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Tamara Besednjak Valič & Erika Džajić Uršič

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RESEARCH ARTICLE

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Exploring the development of Slovenian sociological science: ontology analysis of scientific bibliographical data

Tamara Besednjak Valič [a,b,c] and Erika Džajić Uršič [a,b,c]

[a]Rudolfovo - Science and Technology Centre Novo mesto, Novo mesto, Slovenia; [b]Faculty of Information Studies in Novo Mesto, Novo mesto, Slovenia; [c]School of Advanced Social Studies in Nova Gorica, Nova Gorica, Slovenia

ABSTRACT

One way to demonstrate the research focus and progress in a scientific field is through scientific publishing. Scientific articles are a starting point for analyzing the main topics, concerns, and author networks within a specific domain. This way, we can track the development of the discipline. Through publications, researchers create narratives that reveal the direction and development of specific disciplines. These narratives help form scientific paradigms. The main goal of this article is to detect and discuss the development of predominant scientific topics in particular period of Slovenian sociological science. The analysis starts with the emergence of the transition process from non-democratic Yugoslavia towards the independent Republic of Slovenia and onwards to contemporary times. We analyzed 774 scientific articles published between 1984 and 2022 in the journal Social Science Forum, which had an impact factor of 0.175 in 2022. The findings indicate that Slovenian sociologists' research interests reflect historical transformations – from the transition to independence to EU accession. We use ontology-based analysis with OntoGen to track these thematic shifts systematically. This positions our work as a localized application of established text-mining approaches. The method applied allows us to uncover patterns of knowledge production tied to key sociopolitical moments in Slovenian history.

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Slovenian sociology; bibliographical data; OntoGen; concept; ontology creation

Introduction

Knowledge creation has always been a societal process (see Kastrin et al., 2017). Human understanding of reality shapes the sense of knowledge, while understanding knowledge also helps us understand reality.

Building ontologies from published texts is essential for understanding the development of scientific narratives. The process allows researchers to systematically identify

CONTACT Erika Džajić Uršič erika.ursic@fuds.si; erika.ursic@rudolfovo.eu Rudolfovo - Science and Technology Centre Novo mesto, Podbreznik 15, Novo mesto 8000, Slovenia; Faculty of Information Studies in Novo Mesto, Ljubljanska cesta 31a, Novo mesto 8000, Slovenia; School of Advanced Social Studies in Nova Gorica, Gregorčičeva ulica 19, Nova Gorica 5000, Slovenia

and organize the key concepts/themes/topics and relationships within a particular domain of study. In the context of sociological research, ontology refers to a structured representation of knowledge that defines key concepts, relationships, and categories within the field. Ontologies help formalize and organize sociological discourse by mapping how concepts interconnect, evolve, and contribute to theoretical developments over time. Unlike simple keyword-based analyses, ontology construction offers a hierarchical framework that categorizes topics based on their semantic relationships, allowing a more systematic and meaningful examination of thematic trends. This approach has been widely used in various domains, including social sciences, to track conceptual evolution and knowledge structures (Gruber, 1995; Lavbič & Krisper, 2005).

A topic ontology consists of a set of concepts (or topics) and a set of relations between the concepts that best describe the data field (Fortuna et al., 2006). Ontology concepts are the main components organized in independent hierarchies and linked together by relationships and attributes, as well as practical purposes, models, and data from many sources (Magioglou et al., 2014).

Ontologies have been developed to effectively organize and share knowledge across domains and disciplines in knowledge management (Polenghi et al., 2022). In our case, for instance, ontologies are used to study the evolution and advancement of scientific fields over time. Specific rules that encourage clarity, consistency, and flexibility in knowledge representation must be followed to create successful ontologies. Gruber (1995) has identified several such principles, including using formal definitions, clear and unambiguous words, and separating domain-specific information from generic knowledge. It is equally necessary to include the historical and cultural background of the scientific subject being investigated when creating ontologies for scientific analysis. This entails recognizing the social and political elements that have impacted the discipline's evolution and comprehending the main concepts, theories, and approaches that have molded it. By developing ontologies that capture the key concepts and relationships within a scientific discipline, we gain a better understanding of the significant key concepts and relationships that have emerged over time in the Social Science Forum. The same goes for the theoretical and methodological frameworks that have been used to investigate these themes (Gruber, 1995; Lavbič & Krisper, 2005).

In the context of Slovenian sociology, ontologies can provide valuable insights into the dominant topics and addressed research question(s). Within the given study, constructing an ontology of the published texts in Slovenian sociological science provides a valuable resource for researchers interested in understanding the evolution of sociological research in Slovenia. We can trace the evolution of sociology from the time of socialist Yugoslavia through Slovenia's independence and democratization by nesting the findings in a wider socio-political context. This perspective helps us understand how a particular research domain both responds to and shapes the realities of social change that Slovenia experienced in the period between 1980s to 1990s and onwards.

For the present discussion, two main research questions were formed as follows:

RQ1: What are the most prominent themes occupying the publishing interest of Slovenian social scientists in the period from 1984 to 2022?

RQ2: To what extent have the predominant scientific topics in Slovenian sociological science evolved from the emerging transition from non-democratic Yugoslavia towards the independent Republic of Slovenia to contemporary times?

We analyzed an original dataset from the Slovenian online bibliographical system COBISS. After data cleaning, the dataset includes 774 original scientific articles published in the Social Science Forum between 1984 and 2022. The empirical part of this article thus aims to supplement the existing hits and literature overviews of the period of 39 years. The methodology consists of adopting co-occurrence analysis and topic modeling as two text-mining techniques to extract domains, thus allowing unique computer algorithms to obtain and display meaningful models from the input data (Fayyad et al., 1996; Sebastiani, 2002). We used the OntoGen (Fortuna et al., 2007) topic ontology editor to separate the dataset into distinct domains. Ontology construction is a well-researched area, and researchers use various techniques, such as natural language processing (Ponzetto & Strube, 2007), machine learning (Suchanek et al., 2006), and information retrieval (Cunningham, 2006). The same can be said of using machine learning for text classification.

Using both primary and secondary data, the analysis explores the evolution of Slovenian sociological science, particularly in the post-Yugoslav period and beyond. A key contribution of this study is the ontology built from published article titles and keywords using OntoGen, a Computer Software tool (Fortuna et al., 2007). It enabled us to create semi-automatic ontologies. Ontology constructed this way offers a unique possibility to deliver answers to our predominant research questions. A prior study by Kastrin et al. (2017) has already undertaken an extensive bibliometric analysis of Slovenian research using bibliographic networks, including author-based mappings. Given this comprehensive effort, we opted not to replicate their approach but to complement it by focusing on ontology construction within a key Slovenian sociology journal.

We acknowledge that some computational methods for analyzing scientific literature in sociology already exist. Studies such as Kastrin et al. (2017), Moody and Light (2006), Lindstedt (2019), Maltseva and Batagelj (2020), and others, used computational techniques to analyze keyword relationships, cluster topics, and track research evolution. Using a semi-automated software tool for constructing ontologies is not quite a novel approach in social sciences. However, our study builds on these prior methodologies by applying a slightly different approach: the ontology we constructed is discussed within a broader historical context of Slovenian historical development in the intensive period of social transition from socialist to more liberal society.

Social ontologies in current literature – bibliometric overview

For illustrative purposes of the state of the art in adopting the creation of ontologies in existing literature, the bibliometric analysis was done using the VOSviewer tool (Jan van Eck & Waltman, 2023). The initial query included simple terminology that was applied to the TITLE-ABS-KEY search. The keywords: 'sociology' AND 'ontology' AND 'theory' AND 'social' AND 'ontology' without a time frame yielded a total of 284 results. The desire was to reflect on the state of the art of the literature. The search focused on academic outputs published in the English language. In this phase, no distinctions were

made as to whether the published works were journal articles or book chapters; however, the condition was that they were peer-reviewed.

A bibliometric analysis of the field is presented, and the visual representations, including trend lines and thematic maps, are explored to understand further the dynamics of work done in social ontologies. This way, we can distinguish further the nature of our work with already conducted ontology studies. We utilized VOSviewer (Jan van Eck & Waltman, 2023) to generate the multifaceted visualizations of the researched field in question (see also Rame et al., 2024). The following visualizations were prepared:

- Network visualization, Figure 1(a), offers an overview of the constellation of key terms. The lines among terms show the interconnectedness between different researched keywords. The larger circles represent keywords that are more present in the literature, as in our case is noted from the centrality of the terms 'social science', 'philosophy' and 'foundation' and 'debate'. The analysis also reveals the importance of codependent topics like 'process', 'practice', 'model', 'relationship', 'perspective' and 'author'.
- Overlay visualization, Figure 1(b), offers a view of the evolution of key terms over time. Namely, the brighter colors show relatively new topics. In our analysis, such topics evolve around: 'philosopher', 'scholar', 'methodology', 'social science', and 'perspective'.
- Cluster visualization, Figure 1(c), offers a view into clustered topics. Three clusters are detected, and the most condensed one discusses the social science through

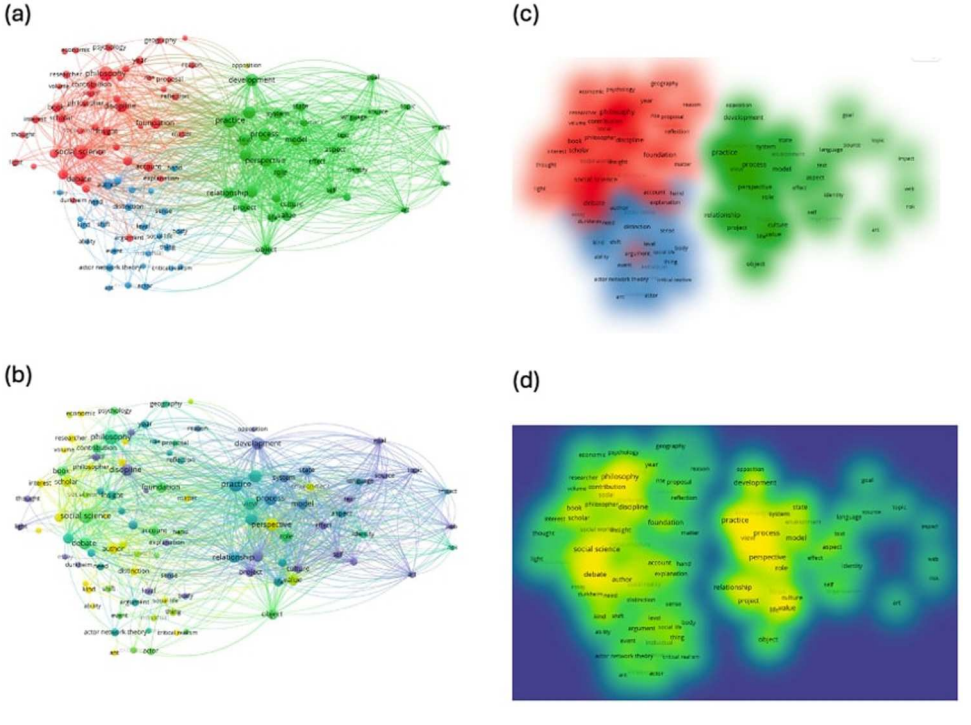

Figure 1. Comprehensive bibliometric analysis. (a) Network visualization. (b) Overlay visualization. (c) Cluster Visualization. (d) Density visualization (source: authors own, 2025).

philosophical approaches, evolving around key terms 'discipline', 'reflection', and 'foundation'. The second cluster discusses social science through 'actor network theory', 'distinction' and 'author'. The third cluster evolves around 'processes', 'models', and 'relationship'.

- Density visualization, Figure 1(d), demonstrates the density of research and so-called hotspots of research activity (see also Rame et al., 2024). For our analysed case, these are: 'social science', 'debate', 'philosophy', 'practice', 'process', and 'perspective'.

The visualizations in Figure 1 demonstrate and highlight the established interconnections between researched topics. As we can see, the main discussions revolve around the three main clusters that are densely connected. However, in the majority of instances, the main focus of conducted research deals with questions on how to understand social science through the prism of philosophy and epistemology relating to understanding of practices, processes and relationships. The bibliometric analysis shows a great interest in computational sociology through ontology creation, which focuses on slightly different aspects as present research is doing.

While previous studies have successfully utilized computational techniques such as topic modeling and network analysis, this study differentiates itself by applying ontology-based modeling to Slovenian sociology. Unlike Lindstedt's (2019) STM approach, which captures thematic shifts in broader social science literature, our method constructs an ontology to systematically define relationships between key sociological topics in a national context. Furthermore, whereas Moody and Light (2006) and Maltseva and Batagelj (2020) focused on broader disciplinary patterns, our approach provides a detailed mapping of how Slovenian sociologists have shaped and engaged with key research themes. This perspective offers a valuable localized contribution to the existing literature on sociological knowledge production, particularly by capturing topic transitions linked to Slovenia's historical and political transformations.

Slovenian science – a research subject supported by developed IT infrastructure

We detect numerous works analyzing the development and particularities of Slovenian science. Besides researchers investigating the collaboration field (Ferligoj et al., 2015; Karlovčec et al., 2016; Karlovčec & Mladenić, 2015; Kronegger et al., 2011; Perc, 2010), authors also investigated interdisciplinary (Lužar et al., 2014) and citation distribution (Perc, 2010). The scientific performance of Slovenian Bologna PhD program graduates was examined regarding their PhD program completion (Rojko et al., 2020), with Rojko and Lužar analyzing their performance across the disciplines (Rojko & Lužar, 2022). However, no research has been conducted on a particular scientific field's thematic development and grouping. Following this, the present research focuses on sociology, with our starting point being a thematic analysis of published articles in the selected Slovenian social science journal.

All cited research, including ours, structured their database through Co-Operative Online Bibliographic System and Services (COBISS)[1] and Slovenian Current Research

Information System (SICRIS).[2] The bibliographic system catalogs all publications published in Slovenia. COBISS was introduced in 1991, and SICRIS followed in 1999. Today, both systems are the primary, high-quality public source of information on publications. Both systems are directly linked to the Slovenian Research And Innovation Agency (ARIS)[3] databases of research organizations, researchers, research projects, programs, and research outputs. Since 1998, all active Slovenian researchers and organizations have been included in the SICRIS database. In 2003, IZUM included the CONOR database, which identifies all bibliographic records correlated to the same author under all possible options of their name and co-authors of the works, thus identifying the degree of international collaboration. Co-authors who are not recorded in SICRIS are very certainly foreign co-authors (Kastrin et al., 2017).

Development of sociology through particular sociological narratives in post-WWII Slovenia

Slovenian science – milestones

The made-up of Slovenian research community is coherently described by Kastrin et al. (2017), where selected milestones are emphasized. Among those, we mention the Adoption of Research Communities Act in 1974, the death of the longstanding Yugoslav president Tito in 1980, and Slovenian independence in 1991. In 2004, Slovenia joined the EU and NATO, and Slovenian Research Agency was formed and put in charge of creating operational research policy (Kastrin et al., 2017).

Social sciences, particularly Sociology, had a less straightforward path. Following the analysis of Adam and Makarovič (2002), we note the first Slovenian sociological publications were published in the 1920s and 1930s. However, those publications are characterized by their pre-empirical status. The first sociological discussions reappeared under the historical materialist perspective (Adam & Makarovič, 2002) and in the mid-1950s, sociological science became utilized in constructing a national imagination. In the subsequent decades, sociology became institutionalized, with the first infrastructure established.[4] The period 1965–1969 was characterized by prevailing Marxist ideology in social sciences, and the communist party seemed to treat the Faculty of Social Sciences as its dependence while also being receptive to new ways and approaches opening the Yugoslav research sphere (Mlinar, 2015). Inevitably, the development of sociological practice led to inconsistencies with the official Marxist ideology, as Adam and Makarovič (2002) write, causing confrontations with the ruling regime. In the decades following the 1960s, some international research themes included topics of industrial democracy and spatial and urban sociology. Later, the topics of the role of family in Europe, the meaning of work, and quality of life and welfare appeared (Adam & Makarovič, 2002). Political control was substantial over the work of researchers in the 1970s, with the central censorship of several researchers/teachers due to their alleged ideologically inappropriate influence on students (ibid). In the 1980s, the ideological control weakened, enabling new concepts to emerge at the forefront of research. Adam and Makarovič (2002) detected concepts of civil society, modernization, functional differentiation, social mobility and stratification, and public opinion research. As reported by different authors, a theoretical turning point occurred in 1989 with the collapse of the communist regime (Bernik &

Rončević, 2001), setting up the possibility for a more fragmented and multi-paradigmatic situation. However, in the last period of the former regime, pressures on society started to soften gradually, and a niche for a more non-conformist activity gradually emerged (Valič et al., 2023). After the independence of Slovenia, the range of topics became larger. More sociologists were internationalized, whilst the Faculty of Social Sciences underwent no significant structural change (Adam & Makarovič, 2002, p. 237).

The analyzed period between 1984 and 2022 is essential, as it is the period when sociology played a significant role in the Slovenian national made-up. During this period, but especially between 1987[5] and 1991, Slovenia faced a number of structural changes that significantly impacted the research society and various economic crises, including changes in the currency system and the political system and research structure (Kastrin et al., 2017).

Methodology and data description

Data construction

In Slovenia, several scientific journals are published regularly, including *Teorija in Praksa*, *Anthropos*, *Socialno delo, and Družboslovne razprave* (Social Science Forum). Each journal tends to emphasize specific methodological approaches, theoretical paradigms, or social science subfields – some of which are less represented in the Social Science Forum. For instance, *Teorija in Praksa* often engages with policy-oriented and applied research, while *Anthropos* leans toward philosophical and anthropological perspectives. Given its focus on sociology and sociologically grounded research, the Social Science Forum is a justified choice for this study. Additionally, previous bibliometric analyses have shown that the Social Science Forum aligns well with major thematic trends in Slovenian sociology (Ferligoj et al., 2015; Kastrin et al., 2017).

The dataset was compiled using the COBISS online database, from which we retrieved all articles published since 1984 due to its high reliability.

The database for the analysis was constructed in two main phases: firstly, using COBISS as a library information system, we retrieved a total of 1157 published entries/documents. These included original scientific articles, reviews, introductory texts, and other contributions. For analysis, we selected only the entries classified as original scientific articles. Following this method, we detected 840 entries. We examined the entries by specific title, and the system pre-assigned keywords[6], and year of publication. As we were not interested in author co-occurrence, the data on authors was not included in the database at this stage. Further title and keyword screening enabled the final selection of the 774 original scientific publications. The final database includes 774 eligible articles and 9,308 relevant keywords. The process is visualized in Figure 2.

In the second phase, we organized the entries in the database based on the year of publication, title, and keywords. The cut-off of 1984 marks the first year of the Social Science Research Forum. The data was exported in plain text format using a text editor, ignoring grammar and word order to ensure neutral processing (Džajić Uršič, 2020). The file with.txt end (all units considered for the analysis are presented as rows) was imported into the OntoGen computer software tool.

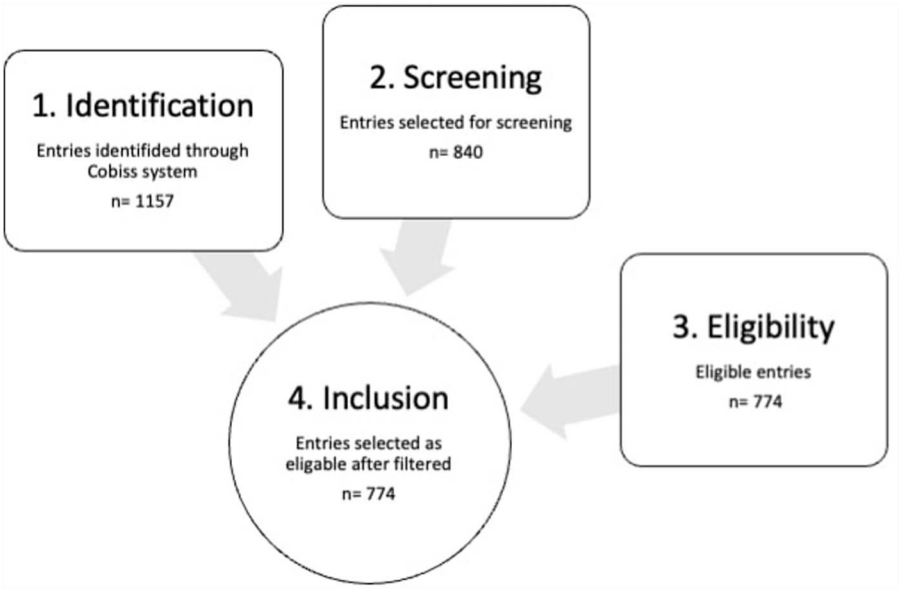

Figure 2. Selection of the entries from the COBISS system (authors' own, 2024).

Ontology construction adopting ontogen

We used the OntoGen software tool for text analysis (Fortuna et al., 2007). OntoGen supports both automatic and semi-automatic data processing and visualization. It allows the presentation of the findings through content hierarchies or ontologies. In our case, ontology is a variety of concepts within the timeframe of the publications in the Social Science Forum that may be classified and demonstrate some basis, rationale, and general aspects of reality (Lavbič & Krisper, 2005). For instance, Structural Topic Models (STM) have been widely used in computational sociology to infer latent thematic structures in large corpora by statistically estimating topic distributions over documents (Lindstedt, 2019). However, this study adopts ontology construction as a more suitable methodology for analyzing the evolution of Slovenian sociological research. Unlike STM, which is designed for unsupervised topic discovery in unstructured text, ontology construction allows for a hierarchical organization of sociological concepts, ensuring a structured, theory-driven representation of research themes over time (Fortuna et al., 2007). Since the dataset consists of curated scientific publications rather than raw textual data, STM's probabilistic inference would be unnecessary, as key concepts are already explicitly defined within the scientific discourse. While STM performs optimally on large, diverse corpora, this study focuses on a specialized dataset of 774 articles, making ontology construction a more precise and context-aware approach. Additionally, ontology-based modeling facilitates the explicit representation of conceptual relationships, which STM lacks, thereby providing a more coherent and interpretable framework for tracking thematic evolution in Slovenian sociology.

Ontology-based text analysis relies on automated keyword extraction, yet refining these outputs is crucial to ensure conceptual coherence and domain-specific relevance

(Fortuna et al., 2007; Lavbič & Krisper, 2005). While OntoGen automatically clusters textual data and assigns keywords based on statistical co-occurrence, raw computational outputs often include ambiguous, overly generic, or redundant terms (Suchanek et al., 2006). Therefore, to enhance semantic clarity and thematic accuracy, a manual review and refinement process was implemented following established best practices in ontology construction (Gruber, 1995). The manual keyword refinement followed a structured, multi-step approach designed to improve topic categorization while mitigating subjectivity:

(1) Extracted keywords were evaluated for their alignment with sociological discourse. Non-specific or generic terms such as 'various' and 'system' were removed as they did not contribute to the meaningful categorization of research themes (Cunningham, 2006).
(2) Synonymous or closely related terms were merged under a single representative category to reduce redundancy. For example, 'social structure' and 'societal organization' were consolidated under 'social structure,' ensuring terminological consistency (Lavbič & Krisper, 2005).
(3) Keywords were cross-referenced with their respective article titles and abstracts to confirm their thematic accuracy. This step ensured that automatically generated terms were not misclassified or assigned to unrelated conceptual domains (Ponzetto & Strube, 2007).
(4) Erroneous, excessively broad, or computationally misclassified terms were eliminated. Keywords that lacked substantive content (e.g. 'data,' 'analysis') but were frequent in metadata fields were systematically excluded to refine topic precision (Sebastiani, 2002).

Discrepancies in classification were resolved through consensus discussions following expert-driven ontology validation in the sociology (Polenghi et al., 2022). Integrating automated text clustering with manual expert evaluation ensures that the final ontology retains both computational objectivity and interpretative depth, strengthening the reliability of thematic categorization in sociological research.

After importing the file into OntoGen as text (.txt file), OntoGen recommended keywords and assigned instances automatically. The procedure followed the selection between two choices: accepting it as a whole or partly. We rejected the recommended conclusions of the text analysis presented automatically and set them according to the pre-conducted title and abstract review of articles. To build ontologies, the OntoGen employs a group sorting approach with the *k-means* algorithm, which divides input items into *k*-groups based on the similarity of components and seeks the most acceptable value of the parameter *k* for the presented ontology. In the case of relations between our concepts, we used *subconcept-of* ***relation***.

The *k*-means clustering algorithm is an iterative strategy that splits a set of instances $X = \{x1,2, \ldots ,xn\}$ into k clusters $C = \{c1, c2, \ldots ,ck\}$ using the formula (1) as described below by Fortuna (Fortuna, 2011, p. 25):

Input: *a set of instances X, similarity measure S, number of clusters k*
Output: *a set of clusters C*

Procedure: *Set initial k centroids*
Repeat *each instance x to the cluster maximizing*

$$\boldsymbol{arg\ max_{Ci\in C}}\, wS(\boldsymbol{\mu x}_i \cdot \boldsymbol{\chi}) \tag{1}$$

Update *the centroids* $\mu = \frac{1}{\boldsymbol{c_i}} \sum_{\boldsymbol{\chi \epsilon c_i}} \boldsymbol{\chi}$

Until *the assignment of instances to clusters has not changed.*
The number of clusters k is specified and supplied to the algorithm as a parameter, and each cluster is represented by a centroid vector, which is a mean of all member instances.

We decided to use the functionality of the *k*-means clustering algorithm (with $k = 7$) to produce various sets of segments corresponding to different keywords and then automatically and manually group them into meaningful domains based on our title and abstract review of articles. The selection of the optimal number of clusters (k) is a critical step in ontology construction, as it determines the granularity of topic differentiation. In this article, we opted for $k = 7$, based on a balance between conceptual interpretability and the granularity of topic differentiation. This choice was guided by an iterative evaluation of clustering results, where different values of k were tested, and the outputs were assessed in terms of coherence, topic distinctiveness, and semantic relevance. Rather than relying purely on statistical cluster validity indices, which assess numerical cohesion and separation but may not capture thematic relevance in text-based analysis, we prioritized a domain-driven approach. This involved manually verifying that each generated cluster meaningfully reflected distinct sociological themes without excessive fragmentation. Higher values of k resulted in an over-segmentation of themes, leading to artificial topic divisions, whereas lower values caused significant overlap among distinct thematic categories. The selection of $k = 7$ thus ensured that the clusters were both homogeneous in composition and representative of major sociological research trends, aligning with prior methodologies used in thematic ontology construction (Fortuna et al., 2007). In the final step, based on the commands given, OntoGen suggested relations, concepts, and names that are automatically assigned to the concepts. It allows a good overview of the ontology construction of the data through concept browsing and the final *k*-means 2D grouping approach visualization (Fortuna et al., 2007, p. 1).

Results

Early themes (1984–2022), included *civil society*, *democracy, and state* – predominating from 1984 to 1987 to topics of modernization, *family,* and *social mobility* predominant in 1989. The topic of modernization continued to be discussed in 1990, as did the topic of *family* and *equality* (connected to the topic of social mobility from the previous year). When building ontologies with OntoGen, we decided to have an optimal parameter k = 7 (number of text groups) relative to the input size of the files, which, in our research, contained 774 documents. Then, we sought intermediate settings that OntoGen showed us as homogenous as possible but also appropriately representative groupings of titles. OntoGen identifies these title groupings with ideas or keywords.

After creating an ontology using 7 automatically generated groups of concepts (parameter value $k = 7$) at the first classification level of article titles, we manually added 4

group subconcepts to each (parameter value $k = 4$). OntoGen suggested the subconcepts, but we checked and corrected keywords manually. The suggestion of the keywords is one of the OntoGen features, and it is a regulated way of introducing ideas based on the active learning method *SVM* (Support Vector Machine). The idea behind this function is that a user may tell or write about a concept and certain documents linked to it. OntoGen's working language was Slovenian, but all the concepts listed in Table 1 were translated into English. The results below show seven (7) main *k*-groups of concepts of the constructed ontology, their extracted words, the number of related documents from all included (774) and the most relevant topics highlighted.

Table 1 shows that in the timespan between 1984 and 2022, several topics covered by Slovenian sociologists were recognized in the Social Science Forum. These topics range from former *society, republic, politics, life* … , – related discussions to broader issues concerning social life … – predominating in 1987 to topics of *society, country, women, ethics, and family* predominant in 1989. In 1990 and after, it continued with topics such as *identity, concepts, communication, public, urban, public, Islam, values, theories, mobility,* and *art. Because of the similarity in document titles, assigning words to a single subject is not feasible, leading to a broader range of concepts*. On the other hand, we can use the map to find the primary content sub-areas and add them as subconcepts to the ontology. This technique, also known as a map of divided words (Gašević & Hatala, 2005), is elaborated in Figure 3. Due to the uploaded sources, the case was elaborated in OntoGen in Slovene language.

Table 1. Overview of first-level K-groups in OntoGen analysis.

No. of first level of *k*-groups	Group of concepts	Extracted Keywords	No. of related documents	Most relevant topical clusters
1	society, social, development of civil society	society, social, social, social, development, civil, of, civil society, social, theory	154	society, republic, politics, life, country, women, ethics, family, identity, concepts,
2	politics, EU studies, Yugoslavia, Europe	administrative politics, life, eu, state, culture, Yugoslavia, studies, Europe.	115	communication, public, urban, public, Islam, values, theories, mobility, art, nationalism, socialist society,
3	culture, power, media	us, for, social, sciences, culture, social_sciences, sociology, power, as, media	90	individualization in connection to modernization, welfare state in connection to gerontology,
4	Slovenia, life, theories, methods	Slovenia lives, theories, analysis, republic_Slovenia, republic, theory, sociological, research, methods	117	quality of life, social exclusion, equality, media, civil society, feminism, film theory.
5	history, identity, women, sociology, time	between, Ljubljana, sociology, history, Slovenia, identity, social, Slovenian, time, university	133	
6	democracy, philosophy, family, Europe	as, political, reviews, democracy, reports, report reviews, philosophy, family, Europe, political.	96	
7	work, families, networks, the elderly	political, reviews, democracy, reports, report reviews, philosophy, family, Europe, political	96	

Columns in Table 1 overview seven first-level K-groups identified through OntoGen analysis. The relevant concepts, extracted keywords, the number of related documents, and the most relevant topical clusters are presented for each group (source: authors own, 2024).

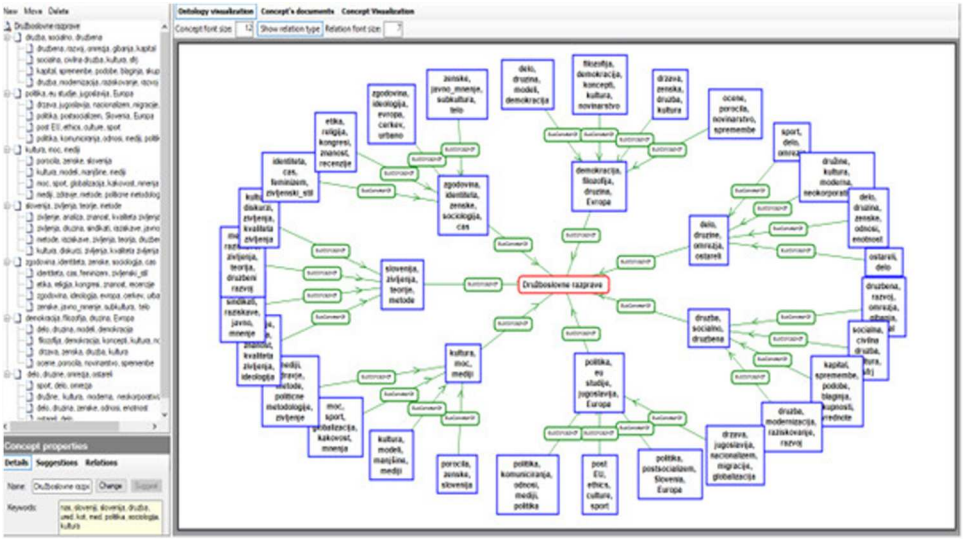

Figure 3. Ontology details visualize concepts around the root concept of the Social Science Forum (source: authors own, 2025).

Figure 3 displays a node-based ontology map generated through OntoGen. The root node 'Social Science Forum' is at the center, where seven main clusters radiate outward. Notably, *feminism* appears strongly interconnected with *civil society*, *identity*, and *education*. Other prominent themes – such as *democracy, social mobility*, and *family* – are also visible as sub-nodes within their respective clusters, illustrating how key sociological concepts overlap and evolve across the publication timeline. *Feminism*, for example, is notably linked to discussions on *education, equality,* and *postmodernism*, illustrating its integration across thematic clusters.

However, getting more detailed and analyzing each of the subconcepts within the new topics that emerged in 1990, there is a topic of *nationalism*, *socialist society*, and *individualization* in connection to *modernization*. Among new topics in the same year, there are also topics of the *welfare state* concerning *gerontology* and *free time*. 1992 is again very rich in discussed topics, with the majority connected to topics discussed in previous years (*post-socialism*, the *welfare state*, *free time*, connected to lifestyle, and *in/equality*). New themes emerged around *sociological theory* (with the sub-topic of *postmodernism*) emerges. In 1997, the topic of *sociological theory* discussed *postmodernism* and *feminism*, as well as the topic of the *welfare state.* By 1997, discussions also linked the welfare state to *social exclusion* and *inequality*. We notice the return of the topic of *gerontology*. The topic of lifestyle remains and connects to the previous period. The topic of *quality of life* has evolved from the topic of lifestyle from 1997 and continues to be present in 2007, except that it mentions the sub-topic of *family*.

Additionally, *equality*, which was connected to *social exclusion* in 1997, discusses *social capital* and *civil society*. In this way, we can see the revival of the topic of *civil society* from 1984. In 2007, the topic of *feminism* remained and continued until the year 2022. It was in 2017 that the topic was upgraded to the subtopic of *film theory*. The topic of post-socialism surfaced in 2017, and it can be connected to its emergence in 1992 roughly.

We witnessed the dynamic with rarer social themes covered between 1984 and 2022, during Slovenia's most challenging period. Despite the variation, several core topics consistently emerge – *social/equality, lifestyles, feminism,* and issues concerning the *welfare state* – which will likely remain prominent in future publications.

Discussion

The developed ontology map illustrates the dispersion and interconnections among the identified concepts. The concept visualization provides a dynamic overview of the themes discussed. Our ontology analysis revealed seven major thematic clusters: *civil society, feminism, sociological research, and administrative politics*.

The most populated group centers on *society, social and the development of civil society*. Related keywords include *society, social, development, civil society*, and *social theory*. With 157 connected documents, this cluster reflects the highest level of research interest. This finding is not surprising, considering the wider environmental and societal change happening in Slovenia in the late 1980s and the beginning of the 1990s. Transition to democracy was a tremendous topic preoccupying the researchers in the mentioned period. The sociologists, already experiencing censorship pressures and legal persecution (e.g. the case of Jože Pučnik), were using the platform of scientific writing to discuss the questions dealing with changes in society.

Another major cluster focuses on identity, feminism, and history – representing the second most prominent area of research. Themes related to *Slovenia*, interlaced with the topic of *identity* again, are noted and understandable to be present. This can be explained as a natural continuity of research interest, which managed to steed from the topic of society and societal change in a broader sense to more intimate topics of *identity* and *feminism*. In this context, the alignment is noted with the results of the bibliometric analysis as the topics of sociology related to psychology are observed. The topics elaborated in the Slovenian scientific journal show the same research focus in wider academic communities.

Somewhat unexpectedly, the theme of higher education and the university emerged, likely reflecting institutional changes during the transition period. The emergence of the topic can be linked to the event where. the authorities dismissed the whole Department of Philosophy at the Faculty of Arts (University of Ljubljana) after the process against Jože Pučnik (Mlinar, 2015, p. 83) exercising harmful actions towards academic liberty in the 1980s. A total of 133 documents are connected to the listed topics.

The third most populated group of concepts is present in 117 documents. The concepts of this group deal with *life in Slovenia* on one hand and *sociological research methods* on the other. Again, the concepts align with wider sociological events of the time. The newly established country and its sociologist research community is interested in the perspective of empirical research. The newly emancipated sociology also discusses the rules of methodological research.

Lastly, the final group, with 115, deals with policy topics, from general concept politics to *EU studies*, *administrative politics*, and EU studies. Again, the topics can be explained as a scientific reflection of the ongoing political changes of the transition period. It was in the 1990s when Slovenia initiated the transition from Yugoslavia and leaned to the European Union as the most substantial foreign ally. In this context, *Yugoslavia* is mentioned

as a concept. In this period, transitional Slovenia's leading political and social goal was to join the EU, a goal reached in 2004.

The evolution of published scientific topics in a historical moment of transition towards independence of the Republic of Slovenia to contemporary times

The study's findings revealed that between 1984 and 2022, Slovenian sociologists identified several topical clusters. From 1984 to 1987, the subjects that dominated these discussions were civil society, democracy, and the state. This is reasonable, knowing the history of Yugoslavia, since it was the 1980s when the economic conditions started to deteriorate, and tensions and desires for independence started to emerge in many Yugoslav republics, including Slovenia. Intelligentsia, including sociologists, were able to research topics connected to that social momentum.

In 1989, the subjects that dominated discussions were *modernization, the family, and social mobility*. In 1990, *modernization, family*, and *equality* (related to social mobility from the previous year) were still among the most published topics, referring to individuals' experiences during expected social change. The survey also found Several concept groups, including those related *to politics, EU studies, Yugoslavia, Europe, culture, administrative politics, life*, and *social mobility*. The study employed the k-means 2D grouping method to depict these concept groups. Again, the topics emerging around the period of the highest strive for independence are justifiable with the period's primary historical and social momentum. In 1990, the era of the Cold War ended. Following that, the modernization of newly established countries is again justifiable, along with topics on more personal experiences of people in the new times – the questions on how the significant change of the social system in Slovenia will impact families and social mobility.

n the 1990s, these main topics still reflect the period of the nascent state of the newly established Republic of Slovenia, encompassing the topics of *post-socialism* and *welfare state*. Much attention was given to topics of *free time* and *equality*. In line with the topics of *equality,* the complementary topic is also *feminism.* The topic of *feminism* also gained prominence through activists' work of the main researcher of the field, who, already in the 1970s, led the petition for equal rights in academic advancement for female academics on maternity leave.[7] Topics of *feminism, equality*, and the *welfare state* remain the same. The most prominent topic of the *welfare state*, consistent throughout the decade, explains the need to form an egalitarian society. According to the Gini index, Slovenia remains among the world's most egalitarian societies. In the 2020s, the topics became more dispersed, covering various themes that demonstrated the end of focus on significant social change. The most evident clustering concerns *social capital, civil society, democracy, politics,* and *Europe,* which are still directly related to the historical momentum of joining the EU.

Conclusion

This study identified key thematic shifts and research trends that shaped Slovenian sociology from 1984 to 2022. We categorized sociological topics and linked them to the broader socio-political environment of the analyzed period. The survey found that Slovenian sociologists frequently wrote about civil society, democracy, the state,

modernization, families, social mobility, and equality. In addition, OntoGen was utilized in the study to create ontologies with $k = 7$, which was shown to be the ideal value given the amount of data input.

The article is a valuable resource for researchers seeking to understand the development of sociological research in Slovenia. It identifies the most frequently published scientific topics and tracks how they evolved over time. Additionally, it contributes to the field of text analysis by linking the development of sociological research to broader social and political contexts. This approach can be applied to other social sciences and humanities fields to understand better how research areas evolve within specific historical and social contexts.

The present research is subject to certain limitations. The most significant of these is its exclusive focus on the outputs of a single scientific journal, despite many relevant journals in Slovenia. The decision to use the Social Science Forum as the sole data source was driven to highlight the specific topics Slovenian sociologists have addressed. In contrast, other journals in the country tend to span a broader range of social and political sciences. Including them would risk undermining the epistemological coherence of the study and introducing disciplinary heterogeneity, extending beyond the intended scope of this research.

The research results can be utilized for future research focusing on understanding the evolution and implementation of policies related to the welfare state, education, and everyday life, to name a few. It would be interesting to observe how the research results of particular research were integrated (if they were) into the policies put forward by the governments of the new country. Significantly, this study contributes to academic understanding and offers practical relevance for national research infrastructure. In Slovenia, the COBISS and SICRIS platforms are central to tracking scholarly output, evaluating research performance, and allocating public funding. The ontology-based analysis developed here – grounded in the data indexed by these systems – can potentially complement standard bibliometric indicators. By providing a structured view of conceptual trends and thematic evolutions, ontology construction could inform policy decisions on funding priorities, disciplinary development, and the strategic orientation of research programs.

Additionally, the further exploration of the Slovenian sociology community and their research outputs in an international context would be an exciting path forward, where potential interdisciplinary and internationalization (connected with scientific collaboration) would give the impression of engagement of Slovenian sociologists in international knowledge production streams. Furthermore, their objective impact on a particular field would be assessed (Kastrin et al., 2017) by including their citation ranks.

Notes

1. Co-operative online bibliographic system and services (COBISS), https://www.cobiss.net/cobiss-platform.htm.
2. Slovenian current research information system (SICRIS), https://cris.cobiss.net/ecris/si/en.
3. Slovenian Research And Innovation Agency (ARIS), http://www.aris-rs.si/en/.
4. Adam and Makarovič (2002) write about the set-up of: the Institute of Sociology and Philosophy at the University of Ljubljana in 1959, a year later, a study of Sociology was initiated at the Department of Sociology of the Faculty of Arts and in 1966, the study was enabled also

at the Faculty of Sociology, Political Sciences, and Journalism, nowadays called the Faculty of Social Sciences. A national sociological association was established in 1965.
5. In 1987, the 57th issue of Nova Revija was published. This particular issue is important and recognized as the dawn of Slovenian democracy due to containing a public call for independent Slovenia. The authors of the articles published in that particular issue are predominantly literates and historians.
6. The keywords of the texts are added to each entry systematically and are, by the rule, preselected by the authors themselves. In such a way, the COBISS system enables the additional level of identification of entries with the field the entry is covering.
7. Letter to the council of the University of Ljubljana, dated in 1971 is available at: https://www.sociolosko-drustvo.si/wp-content/uploads/2022/06/OB-50-LETNICI-ZACETKA-PRIZADEVANJ-ZA-ENAKOST-MOZNOSTI-ZENSK-IN-MOSKIH-V-AKADEMSKEM-PROSTORUPismo-univerzitetnemu-svetu-19712.pdf.

Author contributions

CRediT: **Tamara Besednjak Valič:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing -original draft, Writing -review & editing; **Erika Džajić Uršič:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing -original draft, Writing -review & editing.

Author contributors

Conceptualization, TBV and EDU; methodology, TBV and EDU; validation, TBV and EDU; formal analysis, TBV and EDU; investigation, TBV and EDU; resources, TBV and EDU; data curation, TBV and EDU; writing – original draft preparation, TBV and EDU; writing – review and editing, TBV and EDU; visualization, TBV and EDU; supervision, TBV and EDU.

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ORCID

Tamara Besednjak Valič http://orcid.org/0000-0002-6566-3679
Erika Džajić Uršič http://orcid.org/0000-0003-4001-7002

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