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Systemic Approach in the Study of the Current State of Knowledge in the Field of University Management

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Abstract

Theoretical background: Analyzing the current set of publications relating to the issues of university management, one can distinguish a set of works relating to, among others, the quality of management at universities, the issues of sustainable development of universities, adapting teaching and research to the needs of industrial enterprises, concepts of university quality management, communication barriers at an academic university, and issues of human resource management in higher education. Regardless of the area of research, the work draws attention to the lack of consistency in the concepts which are used to

understand the specific field of university management, the rigorous conceptual framework deficiency and valuable contribution to theory development is limited.
Purpose of the article: The aim of this paper is to organize the current research results related to the issues of university management. The work uses the integration of the concept of systematic literature review with a tool supporting systemic thinking, i.e. System Operator. The paper points to the benefits resulting from the use of a tool derived from the Theory of Inventive Problem Solving (TRIZ) in shaping the image of the current state of knowledge, in a holistic approach.
Research methods: The method of systematic literature review was used in the work. Research activities were divided into four stages, (1) determination of the purpose of the study, (2) selection of basic literature (n = 1,534), and selection of publications (n = 999) and development of a publication database, (3) bibliometric analysis, using content analysis and (4) development of a report using a tool supporting holistic thinking, i.e. System Operator.
Main findings: As a result of the conducted research, six clusters relating to the issues of education and its evaluation (Cluster 1), management of human factors, including students, researchers and administrative staff (Cluster 2), shaping entrepreneurial attitudes, including knowledge and innovation management (Cluster 3), university management in the education system (Cluster 4), issues related to sustainable development and leadership policy (Cluster 5 and Cluster 6) were distinguished. As a result of content analysis, 16 thematic areas in general terms were distinguished in the scope of identifying research problems raised in the collection of the most frequently cited scientific publications. In the last one, as a result of the use of System Operator, the research problems raised in the analyzed set of publications were mapped in a comprehensive manner, i.e. determining the relations between individual elements of university management and university environment, as well as in terms of time, relating to the evaluation of past activities and strategies, research into current solutions, as well as works related to shaping the concept of future solutions in the field of university management.

Introduction

Higher Education (HE) is considered as a global service delivered by quasi-companies in an ever-more complex and competitive knowledge marketplace (Pucciarelli & Kaplan, 2016). To cope with the challenges, HE institutions need an appropriate strategy and such a necessity is reflected in numerous studies on Higher Education Management. The purpose of this article is to contribute to this discussion by providing the analysis of actual studies related to the part of the higher education, namely with the university management.

Management in the field of higher education has and must have a multidimensional character. It concerns both human, material, procedural aspects as well as other features or elements. Decisions taken in this area often change over the years. As public entities, they are often subject to overarching laws and regulations that must be included in the statutes or ordinances of universities (Bogoyiz et al., 2022; Santos-Cangovi, 2019). In addition to the aforementioned principles, as in any unit, the selection of appropriate personal and unit structures that are responsible for making long-term assumptions and responding to urgent independent situations, such as the outbreak of the coronavirus pandemic, is also a priority (Al Mahameed et al., 2023).

University has certain characteristics that distinguish it from other organizations (Sporn, 1996), including (1) the goals are ambivalent (including teaching, research, and service objectives), (2) universities are to a large extent "people-oriented" insti-

tutions (including different groups of people, e.g. students, researchers, academics, professional staff, professional services staff, cooperating business representatives), (3) problematic standards for goal attainment (especially in terms of the goals related to the researches involvement, developments and knowledge management), (4) the researchers working at universities tend to be experts with a strong wish for autonomy (there is the contradiction between the freedom of work and the authorities need for a coordinated initiative), (5) universities are vulnerable to their environment (the changes in political, economic, social, and technological conditions can affect the situation of universities). The literature on the subject considers various elements related to university management. Issues that are addressed relate to, among others, Evaluation, Union Organizations, Academic Entrepreneurship, University – Industry Cooperation, Finance, Risk/Change Management, Student, Academic Staff, etc. (based on the identified categories of publications in the Web of Science database, 2023). However, only a few papers present the issues of university quality management in a holistic approach, i.e. mapping the complex set of elements of universities and their structure (Bogoyiz et al., 2022; Edwards, 2012; Pucciarelli & Kaplan, 2016; Sharrock, 2012). In this paper, a systematic review of the literature in the field of university management has been carried out. The aim of the undertaken research activities is to identify current and important elements of university management. The paper systematically reviews the literature using the database of scientific publications of the Web of Science. Techniques of bibliometric analysis using VosViewer software and content analysis techniques, i.e. keyword frequency analysis, were used. The paper indicates that at the stage of content analysis, regarding the analysis of research problems undertaken from individual publications, additional value is obtained using the System Operator tool. The Operator System was developed as part of the Theory of Inventive Problem Solving, and allows for the mapping of the research object in a holistic approach, i.e. taking into account the set of relations between the elements belonging to it, and the set of relations between the surrounding objects.

Literature review

When studying the issues of university management, elements such as, among others, the quality of management in universities, sustainable development of universities, adaptation of teaching and research to the needs of industrial enterprises, concepts of university quality management, communication barriers at an academic university, or selected elements of human resources management in higher education are taken into account (Wawak, 2006, 2011). In addition, empirical research is conducted to recognize the concept of the university, the concept of knowledge creation and the diagnosis of Polish technical universities and new management concepts of the modern university (Leja, 2011; Leja & Kostera, 2013). When considering a set of publications whose subject of research was the analysis of literature related to the area

of university management, a set of specific research subjects was identified. The issue of recognizing the current state of knowledge in the area of university management is undertaken in the context of, among others, higher education quality management (Manatos et al., 2017; Nasim et al., 2020), sustainability in higher education (Figueiró & Raufflet, 2015; Karatzoglou, 2013) knowledge management in higher education (Quarchioni et al., 2022), university-industry cooperation (Mascarenhas et al., 2018; Sjöö & Hellström, 2019), higher education marketing (Hemsley-Brown & Oplatka, 2006).

In the field of quality management, Manatos et al. (2017) referred to the quality management principles and practices in governance and management systems of higher education institutions. The results of the systematic literature review showing how the literature on quality management (QM) in HE has evolved, show a trend towards the development of holistic and comprehensive quality management approaches both in conceptual and empirical research studies. It is noticed that the research interest in Total Quality Management (TQM) in higher education is growing. Nasim et al. (2020), based on analysis of the results of 75 scientific papers, noticed that the research considers: (1) teaching and learning but neglects research and industry engagement; (2) an isolated factor (e.g. teacher) but neglects other factors (e.g. facilities); (3) the HE sector in advanced countries but neglects the HE sector in developing countries; and (4) TQM as a phenomenon but neglects theory of development and integration. As a conclusion, it is indicated that future research needs to address these limitations and adopt a more holistic perspective as well as take a more inclusive and comprehensive approach to TQM in the HE sector. It is pointed out that in order to ensure efficiency in the management of a university, one should (2005): (1) have clearly defined goals that should be presented to employees – monitor the environment regarding innovative marketing methods and techniques; (2) assess the possibilities of action as well as occurring threats, and evaluate the resources that may enable the development of the organization; (3) consistently implement the developed strategy; (4) perform cyclical control and assessment of the degree of implementation of marketing activities.

In the field of sustainability in higher education with focus on management education (Figueiró & Raufflet, 2015) it is indicated that most articles are descriptive, focusing on specific, unique experiences in a given institution or with a particular teaching method or tool, few situate themselves within the broader philosophy and design of management education. Secondly, the results of systematic review highlights the lack of consistency in the concepts used: no stable categories emerge from these articles and very few studies integrate the three levels of educational philosophy – teaching, program design, and learning.

The evolving roles and contributions of universities to education for sustainable development (Karatzoglou, 2013) is analyzed with reference to university–industry collaboration. The result of a literature review and critique of such articles, published between 2003 and 2011, emphasizes the role and contribution of two leading jour-

nals in the field, the *Journal of Sustainability in Higher Education* and the *Journal of Cleaner Production*. The publications related to contribution from universities to education for sustainable development are characterized by their descriptive nature, which can be inspiring and encouraging for future studies. However, the rigorous conceptual framework of deficiency and valuable contribution to theory development is limited.

Considering the issue of knowledge management (KM) for HE institutions, it is pointed out that the research on this topic is still fragmented and loosely focused (Quarchioni et al., 2022). Based on the results of a systematic review process (121 articles have been coded and analyzed according to distinct dimensions) it can be noticed that despite the growing trend of papers on the topic, research on Knowledge Management in HE is still in its embryonic stage with high levels of heterogeneity and lack of wider theoretical constructs.

Efficient management of the university, which is a condition of its existence on the market of educational services, is largely based on marketing activities. In addition to improving the quality of education, research and development activities, science, and finance, marketing is a very important aspect in the functioning of a university. Without an efficient marketing apparatus, an organization of this type has no chance of survival (Smolarek, 2016). Based on the results of the literature analysis on HE marketing conducted by Hemsley-Brown and Oplatka (2006), the problems of incoherent, even inchoate, and lack of theoretical models that reflect upon the particular context of HE and the nature of their services were indicated.

On the basis of the above presented selected results of work in which the current state of knowledge regarding specific elements of university management was assessed, it can be noted that the current problem is the lack of a systematic, comprehensive model of university management. The research goal of this thesis is the development of the results of the current state of knowledge in the field of university management in a systemic approach, creating the basis for the integration of current research results.

Research methods

The work employs the method of Systematic Literature Review (Mohamed Shaffril et al., 2021), adopting a four-stage research procedure (Czakon, 2016). The individual stages with an indication of the research methods and tools used are summarized in Table 1. The use of bibliometric techniques, i.e. the analysis of the number of publications and the analysis of the number of citations, made it possible to assess the size of the collection of publications and its importance on the map of science. The analysis of publication numbers in subsequent years makes it possible to assess the stage of development of a given research area.

Table 1. Explanation of the adopted literature review procedure

Stages of the research procedure	Research methods and tools	Results of research activities in synthetic terms
1.1. Determining the research objective	Analysis of the literature on publications whose subject of research was a systematic analysis of the literature in the scope of selected areas of university management	Recognition of significant and current elements taken into account in the research into university management. Recognition of the research literature regarding the systematic approach and development of a model enabling a comprehensive mapping of the issues of university management
2.1. Selection of basic literature	The use of the Web of Science database of scientific publications in order to separate a set of publications that contain the search term "university management" in the title, abstract, or author's keywords	Obtained number of works: $n_1 = 1{,}534$
2.2. Selection of publications	Narrowing down the scientific papers extracted at stage 2.1 using filters available in the database, i.e. the year of publication, type of document, WoS index, language of publication	Obtained number of works: $n_2 = 999$
2.3. Development of a publication database	Separation of two classes of publications, i.e. (1) Publications published in journals directly related to the issues of university management, i.e. in journals containing in their title "university management" or "higher education"; (2) other publications	(1) Obtained number of works: $n_3 = 76$ (2) Obtained number of works: $n_4 = 923$
3.1. Bibliometric analysis	Analysis of the number of publications. Analysis of the number of citations	The results are presented in Figure 1
3.2. Content analysis	The analysis of the undertaken research problems in the most frequently cited scientific publications $n_5 = 54$ (34 publications with the largest number of citations extracted from the set of n_3 and 20 publications with the largest number of citations extracted from the set of publications n_4): 3.2.1. Frequency analysis relating to the study of the frequency of occurrence of keywords and their classification (application of VOSviewer software). 3.2.2. Identification of a set of keywords defining research problems undertaken in the analyzed publications	6.1. A 53-element set of keywords was distinguished (Table 2); 6 thematically diverse clusters of keywords were distinguished (Figure 2). 6.2. 16 diverse groups of research problems defined in general terms and 54 groups of research problems defined in detailed terms were identified (Table 3)
4. Report development	Application of the System Operator tool supporting system thinking	Mapping of elements important in university management in a holistic approach (Figure 2)

Source: Authors' own study based on (Czakon, 2016).

The use of content analysis techniques, i.e. frequency analysis, allowed for recognizing the frequency of occurrence of given keywords and their classification. The visualizing scientific software (VosViewer) was applied for scientometric analysis. This method is based on mathematical and statistical bibliometric analysis (Mongeon &

Paul-Hus, 2015). The main premise of this type of analysis is the use of the content and data contained in publications (Diodato & Gellaty, 2013). The main assumption of this type of analysis is the use of the data and content contained in publications (Diodato & Gellaty, 2013). Using content analysis techniques, i.e. the analysis of undertaken research problems, allowed for identifying the areas of scientific inquiry by segmenting the research into several issues. In order to analyze and segment the research problems undertaken, the basics of qualitative modeling were referred to and a tool supporting systemic thinking was used, i.e. System Operator. System Operator often referred to as Multi-screen Schema is aimed at providing system thinking capabilities to any problem solver (Cascini, 2012; Fiorineschi et al., 2021; Gadd, 2011). At the stage of selecting the basic literature, the Web of Science database was used. It is one of the most extensive and multifunctional databases, which, thanks to a wide range of filters, allows for appropriate selection of thematically defined publications. Important elements of this work are not only the titles, types of documents or the content of abstracts of exported publications, but first of all their keywords. The subject of this research is the analysis of publications and their data in the field of "university management". For this purpose, the following auxiliary questions were used:

What keywords are present in publications extracted from the Web of Science database using specific search parameters?

Can extracted keywords create a keyword correlation map?

Which publications from the indicated search scope are the most frequently cited?

Referring to the adopted Search Term, "university management" and determining the type of search, i.e., the use of the form of search after the words contained in the title, in the abstract and the keywords designated by the author ("topic"), a set of 1,534 publications was distinguished. One of the possibilities offered by the Web of Science database is the use of additional filters, enabling the selection of the most precise works for the conducted research. In the first place, the WoS Index was used, i.e. limiting the searched works to those that, for example, have an extended index of scientific citations, an index of citations of emerging sources, and an index of citations of social sciences. In addition to the above-mentioned indexes, other types of filters were also used: limitation of publication years, language used or type of document, e.g. an article. Finally, after applying the so-called database cleaning procedure, a set of 999 publications was obtained. Another element of the conducted analysis was the separation of two sets of publications, the first of which included publications published in journals in whose titles the search term "university management" or "higher education" ($n_3 = 76$) appeared. The second set included the remaining presentations, i.e. $n_4 = 923$. A .txt file was created for each separate set of publications, which was analyzed separately using VOSviewer. The specification of three sets of data allowed for the separation of current and relevant works for independent content analysis, i.e. recognition of research problems raised in the works. The datasets of the publications were ordered in relation to the number of citations and thirty works from the first dataset and twenty works from the second dataset were analyzed.

Results

For the dataset separated in step 2.2. (Selection of publications, $n_2 = 999$), the value of citation parameters was checked. The study referred to the H-Index (Hirsch index), i.e. a measure of the weight and importance of all scientific works of a given author, in this case in relation to the entirety of the exported publications. In addition, two categories related to citation were checked, i.e. (1) Citing Articles (Total as the total number of cited articles, taking into account that the citing articles cited one or more elements in the citation report); (2) Without self-citations (total number of citing articles, but with citation articles removed, which also appear in the citation report), (3) Times Cited (Total as the total number of citations of all elements in the summary of results); (4) Without self-citations as the total number of citations, but excluding citations from other articles in the citation report; (5) Average per item as the average number of citations of articles for all items in the summary of results. The obtained results are summarized in Table 2.

Table 2. Citation Report "university* management*" Web of Science

Ratio/Indicator	Indicator value
Citing Articles	
Citing Articles Total	8,667
Citing Articles Without self-citations	8,544
Times Cited	
Times Cited Total	9,231
Citing Articles Without self-citations	9,078
Average per item	8.33

Source: Authors' own study based on Web of Science.

The values of both "Citing Articles" and "Times Cited" indicators are mutually compatible. The differences between the value of "Total" and "Without self-citations" suggest a small number of self-citations from outside the report.

Another element available for analysis thanks to the Web of Science statistics is the compilation of data on the number of publications and citations of a given issue over the years, which is presented in Figure 1. The time range was adopted for the analysis, i.e. 1955–2023.

Analyzing the number of publications in subsequent years, it is assumed that the number of publications is subject to the regularities of the life cycle, so after birth there is a slow growth that accelerates, then stabilizes at a given level, and finally falls. This corresponds to the phases of development, maturity and decline of the discipline or research area. The number of publications in total and in individual years allows for assessing the research activity in a given field (Acedo et al., 2006; Czakon, 2011; Mohsin et al., 2023; Mongeon & Paul-Hus, 2015; Velt et al., 2020). Analyzing the separate set of publications, it can be noticed that the research area related to the management of the university is in the development phase. The analysis

of citations allows for indicating the significant extent of the impact of the obtained analyzed publication results.

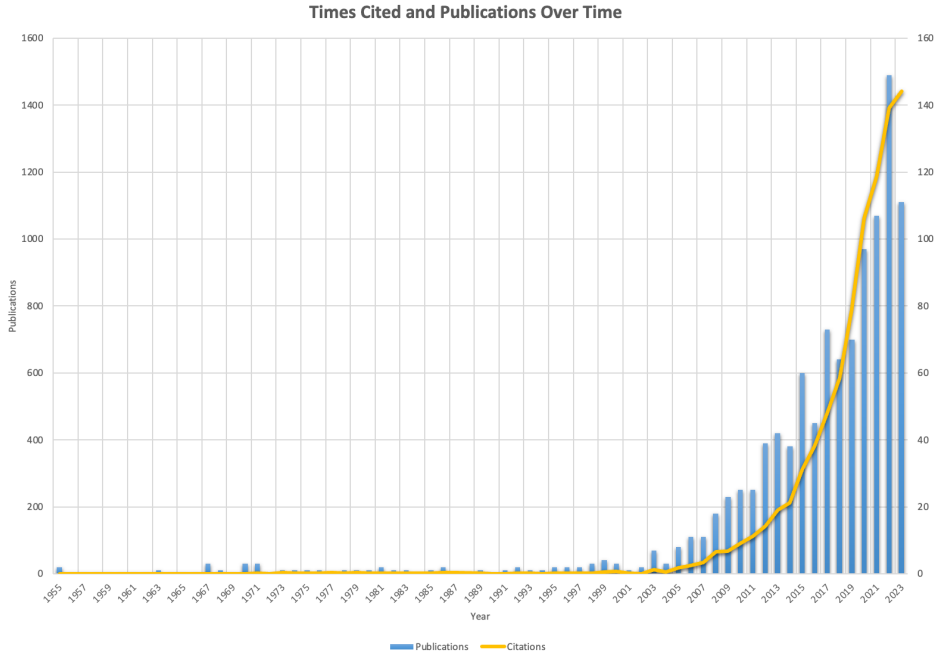

Figure 1. Times Cited and Publications Over Time

Source: Authors' own study based on Web of Science.

At the next stage, the analysis of content, the so-called keyword frequency survey, was conducted. Table 3 shows a set of words ordered against the occurrence of the keywords and the strength of interdependencies with other significant terms in a separate publication database.

Table 3. Citation Report "university* management*" Web of Science

Keyword	Occurrences	Total link strength
university management	197	233
higher education	124	220
university	82	160
higher education	78	193
management	78	179
education	62	133
universities	60	118
impact	49	130
quality	39	102
students	39	83

Keyword	Occurrences	Total link strength
leadership	38	91
model	37	96
performance	32	101
innovation	30	72
governance	27	55
gender	24	55
knowledge	22	54
covid-19	20	48
perceptions	20	53
(…)		
strategy	10	24

Source: Authors' own study based on the results from Web of Science and VOSviewer.

Subsequently, the distinguished 53 keywords with the highest level of occurrence were classified. A specific set of keywords was extracted after the adoption of the so-called minimum number of keyword repetitions. The larger the database, i.e. the number of analyzed publications, the greater the number of keywords occurring and recognized by VOSviewer software. In order to separate the crucial keywords in the analyzed data set, after initial verification of the number of repetitions based on the graphical presentation of the results, a minimum number of keywords repetitions amounting to ten was adopted. In the next step, in order to increase the reliability of the results, the keywords with the lowest correlation value, i.e. the value of the Total Link Strength indicator calculated by VOSviewer, were removed from the data set. Having the created set of keywords, the VOSviewer software algorithm was used, which classifies keywords by taking into account thematically and meaningfully similar areas in which the words occurred. As a result, six clusters were separated, as shown in Figure 2.

The last effect of the algorithm carried out using VOSviewer is the ordering of keywords into sets called "clusters", distinguished by appropriate colors. Below, for the distinguished clusters of keywords, a set of words classified into each cluster is compiled, together with an indication of the frequency of occurrence of a given word:

Cluster 1: {higher education, 124; education, 62; performance, 32; perceptions, 20; satisfaction, 17; faculty, 16; work, 16; motivation, 12; engagement, 11; service quality, 11; commitment, 10; academics, 10; evaluation, 10}.

Cluster 2: {universities, 60; students, 39; model, 37; covid-19, 20; technology, 16; stress, 14; academic staff, 13; adoption, 12; teachers, 11; acceptance, 11; e-learning, 10}.

Cluster 3: {impact, 49; innovation, 30; knowledge, 22; science, 19; policy, 11; information, 11; strategy, 10; entrepreneurial university, 10; identity, 10; entrepreneurship, 10}.

Cluster 4: {higher-education, 78; management, 78; quality, 39; governance, 27; systems, 14; implementation, 14; challenges, 13; framework, 12}.

Cluster 5: {university, 82; sustainability, 17; attitudes, 13; sustainable development, 12; models, 11; managerialism, 10; knowledge management, 10}.

Cluster 6: {university management, 197; leadership, 38; gender, 24; women, 12}.

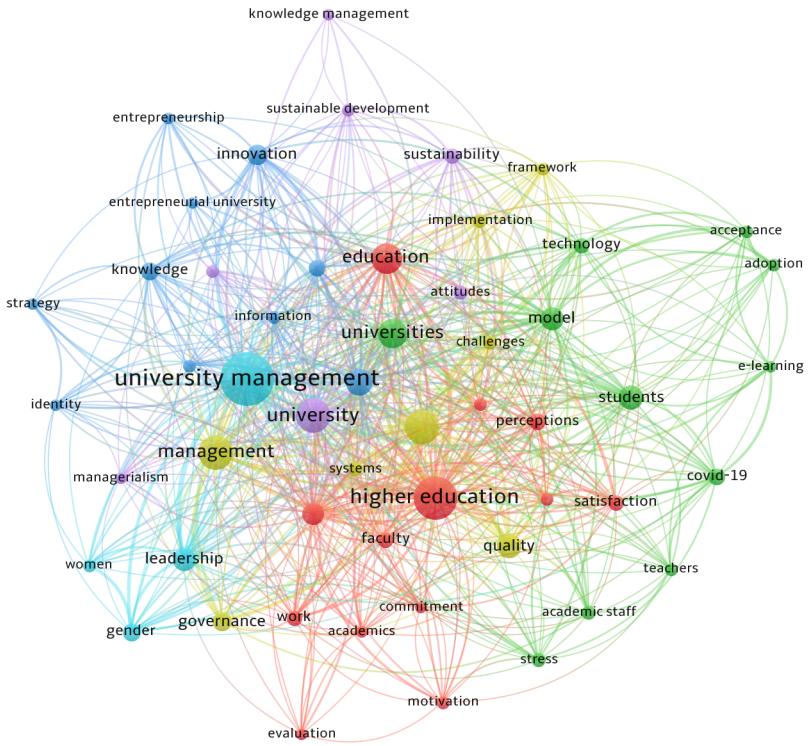

Figure 2. Visualization of scientometric analysis (keywords) for the selected publication database (the map was created using VOSviewer software)

Source: Authors' own study.

In general, it can be assumed that a set of 6 thematic areas related to: issues of education and its evaluation (Cluster 1), management of human factors, including students, researchers and administrative staff (Cluster 2), shaping entrepreneurial attitudes, including knowledge and innovation management (Cluster 3), university management in the education system (Cluster 4), issues related to sustainable development and leadership policy (Cluster 5 and Cluster 6).

In order to specify the thematic areas related to university management, an analysis of the content was also made, in terms of identifying research problems raised in the set of the most frequently cited scientific publications (n = 54), selected in accordance with the procedure explained in Table 1. So defined object of research allowed the identification of current areas of scientific inquiry carried out at a given moment (Coombs et al., 2009). As a result, 16 thematic areas in general terms were identified, to which 54 issues which were the subject of research problems formulated in the publications were classified. This is presented in Table 4.

Table 4. A set of research issues and problems undertaken in the analyzed set of scientific publications

Thematic area	Research subject
Academic Entrepreneurship	Business Schools for Academic Entrepreneurship (Wright et al., 2009); Higher Education Institutions (Business Schools) for Sustainability (Chiappetta & Charbel, 2010)
Academic Staff	Academic Performance Metric (Beatson et al., 2022); Academic Staff Experience (Ylijoki & Mäntylä, 2003); Academic staff opinion on Professional Staff (Gray, 2015); Experience of Academic Work (Manathunga et al., 2017); Job Satisfaction among Academic Staff (Lacy & Sheehan, 1997); Non Academic Staff at the University (Croucher & Woelert, 2022); Work Stress and Well Being in Higher Education Sector (Sang et al., 2013)
Change Management	Change impact on working conditions (Mapesela & Hay, 2006); Management practice as a Critical Management (King & Learmonth, 2015)
Doctoral Students	Progress Reporting in Doctoral Studies (Mewburn et al., 2014); Timely Doctoral Completions and Funding of Doctoral Students (Rodwell & Neumann, 2008)
Education	Teacher Training Courses (Silander & Stigmar, 2019); Teaching Skills and Practice Development (Kennelly & McCormack, 2015)
Evaluation	Impact of External Quality Assessment (Vilgats & Heidmets, 2011); Internal Auditing (Christopher, 2012); Quality in Research and Teaching (Anderson, 2006); Quality Management System (Barandiaran-Galdós et al., 2012); Self-Assessment on the University Management (Busco et al., 2018); Transparent Faculty Evaluation Systems (Bana E Costa & Oliveira, 2012)
Finance	Accountability in Higher Education (Huisman & Currie, 2004); Conflict Situation: Allocation of Money among Faculties (Pulido et al., 2002); Funding Based on Management by Results (Kuoppala, 2005); Introducing Spending Cuts (Sharrock, 2012)
Leadership	Career Path (White et al., 2012); Deans positions (Shepherd, 2018); Differences in Perceptions of Gender (White & Özkanlı, 2010); Gander and Leadership Development (Tessens et al., 2011); Leadership at the Top Level University Structure (Sirat et al., 2012); Strategic Management Framework and Practical Approaches (Sharrock, 2012); Students and Academics and their Health and Wellbeing (Blackmore, 2020)
Market Environment	Collaborative Advantage between Universities (Gunn & Mintrom, 2013); Environmental Management System (Mason et al., 2003)
Risk Management	Cyber Security Protection (Imgraben et al., 2014); Risk-Based Quality Assurance (Edwards, 2012); Work Integrated Learning (WIL), (Cameron & Klopper, 2015)
Strategy	Administrative Management (Krücken et al., 2013); Management and Creation of Scientific Knowledge (Tian et al., 2009); Strategic Recommendations and Guidelines (Pucciarelli & Kaplan, 2016)
Student	Distance Learning (Kaplan & Haenlein, 2016); Local student Adoption to University Internationalization (Yuan et al., 2019); Contact of Managers and Academics with Students (Johnson & Deem, 2003); Students Personal and Pre-university Characteristics (Kabakchieva, 2013)
Technology Transfer Offices	Organization, Management, and Perceived Performance Effectiveness (Dill, 1995); Commercialization of Academic Knowledge (O'Kane et al., 2015)
Union Organizations	Union Organizing Campaigns (Badigannavar & Kelly, 2005); University Management and Staff Union Integration (Paewai et al., 2007)
University in Public Sector	Higher Education Structure and Its Impact on University Management and Performance (Knott & Payne, 2004); Impact of Public Sector Reforms (Bisaso, 2010); Political Transformation (Dobbins & Khachatryan, 2015); University Governance Reforms (Mok, 2010)
University–Industry Cooperation	Researchers' motivations and Interaction Channels (Franco & Haase, 2015); Universities as Equal Partners in U-I Collaboration (Bjursell & Engström, 2019)

Source: Authors' own study based on results from Web of Science.

In order to further classify and organize the thematically identified research areas and undertaken research problems in the field of university management, the System Operator tool was used to map the set of features belonging to the university in a systemic approach. The results of the conducted activities are presented in the next section. They discuss the approach used, taking into account, firstly, the standard procedure of systematic review of the literature. Secondly, an indication of the need to use additional tools, i.e. a reference to a set of tools supporting systemic thinking, to organize the results regarding the current state of knowledge related to the research object.

Discussion

The System Operator often referred to as Multi-screen Schema is aimed at providing system thinking capabilities to any problem solver (Cascini, 2012; Fiorineschi et al., 2021; Gadd, 2011). The System Operator is typically depicted as a 3 × 3 matrix of "screens" characterized by a vertical axis representing the level of detail of the analysis (to be intended as the subsystem level of the analysis focus) and a "Time" dimension constituting its horizontal axis. Time dimension can be considered as: (1) a historical time (the evolution of certain systems), (2) a process time (while analyzing a chain of events, even with their cause-effect relationships), or (3) as a life cycle of an element of a system (from its creation to the disposal/recycling stage and as speed or acceleration of an action), if these variables are relevant for the specific situation (Cascini, 2012). The representation of the System Operator as a nine-screen scheme is just conventional. Its dimension might be considered arbitrarily extendible in any direction.

Analyzing the set of publications, the specified research subjects were classified into one of nine categories distinguished with reference to two dimensions characterized by:

(1) Representing Time Dimension (Past, Present, Future). When classifying publications in terms of Time Dimension, attention was paid to whether the research problem undertaken in the publication concerned the analysis and assessment of already implemented solutions (Past), whether the work refers to the research and assessment of the current state, e.g. in the form of a comparative analysis of existing solutions (Present), or whether the research focuses on shaping possible scenarios of changes in the research object and its environment (Future),

(2) Representing the Level of Detail of the Analysis (Subsystem, System, Supersystem). When classifying the subject of research in relation to the Level of Detail Analysis, they refer to the general theory of systems, the University is treated as a system whose quality is determined by the set of relations between its elements (features) and by the external structure, which is a set of relations between the elements (features) of the system and the associated elements belonging to its environment.

The developed model of the university quality, using the System Operator tool, is presented in Table 5. Seven thematic areas were classified to the system level, i.e. Change Management, Education, Evaluation, Finance, Leadership, Risk Management, Strategy. Within these thematic areas, the analyzed set of publications includes 27 research subjects related to the research problems undertaken in the works (17 – Present, 7 – Future, 3 – Past). Four thematic areas have been classified to the subsystem level, i.e. Academic Staff, Doctoral Students, Student, Union Organizations. Within these thematic areas, the analyzed set of publications includes 15 research subjects related to research problems undertaken in the works (9 – Present, 2 – Future, 4 – Past). Five thematic areas were classified to the supersystem level, i.e. Academic Entrepreneurship, Market Environment, Technology Transfer Offices, University in Public Sector, University–Industry Cooperation. Within these thematic areas, the analyzed set of publications includes 12 research subjects related to research problems undertaken in the works (4 – Present, 3 – Future, 5 – Past).

The developed model mapping a set of current research problems raised in publications dealing with the issues of university management is the basis for conducting further research activities. The developed model requires further verification, including, firstly, the reference to the correctness of the classification of individual elements, to the Supersystem, System and Subsystem (e.g. through expert research). Secondly, regarding the classification of publications in terms of Time Dimension (e.g. by developing an interactive matrix, available to the authors of the publication, who can independently determine the area to which their research problem belongs). The developed model is the first step in ordering current and relevant research results, their integration and systemic approach.

Conclusions

The aim of this study was to identify and order current research problems undertaken in scientific publications related to the issues of university management. In the first part of the work, the literature was reviewed in order to identify the topics discussed in publications related to university management. A collection of works related to, among others, higher education quality management, sustainability in higher education, knowledge management in higher education, university–industry cooperation, higher education marketing was distinguished. It was noted that regardless of the research areas, the authors of the publications draw attention to the problem related to the lack of the rigorous conceptual framework and valuable contribution to theory development. This constituted the prerequisite for recognizing the current state of knowledge in the field of university management based on the results of a systematic literature review. The paper employs the Systematic Literature Review method, adopting simultaneously the four-stage research procedure, i.e.:

Table 5. The application of the System Operator to reflect the research problems related to University Management

	past	present	future
supersystem	**Market Enviroment** (Collaborative Advantage between Universities (Gunn, Mintrom, 2013)); **University in Public Sector (**Higher Education Structure and its Impact on University Management and Performance (Knott, Payne, 2004); Impact of Public Sector Reforms (Bisaso, 2010); Political Transformation (Dobbins, Khachatryan, 2015)); **University–Industry Cooperation (**Researchers' motivations and Interaction Channels (Franco, Haase, 2015)).	**Academic Entrepreneurship (**Higher Education Institutions (Business Schools) for Sustainability (Chiappetta, 2010)); **Technology Transfer Offices (**Oganization, Management, and Perceived Performance Effectiveness (Dill, 1995)); **University in Public Sector** (University Governance Reforms (Mok, 2010)); **University–Industry Cooperation** (Universities as Equal Partners in U-I Collaboration (Bjursell, Engstrom, 2019)).	**Academic Entrepreneurship** (Business Schools for Academic Entrepreneurship (Wright et al., 2009)); **Market Enviroment** (Environmental Management System (Mason et al., 2003)); **Technology Transfer Offices** (Commercialization of Academic Knowledge (O'Kane et al., 2015)).
system	**Evaluation** (Impact of External Quality Assesment (Vilgats, Heidmets, 2011)); **Leadership** (Students and Academics and their Health and Wellbeing (Blackmore, 2020)); **Strategy** (Administrative Management (Kruecken et al., 2013)).	**Education (**Teacher Training Courses (Silander, Stigmar, 2019)); **Evaluation** (Internal Auditing (Christopher, 2012); Quality in Research and Teaching (Anderson, 2006); Quality Management System (Barandiaran-Galdos et al., 2012); Self-Assessment on the University's Management (Busco et al., 2018); Transparent Faculty Evaluation Systems (Bana, Oliveira, 2012)); **Finance (**Accountability in Higher Education (Huisman, Currie, 2004); Conflict Situation: Allocation of Money among Faculties (Pulido et al., 2002); Funding Based on Management by Results (Kuoppala, 2005); Introducing Spending Cuts (Sharrock, 2014)); **Leadership (**Deans positions (Shepherd, 2018); Differences in Perceptions of Gender (White, Ozkanli, 2010); Gander and Leadership Development (Tessens et al., 2011); Leadership at the Top Level Univesorty Structure (Sirat et al., 2012)); **Risk Management (**Cyber Security Protection (Imgraben et al., 2014); Risk-Based Quality Assurance (Edwards, 2012); Work Integrated Learning (WIL) (Cameron, Klopper, 2015)).	**Change Management** (Change impact on working conditionas (Mapesela, Hay, 2006); Management practice as a Critical Management (King, Learmonth, 2015)); **Education** (Teaching Skills and Practice Development (Kennelly, McCormack, 2015)); **Leadership** (Career Path (White et al., 2012); Strategic Management Framework and Practical Approaches (Sharrock, 2012)); **Strategy (**Management and Creation of Scientific Knowledge (Tian et al., 2009); Strategic Recommendations and Guidelines (Pucciarelli, Kaplan, 2016)).
sybsystem	Doctoral Students **(**Progress Reporting in Doctoral Studies (Mewburn et al., 2014)); Student (Students Personal and Pre-university Characteristics (Kabakchieva, 2013)); **Union Organizations (**Union Organizing Campaigns (Badigannavar, Kelly, 2005); University Management and Staff Union Integration (Paewai et al., 2007)).	**Academics Staff (**Academics Staff Experience (Ylijoki, Mantyla, 2003); Accademic staff opinion on Proefessional Staff (Gray, 2015); Experience of Academic Work (Manathunga et al., 2017); Job Satisfaction among Academic Staff (Lacy, Sheehan, 1997); Non Academic Staff at the University (Croucher, Woelert, 2022); Work Stress and Well Beeing in Higher Education Sectoir (Sang et al., 2013)); **Student (**Distance Learinging (Kaplan, Haenlein, 2016); Local student Adoptation to University Internacionalization (Yuan et al., 2019); Managers and Academics Contact with Students (Johnson, Deem, 2003)).	**Academics Staff** (Acadamic Performance Metoric (Beatson et al., 2022)); **Doctoral Students** (Timely Doctoral Completions and Funding of Doctoral Students (Rodwell, Neumann, 2008)).

Source: Authors' own study.

1. Determining the purpose of the study, i.e. analysis of literature regarding publications whose subject was a systematic analysis of literature in the field of selected areas of university management.

2. Selection of basic literature (n_1 = 1,534), selection of publications (n_2 = 999) and development of a publication database: publications published in journals directly related to the issues of university management: n_3 = 76; Other publications: n_4 = 923.

3. Bibliometric analysis of the number of publications and citations and content analysis: (1) frequency analysis referring to the study of the frequency of occurrence of keywords and their classification; (2) identification of a set of keywords defining research problems undertaken in the analyzed publications.

4. Report development. In order to organize and present the results obtained in the previous research stages in a holistic approach, the System Operator tool supporting system thinking was used.

As a result of the frequency analysis relating to the study of the frequency of occurrence of given keywords, six clusters related to the issues of education and its evaluation were distinguished: (Cluster 1), management of human factors, including students, researchers and administrative staff (Cluster 2), shaping entrepreneurial attitudes, including knowledge and innovation management (Cluster 3), university management in the education system (Cluster 4), issues related to sustainable development and leadership policy (Cluster 5 and Cluster 6).

As a result of content analysis, in terms of identifying research problems raised in the set of the most frequently cited scientific publications (n_5 = 54), 16 thematic areas in general terms were distinguished (i.e. (1) Academic Entrepreneurship; (2) Academics Staff; (3) Change Management; (4) Doctoral Students; (5) Education; (6) Evaluation; (7) Finance; (8) Leadership; (9) Market Environment; (10) Risk Management; (11) Strategy; (12) Student; (13) Technology Transfer Offices; (14) Union Organizations; (15) University in Public Sector; (16) University–Industry Cooperation). For each of the above-mentioned thematic areas, the research problem raised in the set of canceled works was classified. The last part of the paper indicates the need to use a tool that will enable the mapping of results in a holistic approach, i.e. determining the relations between individual elements of university management and the university environment, as well as in terms of time, relating to the evaluation of past activities and strategies, research into current solutions, as well as works related to shaping the concept of future solutions in the field of university management.

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