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RESEARCH PROBLEM FORMULATION IN MANAGEMENT SCIENCE

Henryk DŹWIGOŁ[1*], Mariola DŹWIGOŁ-BAROSZ[2]

[1] Department of Management, Faculty of Organization and Management, Silesian University of Technology; henryk.dzwigol@poczta.fm, ORCID: 0000-0002-2005-0078
[2] Department of Management, Faculty of Organization and Management, Silesian University of Technology; Mariola.Dzwigol-Barosz@polsl.pl, ORCID: 0000-0002-5306-3836
* Correspondence author

Purpose: The purpose of this paper is to explore the formulation of research problems in management science, highlighting the importance of a structured research methodology and its connection to both theory and practice. The paper seeks to bridge the gap between scientific research and business practice in the discipline of management.
Design/methodology/approach: The paper is based on an extensive literature review and theoretical analysis of the development of management science. The methodological approach includes examining historical methods in management research, analyzing their evolution, and proposing a model for structuring the research process. The paper emphasizes methodological triangulation and the relevance of both qualitative and quantitative methods.
Findings: The analysis reveals that management science has evolved significantly, from industrial efficiency to modern paradigms that include flexibility, sustainability, and innovation. The formulation of research problems in management science is driven by both theoretical inquiry and practical application, requiring a balance of qualitative and quantitative methods. The paper identifies the importance of methodological pluralism and the necessity of bridging theory with practice in modern management research.
Research limitations/implications: The research primarily focuses on the theoretical development of management science and does not include empirical testing. Future research should aim to test the proposed models and frameworks in practical settings to validate their applicability and effectiveness.
Practical implications: The paper offers insights into how businesses can benefit from structured research methodologies in management science, providing a guide for managers to apply academic research to real-world business problems. It encourages businesses to adopt flexible and innovative management practices, supported by rigorous research methods.
Social implications: The research highlights the importance of sustainable and responsible business practices, suggesting that management science can contribute to societal well-being by promoting practices that balance economic success with environmental and social responsibility.
Originality/value: This paper contributes to the ongoing discussion of research methodologies in management science by proposing a model that integrates theoretical and practical perspectives. It is valuable for researchers and practitioners looking to enhance their

understanding of the evolving nature of management science and the formulation of research problems.
Keywords: management science, research problem formulation, methodological triangulation, theoretical-practical integration, business research.
Category of the paper: theoretical paper, review.

1. Introduction

The goal of management science is to continuously develop or create new methods and research techniques. Management has been a part of human life since the beginning of civilization, and in practice, it is employed daily by individuals in various ways. Methodology refers to a structured set of approaches, rules, and principles for completing tasks. However, it is essential to consider the unique aspects of management science methodology. Some literature highlights the idea that management sciences suffer from a lack of methodological development, partly due to the anti-methodological stance of some of its leading schools of thought (Koźmiński, Obłój, 1989).

Theoretical sciences focus on understanding the natural and social world without considering how the research findings will be applied. In contrast, practical research is geared toward solving or explaining real-world problems or phenomena. As a result, the practical and theoretical dimensions must complement each other (Dźwigoł, 2018).

In management sciences, however, experimental research is not the primary method used. Instead, internal relevance depends on aligning with a suitable theoretical framework, employing deductive reasoning, or analyzing variable relationships that provide robust support for the findings. Additionally, internal validity enhances the value of theoretical triangulation, as the multifaceted study of a phenomenon helps to identify the most persuasive interpretation (Dźwigoł, 2018).

In recent years, similar issues have been explored in the context of sustainable development, as researchers have focused on aligning management practices with sustainability goals. This growing trend highlights the need to incorporate environmental, social, and governance (ESG) factors into management science, ensuring that research not only supports business efficiency but also contributes to the broader goal of sustainable development. Studies suggest that integrating sustainability into management methodologies fosters long-term business viability and resilience (Dźwigoł et al., 2021, 2023a, 2023b; Kwilinski et al., 2022, 2023c). Furthermore, the rapid digitalization of businesses has significantly impacted management practices, with digital tools and technologies reshaping the way organizations approach decision-making, resource allocation, and stakeholder engagement. Digital transformation, in combination with sustainability efforts, allows companies to innovate while maintaining their commitment to responsible and sustainable practices (Kwilinski, 2019a, 2019b; Kwilinski

et al., 2022, 2023a, 2023b, 2023d). This reflects the ongoing shift in management science toward more holistic approaches that encompass both economic and societal impacts (Dźwigoł, Trzeciak, 2023; Kharazishvili et al., 2020, 2021; Kharazishvili, Kwilinski, 2022; Krieger et al., 2023).

The formulation of the research problem and the search for a solution are largely driven by the adopted research objective. According to J. Niemczyk (2016), these may be goals that refer to an unrestrained desire to learn about the world, however, more often they are strictly determined by the persons or institutions ordering a solution to a scientific problem. The commercialisation of science has meant that the utilitarianism of the proposed solutions, the timing of the research, the success of the promotion process or the desire to use funds that are earmarked for the development of science effectively inhibit ambitious, risky, long-term and multifaceted projects - from this point of view, the area of interest of researchers may be the result of compromises between their own ambitions and the expectations of the environment (Lakatos, 1995).

To accurately formulate a research problem in management science, several fundamental questions need to be addressed (Dźwigoł, 2018):

- What research methods are appropriate for the research process in management sciences?
- Is methodological triangulation essential for conducting research?
- Should qualitative methods in research be complemented by case studies?
- Is it necessary to validate the methods, procedures, or models developed in practice to ensure the credibility of the research?
- Does the pilot study play a guiding role in the research process?
- Is it important to create specific models, procedures, tools, or approaches for the research process?

To provide adequate answers to these questions, relevant research needed to be conducted with the primary goal of developing a model, procedure, tool, or approach for selecting methods and outlining the process for conducting research in management science and practice.

This paper outlines the approach to formulating research problems and establishing the assumptions for the research process in management science. It highlights the growing connection between scientific research and business practice, emphasizing that modern management still requires strict adherence to methodological rigor in the research process.

2. Developments in management science

Management science emerged in its original form at the end of the 19th century. It is associated with the classical school of management, namely the American engineer F. Taylor. Management in classical terms was called industrial direction. The industrial approach assumed that man was merely an accessory to machines and equipment. Contributions to the management sciences at this time were mainly made by Le Chatelier, H. Gantt, H. Emerson, the marriage of F.B. and L.M. Gilbreth and K. Adamiecki. The main areas of activity of the above-mentioned people included, above all, the issue of increasing labour productivity. Among others, the following methods were developed:

- A 'time and motion study' method to measure and standardise work.
- A cyclogram method to film a worker's working movements in order to better match machines and equipment to the worker.
- Organised activity cycle stages method - aims to identify those activities through which employee performance is increased.
- The scheduling method allowed a comparison between the planned and actual workflow.

We can call these methods management by hierarchy.

Initially, management methods (19th century) were only applied by experts through their own tools of analysis and action when specific problems or phenomena occurred at all levels of the organisation. The myth of a machine dominated all other activities continued to be present. As a result, organisations sought to function as 'mega-machines' in which humans are just one of the wheels of the mechanism (Chauvet, 1997).

The next stage in the development of management methods is the taking of an administrative direction and the inclusion of bureaucracy theory (1920s). This was followed by the approach of the behavioural school in management (1940s), which focused, among other things, on the aspect of motivating employees. It emphasised the human aspect as a more important element than the material factor (machinery and equipment). During this period, management methods and techniques such as:

- methods of work enrichment,
- motivation methods and techniques based on needs classification,
- management methods by delegation,
- methods using autonomous groups.

Management methods based on operational research were also emerging, and mathematical decision-making methods were the result.

Another element of the development of methods about management is the 1960s-70s, when a radical change took place and organisations discovered the benefits and power of participatory methods.

In the 1980s-90s, many interesting methods and techniques were provided by the academic field of strategic management, resulting in methods such as:

- portfolio methods,
- scenario methods.

Modern companies need to be able to adapt flexibly to an economy marked by uncertainty and continuous dynamic changes (Zieniewicz, 2007). Several key concepts related to management in the global economy can be identified, including (Nogalski, Rutka, 2007):

- sustainability and sustainable enterprise,
- responsible business partnerships,
- flexibility and adaptability in organizational behavior and structures,
- intellectual capital and knowledge,
- entrepreneurship.

In today's business management, the focus should be on not only improving productivity but also increasing the overall value of the enterprise (Gerring, 2017; Mooi et al., 2018). Enhancing an enterprise's value largely depends on its ability to collaborate sustainably with its environment and implement flexible changes in its organizational culture, supported by IT technology. The use of IT enables companies to maintain sustainability while swiftly adapting to environmental changes and various internal processes (Dźwigoł, 2018).

The ongoing changes in the business environment call for the creation of new rules, principles, and management systems (O'Leary, Hunt, 2016; Petrova, 2018). The complexity of modern organizations and their external relationships requires employees to have advanced organizational knowledge and multidisciplinary skills. In this context, both the survival and growth of an enterprise depend on (Nogalski, Rutka, 2007):

- the ability to anticipate and stay ahead of change,
- focusing on core operational processes,
- adapting current management methods to new implementation conditions,
- effectively managing ongoing and implemented changes,
- fostering positive employee attitudes and behaviors,
- concentrating on building efficient processes.

As a result, management science in the 21st century has adopted a new paradigm centered on the ability to manage constant change. Change is now recognized as the only consistent process in the modern economic landscape (Sloan, Quan-Haase, 2017; Singleton, Straits, 2017). This new paradigm emphasizes (Nogalski, Rutka, 2007):

- teamwork,
- continuous learning,
- project implementation based on prior experience,
- effective communication,
- integration and cooperation,

- partnerships with customers and suppliers,
- agility and innovation.

Building the enterprise of the future based on the management science paradigm in the 21st century therefore requires, among other things (Malara, 2006):

- restructuring of the governance structure,
- restructuring the rules on information gathering,
- more efficient use of resources.

In modern companies, moreover, the organisational structure is changing, moving away from bureaucratic and hierarchical forms and the business processes themselves are taking place in so-called inter-organisational networks. Of particular importance in this context are concepts which build so-called intelligent organisations, virtual organisations, organic organisations (e.g. with a network or cluster structure), relational organisations (Czakon, 2007). In order to build an organisation based on the above concepts, it is necessary to develop the organisation's resource of knowledge. The correct management of knowledge will therefore determine the achievement of a competitive advantage (Dźwigoł, 2018).

3. New trends in management and research methodology

In the literature, there are additional claims pointing to the weak methodological foundation of management sciences, along with the emphasis on the need for skillful acquisition of knowledge, methods, and techniques from other scientific disciplines (Krzyżanowski, 1999). It is also argued that it is not necessary to create and develop methods exclusive to management sciences, but rather to pursue a transdisciplinary integration of sciences, avoiding excessive specialization (Dźwigoł, 2018).

However, the assertion that the methodological state of management sciences is weak is somewhat overstated. It should be acknowledged that management science employs both methods unique to the field and those borrowed from other disciplines. Borrowed methods are typically used to study organization and management, while proprietary methods are designed to shape the organization and its management system. Examples of methods used in the study of organization and management include:

- survey methods (derived from sociology),
- observational methods (from natural sciences),
- ethnological methods (from anthropology),
- para-experimental methods (from natural and social sciences),
- documentary methods (from social and historical sciences).

The application of management methods and the classification of management as a scientific discipline are frequently subject to critical scrutiny. This is often due to the rapid emergence and application of new management methods, which are sometimes adopted as trends or marketed as concepts, with their effectiveness often questioned by researchers.

In contemporary management, there is an increasing focus on the quality of the thinking process, as it directly influences the accuracy and quality of decisions made. The difference between contemporary and traditional approaches is substantial. The traditional approach to management, particularly in research, revolves around answering questions such as:

- Which elements of the organization or process are not functioning properly?
- Which elements are considered inadequate?
- What are the causes of these issues?

This traditional approach does not always yield satisfactory results and may not necessarily lead to improvements. In contrast, the contemporary approach seeks to expand knowledge of problem situations through the development of new rules, procedures, and tools (Ares, Varela, 2018a, 2018b). For example, the Positive Organizational Scholarship (POS) perspective can be applied. Using POS, one would start by asking, "Why are some employees ineffective?" and follow up with questions such as:

- Why is this happening?
- What are the underlying causes of this issue?

The application of POS leads to insights on what actions need to be taken to achieve the desired outcomes, such as improving performance and striving for excellence.

In modern management science, methodological fundamentalism, which rigidly defined scientific methods according to neopositivist models from the natural sciences, has been largely abandoned (Hempoliński, 1992). The literature frequently stresses the need to use a wide range of methods concurrently to both understand and shape organizations (Dźwigoł, 2018).

4. Science and practice

There is a strong connection between science and practice, as scientific research is frequently driven by real-world problems or phenomena. This connection highlights the interaction between scientific inquiry and practical human activity, where research can be categorized into:

- theoretical (basic) sciences,
- practical (applied, developmental) sciences.

The primary goal of management science is to support the practical aspects of economic and social life by (Lichtarski, 2007):

- offering models for effective organizational and management solutions,
- providing methods for implementing these models.

As research becomes more integrated with business practice (Koźmiński, 2000), it is crucial that management research addresses both theoretical and practical perspectives. Although management sciences are typically considered applied or practical, theoretical research remains essential for the growth of any scientific discipline (Kuciński, 2009). Additionally, the relationship between management science and business practice is both reciprocal and complex (Gabara, 1989). For this reason, management sciences can be seen as the "medicine of organizations," addressing the "health and diseases of organizations" while simultaneously focusing on "the art of prevention and treatment" (Koźmiński, 2000; Zimniewicz, 2005).

Management sciences have evolved alongside the economy, adapting to its changes and complexity. The discipline emerged as a practical response to economic and social needs, and as these conditions grow increasingly complex, the necessity for practical scientific approaches becomes more pronounced. Consequently, management science is often crucial for driving competitiveness in the modern business landscape (Dźwigoł, 2018).

However, one of the primary challenges of management science is the transient nature of its conclusions. This instability stems from several factors (Jokiel, 2006):

- the variables studied are subject to change over time due to various factors, such as legal, environmental, and social conditions,
- the research subjects (e.g., companies) are diverse and complex,
- qualitative factors, which are difficult to measure, must be considered,
- the methods used are evaluated differently by theoreticians and practitioners depending on historical context,
- challenges with verifying research results,
- the normative character of management science,
- claims are often only verified when research findings are applied in practice.

Despite these challenges, the collaboration between science and practice must remain strategic for effective management in 21st-century enterprises. Several aspects of the relationship between science and practice can be identified:

- Theory and practice are inseparable. "Theory fundamentally arises from practical needs. Practice raises questions for theory, and theory in turn requires practice to implement its findings" (Pytkowski, 1981).
- There is a fundamental mismatch between the goals of science and practice. Science seeks objective truths, while practice prioritizes effective algorithms and solutions for problem-solving (Mazur, 1970).
- When companies present low-impact problems to the scientific community, it can dilute the scientific inquiry, reducing the credibility and authority of the proposed solutions.

- A significant delay often occurs between identifying a problem, analyzing it, finding a solution, and implementing it, which affects both the effectiveness and evaluability of the solution.
- The concepts and solutions developed in management science are not universally applicable; research results often apply only to specific cases.

5. Methodological approach

Methodological evaluation of research can be conducted across three dimensions (Shrivastava, 1987): a) Conceptual adequacy, which ensures that the study is appropriately embedded within the relevant theoretical framework for the discipline. This involves confirming that the correct knowledge is applied to define the research problems and that suitable methods are chosen to address them. b) Methodological rigour, relating to the research design and method, which evaluates whether the research process achieves the intended outcomes. c) Empirical validation, which assesses whether the collected data confirms and supports the proposed solutions, descriptions, and relationships between concepts.

In economic sciences, there is often tension between the rigour of research—understood as the formal strictness of models and assumptions—and its relevance to the audience (Blaug, 2009). Based on this, three types of theories can be distinguished:

1. Highly rigorous,
2. Moderately rigorous,
3. Low in rigour.

Highly rigorous theories, such as general equilibrium theory, rely on a few fundamental laws expressed through mathematical equations, enabling the explanation of various economic laws and deviations. However, their weakness lies in their detachment from reality, as they lack empirical evidence and are not aligned with real-world economic practices (Blaug, 2009).

Moderately rigorous theories, exemplified by game theory, use mathematical models to simulate interactions between multiple players in decision-making scenarios. Yet, in practice, people rarely engage in the kind of complex thinking predicted by game theory, leading to deviations from theoretical predictions (Blaug, 2009).

Low-rigour theories, though less formally structured, are still used in management sciences to make decisions or explain phenomena. Therefore, the absence of rigour does not necessarily reduce the relevance of a theory in management research (Czakon, 2016).

Quantitative research seeks to test hypothesized relationships between variables. Three areas are key in evaluating the methodological rigour of such research:

1. Theories related to phenomena.
2. Measures that explain these phenomena.
3. The reality being analyzed.

This allows the development of models of social processes, incorporating theoretical causal relationships, operational measures to evaluate variable relationships, and theories describing these relationships (Boyd et al., 2005). Methodological rigour applies individually to each area and to the coherence between them. Consistency defines the logic of hypothesis testing, while reliability refers to the ability of the research to produce comparable results (Czakon, 2016).

Intrinsic relevance focuses on establishing causal relationships, which applies to studies analyzing the causes of phenomena. Causality involves three requirements (Scandura, Williams, 2000):

- Covariance in the statistical relationships.
- Temporal sequencing to prove that cause precedes effect.
- Rejection of alternative explanations.

Construct validity refers to how well an operationalization measures the intended concept (Cook & Campbell, 1979). Complex issues require a construct to describe the phenomenon, although direct observation of constructs is rare. Therefore, to test theoretical propositions, it is necessary to use measures that allow for quantitative description of constructs, known as operationalization (Czakon, 2016). A rigorous approach to constructs requires that the measures assess all relevant characteristics. The most effective way to assess construct validity is through the multi-trait multi-method (MTMM) matrix (Campbell, Fiske, 1959). There are at least ten different procedures for MTMM analysis, sometimes leading to conflicting results (Bagozzi et al., 1991). Currently, factor analysis is preferred for its ability to determine overall fit, discriminant and convergent validity, and clarify variance (Czakon, 2016).

External validity refers to the generalizability of results across time, space, and participants. It evaluates whether relationships between variables observed in one setting can be applied elsewhere. External validity highlights the background variables that influence empirical findings (Calder et al., 1982) and provides insights for management researchers and practitioners on the likelihood of obtaining similar results in other contexts (Lynch, 1999). Though external validity is rarely discussed in management science methodology, it is crucial for the practical applicability of research findings. However, the generalizability of results depends not only on external validity but also on the combined influence of relevance and reliability (Czakon, 2016).

Reliability pertains to the reproducibility of results, focusing on the accuracy of data before hypotheses are tested. Various types of reliability are mentioned in the literature, based on factors like time, research subjects, and the tools used (Czakon, 2016). The demand for reproducibility drives the need for reliable tests, which also raises costs and introduces risks that can undermine reproducibility. The most widely used tool for assessing reliability is Cronbach's alpha (Cronbach, 1951).

Interpretive research, evaluated by its adherence to methodological standards, is based on four assumptions (Corbin, Strauss, 1990):

- Data collection and analysis are interdependent processes.
- The core unit of analysis is the concept, not the data itself.
- Concepts are categorized and interrelated, forming a comprehensive picture of the phenomenon.
- The research process is guided by theory, focusing on specific individuals in specific contexts.

Despite the distinct criteria of qualitative research, there is a tendency in management sciences to adopt criteria from quantitative approaches. Relevance is considered in two ways (Leitch et al., 2010): as an outcome and as a process. Relevance as an outcome focuses on the narrative, including aspects like description, interpretation, theory, generalizability, and evaluation (Maxwell, 1992). Relevance as a process refers to validating research procedures, emphasizing ethics, researcher quality, and substantive content (Leitch et al., 2010).

6. Grading of scientific problems

The priority of the researcher according to K. Popper (Niemczyk, 2016), also in management science, should be the search for new knowledge. In turn, other researchers are associated with its falsification (Niemczyk, 2016).

Management science is a relatively young scientific discipline. For this reason, according to J. Niemczyk (2016), one can risk the observation that in principle the level of mature theory has not yet been reached. The relationship of management with the social sciences (including the humanities) or the mathematical sciences is still questionable - this poses a problem with defining problems in the management sciences and, in particular, with adopting a particular research perspective. This feature, from the researcher's point of view, of the management sciences is not necessarily a weakness. It can also represent an opportunity to make discoveries on the scale of important systematisations, a chance to build coherent and holistic paradigms, or an opportunity to remove inconsistencies at the level of local and strongly contextual laws (Niemczyk, 2016).

The research problem, in the management sciences, may be located in the area of ontology, epistemology, methodology or axiology specific for each of the fields or scientific disciplines included in the Polish classification. Research in the area of ontology of science is typical basic research, which is not easy to enclose in an inductive-hypothetical system. They are extremely difficult, however, they may have a very real and wide impact on the development of a scientific discipline or field. Epistemology, on the other hand, is the part of knowledge that makes it possible not only to name, but also, to a large extent, to understand the world - research in this

area is primarily basic research. It should be noted that from the level of epistemology it is much closer to management practice than from the level of ontology. Methodology is classical foundational knowledge, which is a specific area of knowledge. The management sciences use a variety of scientific methods, however, they still lack methods specific to it - perhaps in many cases this aspect raises the question of the identity of these sciences. Axiology, on the other hand, defines solutions not only for all specific sciences, but also as a component of each specific science. The dilemma related to the notion of value (Niemczyk, 2016) becomes important. According to W. Tatarkiewicz (Niemczyk, 2016), the notion of value is defined in different ways and for this reason frequent misunderstandings arise both among philosophers and representatives of the sciences applying the term. The concept of value can be seen as (Niemczyk, 2016): axiological subjectivism (things do not have value by themselves, it is people who give them value), axiological relativism (things have value, but not by themselves, only in relation to other things or entities), axiological variabilism (value is both subjectively relative and changeable), axiological scepticism (values that are an expression of desires or needs are nothing certain) (Niemczyk, 2016).

It is worth considering locating, or looking for, a problem from the level of detailed management sub-disciplines. From this perspective, one has a so-called cube to choose from, which includes at the strategic level: strategic management and entrepreneurship, at the operational level: knowledge and information management, process management, quality management, management decision support, organisational behaviour and innovation management, at the functional level: logistics management, human resource management, production and technology management, marketing management, corporate financial management and service management and intangible asset management (Cyfert et al., 2014). According to J. Niemczyk (2016), this cube can be treated as a morphological one, which increases the possibilities for creating new directions in management science. Another way of searching for research problems may be to build new knowledge in management by locating its general framework in the theory of management science and using it to explain problems at the level of management sub-disciplines. The opposite direction is also possible, i.e. specific knowledge from a sub-discipline can be used to introduce generalisations appropriate to the management sciences as a whole. A way to build knowledge in this convention is to transfer solutions between the subdisciplines of management science, or to create new subdisciplines in the form of separate sets (Niemczyk, 2016).

The full structure of the sciences should also be considered. In this arrangement, any sub-discipline of the management sciences can be placed at the lowest level, above them the management sciences above the management sciences, and above them the economic sciences (management with economics, finance and commodity studies are part of them). In turn, the economic sciences are part of the social sciences, and above them are placed solutions specific to the philosophy of sciences. In this form, it is possible to try to verify the appropriateness of specific solutions to build general knowledge, or, based on general

knowledge, to build solutions to problems arising in specific disciplines. An example would be any scientific problem referring to praxeological anatomies of efficient action, i.e. specialisation or diversification, efficiency or economy, resource reserves or work without reserves, etc. Given a change of perspective, one will obtain a variety of ways of transforming knowledge from the general level to the level of, for example, a sub-discipline (Niemczyk, 2016).

Due to methodological rigour, variants of knowledge construction at the interface of different sciences and areas are possible, hypothetically also new, formally hitherto non-existent areas of scientific knowledge. In summary, the presented ways of identifying scientific problems by locating them in different scientific structures can also prove effective in the precise identification of reference points (Niemczyk, 2016).

The scientific process requires, firstly, the finding or search for a scientific problem, secondly, the creation of a solution to that problem and its scientific justification. According to T.S. Kuhn (1968), the history of sciences is a history of accidental discoveries and expanding knowledge, not a constant accumulation of knowledge made possible by precise data and increasingly extensive theories. According to K. Popper (1977) the progress of science does not come from the fact that more and more perceptual experiences are accumulated over time (Dźwigoł, 2018).

An identified research gap can be a source of scientific problems. Its filling is a motivator to undertake scientific research work. It should be emphasised that most science methodologists focus on defining the research method in such a way that a priori it guarantees the reliability of the solution (Niemczyk, 2016). Finding a research problem from the perspective of the researcher or the potential impact on the development of science is not a simple task. The whole work of a scientist boils down to the search for certainty as to the credibility of a given research problem (for this purpose one can use such activities as: inventory of knowledge available in scientific publications, participation in conferences, etc.) (Stańczyk-Hugiet, 2014). The result of the above activities is the formulation of a research question and, if possible, also a research hypothesis in the form of a conjecture - this is the phase of the researcher's work that provides an opportunity to undertake appropriate research to justify the hypothesis or research question posed. The question for the researcher is whether to accept the principle that one should always formulate a hypothesis, or whether to look for a form of evidence for the questions or hypotheses posed. As a rule, as a result of a review of the literature or management practice, the formulation of hypotheses does not meet the requirement of credibility (for this reason, they are often trivial, safe and formulated in such a way as to favour evidence carried out by quantitative methods). Thus, it is useful to formulate research questions particularly for questions that address open-ended problems, exploring completely new areas or building new theories (Niemczyk, 2016).

The phenomenological approach, on the other hand, describes reality without assumptions (as it is) and the research problem is constructed in a different way than in the method of questioning theories - abstracting from conventions, theories, paradigms. The advantages of this approach are the discovery of a completely new phenomenon, relationship or event. It is possible to see what might be missed when looking through the prism of a rigid set of ontological and often even methodological assumptions (Niemczyk, 2016).

According to J. Niemczyk (2016) among the detailed methods of finding management-specific problems will be the methods of heuristic thinking (Delphi method, cross tables, brainstorming, etc.). The researcher's intuition should also not be overlooked as a good source of research problems.

In management, compared to other sciences, outstanding discoveries are hard to come by. However, this does not mean finding solutions to trivial problems. What is important is that the problems are:

1) new, with a global dimension,
2) resulting in a significantly important impact on the development of both the practice and theory of the discipline of management science,
3) difficult and even fraught with the risk of failure,
4) scientific (Niemczyk, 2016).

Novel problems absolutely provide new knowledge that fills a significant research gap. They can include: problems interpreted as novel in the context of the novelty of the research, new approaches in the different phases of the problem-solving process, the use of new problem-solving methods, or new research procedures. As M. Kostera states, "if the interests of researchers are only aligned with existing ways of scientific cognition, they may become one of the main obstacles to the acquisition and expansion of knowledge" (Kostera, 1996).

Citations can also be unreliable due to the fact that journals are often subject to a market game of supply and demand (Niemczyk, 2016). It should be borne in mind that the more applications a researcher's solution finds, in learning about, understanding and explaining the objects of interest of a particular subdiscipline of management science, management science itself, economic sciences and social sciences, the greater the impact it will have on the development of science (Niemczyk, 2016).

It is worth citing here the determinants of D.C. Feldman (2004) regarding well-developed scientific papers that are directed at enriching scientific theory in management. These include (Feldman, 2004):

- the non-trivial scope of the research question,
- a literature review covering the most relevant publications and including citations from scientific articles over the last 5 years,
- maintaining a balance in the research between redundancy and exclusivity of the variables analysed,
- precise and concise definition of the relevant paper constructs,

- the unambiguous nature of both the dependent and independent variables and the consistency of the hypotheses presented, etc.,
- locating research in a specific research perspective,
- visible definition of boundaries in the research argument carried out,
- clear presentation what you want to present in the theory you are building,
- discovering new knowledge, pointing out new directions or new insights into existing solutions,
- relating the theoretical proposals put forward in the paper to the real world (possibility of empirical testing) (Dźwigoł, 2018).

7. Conclusion and future research prospects

Upon analyzing the above findings, it is evident that management science, along with its associated methods, plays a crucial role in supporting business practices. It should guide managers and supervisors by offering normative frameworks that facilitate effective and efficient organizational operations. Management science must be viewed as a normative discipline, aiming to develop rules that enhance the functionality of enterprises. The research outcomes from management science should, therefore, find direct practical application. Failing to meet this expectation could result in the discipline being criticized as lacking practical value and being regarded as inferior (Nogalski, Rutka, 2007).

The literature also emphasizes the importance of employing multiple, mutually verifying methods within management research (Denzin, 1970). This highlights the phenomenon of methodological pluralism, which assumes that solving complex research problems requires using a combination of methods from different disciplines and theoretical perspectives. As Krzyżanowski (1999) noted, this approach acknowledges the diverse ways of understanding the world and the corresponding diversity of methods and techniques available to researchers. However, this approach can sometimes lead to methodological anarchy or eclecticism, which undermines the coherence and reliability of the research. To counter these risks, researchers must carefully analyze the problem at hand and select methods that ensure methodological rigor while avoiding unnecessary complexity or inconsistency.

Considering the critical assessment of management science theory, we can observe an ongoing tension between methodological rigor and practical relevance. Achieving high levels of rigor, particularly through mathematical modeling, presents challenges such as the rationality of decision-makers, the difficulty of aggregating individual preferences into collective decisions, and the complexities of profit maximization. These issues suggest that management science has two distinct audiences: researchers who prioritize rigor and theoretical precision, and business practitioners who value the practical usefulness of the research.

For managers, the utility of research results is often more important than the degree of rigor involved in producing them (Krzyżanowski, 1999).

Given these challenges, there are several promising avenues for future research in management science. Firstly, research should explore the balance between rigor and practical application, particularly examining how research findings can maintain both high methodological standards and relevance to practitioners. Developing frameworks that bridge the gap between theory and practice would enhance the impact of management research.

Secondly, there is a need to investigate more deeply the phenomenon of methodological pluralism in management research. Future studies could focus on determining the optimal mix of methods from various disciplines, ensuring that the use of diverse techniques leads to comprehensive and reliable insights without falling into methodological eclecticism. Additionally, further exploration of how to standardize the selection of appropriate methods for specific research problems is crucial.

Thirdly, the impact of digitalization and emerging technologies on management science opens new fields of study. Future research can focus on how technological advancements, such as artificial intelligence, big data, and machine learning, can be integrated into management science methodologies to enhance both rigor and applicability. The incorporation of technology in management research could provide new opportunities for data collection, analysis, and predictive modeling, offering more precise and actionable insights.

Lastly, addressing the evolving needs of businesses in a rapidly changing global environment should remain a key focus. This includes expanding research on sustainability, ethics, and social responsibility in management practices. Understanding how businesses can adapt to these new demands while maintaining competitiveness offers rich ground for further inquiry.

In conclusion, while methodological rigor remains essential for producing credible research, it must be balanced with practical relevance to ensure that management science continues to provide valuable insights for both scholars and practitioners. Future research should aim to refine the methods and frameworks used in management science, ensuring their continued relevance in addressing the challenges faced by modern organizations.

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