceive and independently create new communicative configurations inaccessible to traditional institutions. The place of structural analysis (network theory) in modern sociological theory. Main schools: American, European, Canadian. Basic strategies of social reality research. Concepts of "network analysis" and "network theory": interpretation, differences, correctness of application. Theoretically, any online community can be considered a social network. A social network is formed by readers of a thematic community created on any blog service. Many professional communities have evolved into a people-finding and job-finding tool. Basic principles of structural analysis. Methodological base of network analysis. Network analysis as a system of research methods of social structure. Genesis of network analysis. Basic concepts.

Topic2. Structural analysis as a theoretical and methodological base of network analysis in sociology
Research traditions in the history of the development of structural analysis. Methodological principles of structural analysis and analytical principles of network analysis. Social network research and network analysis (common and distinct). Research using methods of network analysis and quantitative methods (common and different). Concepts of "research of social networks" and "network analysis": interpretation,

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features, research tasks, common and different. Classification of network analysis methods (R. Barth, St. Wasserman, R. Haneman). Research directions of social networks: structural, resource, normative and dynamic approaches. The application of social network analysis in the research of social communities (communities), market relations, social changes and social mobility. Peculiarities of the interpretation of the social network within the framework of various sociological concepts.

Topic3. Mathematical modeling of social networks

Peculiarities of mathematical modeling of social networks. Graph theory and linear algebra as the basis of network analysis methods. Two strategies for researching social networks. Classification of social networks (types and types of networks). Features of data collection and measurement in network analysis. Ways of presenting network data: graph-theoretic, algebraic and matrix representation. Basic concepts of graph theory: graph, directed graph, path, distance, signed graph, loaded graph, density, connectivity, reachability. Interpretation of graph vertices as actors, edges as connections, types of actors and types of connections. The concept of the ideal structure of interactions of each actor with other actors. Matrices, basic matrix operations. Matrices of images. Social network and social structure: definition, main characteristics, common and different. Basic concepts and scope of network analysis.

Topic 4. Basic theoretical concepts of network analysis

Peculiarities of measurement in network analysis. Basic concepts on which measurement in network analysis is based. Levels of measurement in network analysis, levels of social network modeling, and levels of analysis. Types of scales in network research. Determination of types of connections (content of relations), their number, intensity. The concept of a name generator. Basic theoretical concepts (according to R. Barth): range, salience, mediation, cohesion, equivalence. The concept of "visibility" of an actor in the network. Centrality and prestige as indicators of salience. Measurement of centrality (by degree, closeness, mediation and information). Prestige indices. Indicators of the actor's degree of power in the network. Peculiarities of calculating centrality measures using the UCINET program. Aggregation levels of actors in the unit of analysis: actor, connections, structure. Conceptual model of network analysis.

Topic 5. Methodological features of network data collection in sociological research

Network sampling. Delineation of the boundaries of general and egocentric networks. Approaches to assessing the representativeness of network data, the relationship between the assessment of representativeness and the type of network. Peculiarities of the design of survey instruments. Peculiarities of toolkit construction in egocentric network research. Defining a name generator. Comparative characteristics of name generators. Peculiarities of network data collection and analysis in GeneralSocialSurvey (GSS). R. Barth's methodology for building a toolkit in social network research. Peculiarities of using the SPSS package in data analysis of egocentric networks. Estimation of network size and density.

Topic 6. Instrumental specifics of the application of formal methods of network analysis

Methods of analyzing the visibility of the actor in the network: indicators of the centrality of the location of the actor in the social network, indicators of the prestige of the location of the actor in the social network, indicators of the power of the actor in the network, indicators of the centralization of the network. The concept of "node degree", methods of calculation. The concept of "network centralization": calculation of the indicator, interpretation. Methods of cohesion analysis. Bottom-up and bottom-up data analysis strategies. Classification of cohesion analysis methods, types of cohesive subgroups. Peculiarities of defining cohesive subgroups due to the types of relationships on the basis of which the network is built. Methods of analysis of cliques, n-cliques, k-plexes, LS-sets, blocks, components. Application of factor analysis and multivariate scaling to identify cohesive subgroups. Methods of equivalence analysis: methods of positional analysis, methods of role analysis. Interpretation of the concepts of "social position" and "social role", common and 8 different when establishing the positions and roles of actors in the network. Concept of network position and role. Definition of equivalence. Structural, automorphic, isomorphic and regular equivalence. Stages (steps) of positional analysis. Peculiarities of equivalence measurement. Methods of representing network positions: CONCOR, hierarchical cluster analysis, factor analysis. Levels of role analysis of social networks: individual roles, local roles, general role structure. Algorithms for determining network positions and roles (application of the UCINET computer program). Definition and basic concepts of block modeling. Types of blocks, features of defining blocks. Block coding criteria: full fit, zero block, alpha-density criterion, maximum and average value (for loaded data). Methods of evaluating the constructed model. Interpretation of the network structure highlighted on the basis of block modeling. Statistical methods of block modeling. Methods of

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range analysis. Calculation of the range of an individual actor. Range as a measure of the diversity of an actor's ties in a network. Range measures (according to R. Barth). Multiplexing of the network. Mediation analysis methods. Mediation as a characteristic of an actor's location in a network. The concept of structural holes and weak links. "The Power of Weak Ties." Indicators of oligopoly, coercion, hierarchy. Connection networks. Concept of cognitive social structure. Network representation of cognitive social structures. Construction of probabilistic models of cognitive social structures and evaluation of their parameters. General characteristics of connection networks. Actors and events. Bimodal representation of attachment networks. Peculiarities of analysis of local and positional properties of connection networks. Defining cohesive subgroups in attachment networks: sets of c-connected and q-connected actors. Application of correspondence analysis in studies of attachment networks.

Topic 7. Features of marketing in social networks

The influence of marketing in social networks on the modern consumer. Advantages and disadvantages of marketing in social networks. Using various social promotion tools on the Internet. Comparison of the effectiveness of SMM tools and traditional advertising. Overview of social networks and their role in promoting the site. Types of social networks, their detailed description and functional purpose. What is the basis of the choice of social networks for the promotion of various types of business. A marketing strategy is a principled and long-term decision with the appropriate methods and means that determine the benchmarks and direct individual marketing activities to achieve the set goals, which cover the elements of the marketing complex (product, price, place and promotion). They are global areas of activity that need to be specified through the planning of marketing activities, and are a kind of plan according to which the enterprise formalizes how it will achieve success, that is, the sale of products on a specific market. Rating of the most popular social networks in Ukraine Use of social networks in marketing strategies of enterprises.

Topic 8. Marketing strategy of social networks

The marketing strategy is the basis for the formation of the company's strategic priorities. The first three elements of the strategy reflect the essence of the so-called STP marketing (segmenting - targeting - selection of the target market; positioning - positioning). Social factors include demographic changes, changes in the style (way) of life, living conditions, educational and cultural levels, the level of urbanization, level of income after taxes. Will these changes affect the demand for the organization's goods and services? Do you need to make any adjustments to your marketing plan to achieve the best results? Technological factors mean a change in technology. Unprecedented acceleration of technological development in the 20th century. led to a sharp reduction in the life cycle of the product, makes drastic changes in distribution channels, the speed of delivery of more information to more people, etc. What is the impact of this coming "cashless" market? Marketing at the modern stage is becoming more operational, more expensive and risky. The current economic situation and prospects for its development are considered as economic factors. What is happening now in the economy - economic downturn or boom, what is the inflation rate, what are the interest rates, taxes (VAT), the minimum wage, the most important tariffs? Peculiarities of marketing in social networks as a component of the company's marketing strategy. Corporate mission, specific decisions regarding target market segments. Marketing strategy of differentiation and positioning Problems solved by marketing in social networks. Correct positioning of the community in social networks. Compilation of basic schemes for building an SMM strategy. How to build an SMM strategy: a step-by-step plan for promotion in social networks.

Topics of the workshops

Topic1. Social networks in the structure of modern society.

The essence, the concept of "social network". Global practice of social networks. The process of monetization of social networks. Peculiarities of the Ukrainian audience of social networks. Conditions of emergence, distribution and use of social networks

Topic2. Structural analysis as a theoretical and methodological base of network analysis in sociology

Research traditions in the history of the development of structural analysis. Social network research and network analysis (common and distinct). Concepts of "research of social networks" and "network analysis": interpretation, features, research tasks, common and different. Classification of network analysis methods (R. Barth, St. Wasserman, R. Haneman). The application of social network analysis in the research of social

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communities (communities), market relations, social changes and social mobility.Content of the workshop, if necessary.

Topic3. Mathematical modeling of social networks

Peculiarities of mathematical modeling of social networks. Features of data collection and measurement in network analysis. Ways of presenting network data: graph-theoretic, algebraic and matrix representation. Basic concepts of graph theory: graph, directed graph, path, distance, signed graph, loaded graph, density, connectivity, reachability. Interpretation of graph vertices as actors, edges as connections, types of actors and types of connections. Matrices, basic matrix operations. Matrices of images.

Topic 4. Basic theoretical concepts of network analysis

Peculiarities of measurement in network analysis. Basic concepts on which measurement in network analysis is based. Levels of measurement in network analysis, levels of social network modeling, and levels of analysis. Types of scales in network research. Determination of types of connections (content of relations), their number, intensity. Prestige indices. Indicators of the actor's degree of power in the network.

Topic 5. Methodological features of network data collection in sociological research

Network sampling. Delineation of the boundaries of general and egocentric networks. Approaches to assessing the representativeness of network data, the relationship between the assessment of representativeness and the type of network. Peculiarities of the design of survey instruments. Peculiarities of using the SPSS package in data analysis of egocentric networks. Estimation of network size and density.

Topic 6. Instrumental specifics of the application of formal methods of network analysis

Methods of analyzing the visibility of the actor in the network: indicators of the centrality of the location of the actor in the social network, indicators of the prestige of the location of the actor in the social network, indicators of the power of the actor in the network, indicators of the centralization of the network. The concept of "node degree", methods of calculation. The concept of "network centralization": calculation of the indicator, interpretation. Methods of cohesion analysis. Bottom-up and bottom-up data analysis strategies. Classification of cohesion analysis methods, types of cohesive subgroups. Methods of analysis of cliques, n-cliques, k-plexes, LS-sets, blocks, components.

Topic 7. Features of marketing in social networks

The influence of marketing in social networks on the modern consumer. Using various social promotion tools on the Internet. Overview of social networks and their role in promoting the site. What is the basis of the choice of social networks for the promotion of various types of business.

Topic 8. Marketing strategy of social networks

The marketing strategy is the basis for the formation of the company's strategic priorities. Corporate mission, specific decisions regarding target market segments. Problems solved by marketing in social networks. Compilation of basic schemes for building an SMM strategy

Topics of the laboratory classes

Laboratory classes are not provided.

Self-study

Independent work on the course consists of students' independent study of topics and issues that are not taught in classes, and completion of individual tasks. Students are also recommended additional materials (videos, articles) for independent study and analysis.

Course materials and recommended reading

Hogan B. AnalysisofsocialnetworkinInternet / B. Hogan // SageHandbookofOnlineResearchMethods, ThousandOaks, CA: Sage. – 2008.
Linton C. Freeman The Development of Social Network Analysis: A Study in the Sociology of Science// https://www.amazon.com/Development-Social-Network-Analysis-Sociology/dp/1594577145
Ryan Light (ed.)The Oxford Handbook of Social Networks //
https://doi.org/10.1093/oxfordhb/9780190251765.001.0001

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Assessment and grading

Criteria for assessment of student performance, and the final score structure

100% of the final grade consists of the results of the assessment in the form of credit (20%) and current assessment (80%). Assessment: performance of the calculation task and oral report. Current assessment: 8 online tests on topics (40%), individual assignment (20%) and test (20%)

Grading scale

Total points	National	ECTS
90–100	*Excellent*	*A*
82–89	*Good*	*B*
75–81	*Good*	*C*
64–74	*Satisfactory*	*D*
60–63	*Satisfactory*	*E*
35–59	*Unsatisfactory (requires additional learning)*	*FX*
1–34	*Unsatisfactory (requires repetition of the course)*	*F*

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.

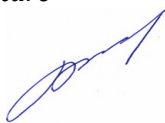*Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website:http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/*

Approval

Approved by	*Date, signature*	*Head of the department*
	30.06.2023	Vladimir MOROZ

	Date, signature	*Guarantor of the educational program*
	30.06.2023	Yuri KALAGIN

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