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Review of doctoral dissertation  
of Mariya Sira, MA  
entitled: „IMPLEMENTATION OF COGNITIVE TECHNOLOGIES IN MANAGEMENT  
IN THE MODERN BUSINESS SERVICES SECTOR”  
Supervisor: Prof. SUT Aleksandra Kuzior, PhD., DSc.  
Co-supervisor: Prof., Dr. Volodymyr Tkachenko

### **Formal and legal basis for preparing the review**

The formal basis for this review is the letter (ROZ-RD:512.5.2025.1) dated 26 November, 2025, from the chair of the Discipline Council for Management and Quality Science at the Silesian University of Technology, Dr. Lidia Knop, informing me of my appointment as reviewer, in accordance with the Resolution of the Discipline Council of 26 November, 2025, of the doctoral dissertation of Mariya Sira, M.A., entitled “Implementation of cognitive technologies in management in the modern business services sector.”

### **1. Assessment of the selection of research issues and the topic of the dissertation**

The topic of Mariya Sira's doctoral dissertation entitled “Implementation of cognitive technologies in management in the modern business services sector” concerns the conditions for the implementation of cognitive technologies (in particular solutions based on machine learning and intelligent process automation) in the management of organizations in the modern business services sector. The title itself clearly outlines the relationship between contemporary technological trends and the issues of management and quality, which should be considered fully consistent with the profile of the discipline of Management and Quality Sciences, within which the dissertation was written. The choice of research topic is very timely and relevant from both a scientific and utilitarian perspective. The author places her research in the dynamically developing area of cognitive technology applications in service organizations operating in conditions of accelerated digital transformation, changing customer expectations, and a rapidly evolving technological environment. In particular, the modern business services sector (BPO/SSC/GBS), which is one of the key segments of the modern economy of so-called knowledge-intensive services, is becoming a natural “laboratory” for cognitive technologies and generative AI solutions, which the author well justifies in the introductory part and in the chapter devoted to the characteristics of the sector.

The accurate identification of the research gap is noteworthy. The author points to the dominance of AI and Industry 4.0 topics in the manufacturing context, with insufficient recognition of the specific nature of the business services sector. This sector, which requires the processing of unstructured data and close human-system interaction, remains an under-researched area, especially in terms of ethics and regulation. The author also draws attention to the lack of a comprehensive theoretical framework combining classical management theories with the implementation of cognitive technologies, as well as the scarcity of rigorous empirical research on the effectiveness of implementing these solutions in service organizations.

The main research problem concerns the identification of determinants of the effectiveness of cognitive technology implementation in the modern business services sector. Key questions include the impact of organizational, competency, technological, and ethical factors and how they are integrated into the implementation framework model. The author clearly points to the need to simultaneously take into account innovation priorities, ethical and legal frameworks, managerial competencies, and employee experience, which makes the research problem comprehensive and well-grounded in the realities of contemporary organizations.

On this basis, the author formulates the main objective of the dissertation: to develop and empirically verify an integrated model for the implementation of cognitive technologies in the modern business services sector. This objective responds to the identified research gap. The work thus moves from a general formulation of the problem to the construction of a theoretical and empirical framework explaining the conditions for successful implementation.

The topic of the dissertation is correctly formulated and fully corresponds to the actual content of the work. In the following chapters, the author consistently remains within the declared subject matter: from the systematization of the concept of cognitive technologies and their functions in management, through the analysis of the modern business services sector, to quantitative and qualitative research. Such embedding of the topic in a specific sectoral context gives the dissertation both cognitive and applicational value.

As a remark of an organizing nature, it can only be noted that both the category of “cognitive technologies” and “modern business services sector” are broad and dynamically evolving concepts. However, the author narrowed down the subject of her research by focusing on intelligent process automation (IPA) in the business services sector on the Polish market (2020-2024). This allowed for sufficient limitation and clarification of the research field.

## **2. Evaluation of the formal aspects of the work**

Mariya Sira, MA's doctoral dissertation consists of 428 pages of typescript. The main substantive part covers over 250 pages (chapters 1-8), while the final parts of the work contain an extensive bibliography, a list of abbreviations, lists of figures and tables, and very extensive appendices. This scope of the study should be considered fully sufficient for a doctoral dissertation in the field of management and quality sciences.

The dissertation is divided into eight main chapters, the structure of which can be considered logical and well thought out:

- Chapter 1. *Introduction*, outlines the background of the problem, identifies research gaps, and presents the main goal and specific objectives of the dissertation, as well as a general outline of the structure of the work.
- Chapter 2. *Theoretical framework and research design*, presents the rationale for the choice of topic, research challenges, objectives, hypotheses, and scope of research, as well as the theoretical and methodological framework adopted.
- Chapter 3. *Essence and features of cognitive technology solutions in management*, systematizes the concepts and typologies of cognitive technologies, discusses their evolution and functions in management.
- Chapter 4. *Analysis of the modern business services sector and impact of cognitive technology solutions on business performance*, contains a quantitative analysis of the literature on the subject and a description of the modern business services sector in Poland, with particular emphasis on the role of cognitive technologies.
- Chapter 5. *Empirical findings from survey investigation*, presents the assumptions, course, and results of the survey, including the testing of research hypotheses.
- Chapter 6. *Qualitative validation of empirical findings through in-depth interviews*, presents the methodology of in-depth interviews and a qualitative analysis of the results in relation to the research questions and hypotheses.
- Chapter 7. *Discussion of cognitive technologies implementation results in business services*, provides a synthesis of the research results. The author formulates strategic recommendations, defines the theoretical contribution of the work, and discusses its limitations and directions for further development. The whole is complemented by an overview of technological tools and platforms.
- Chapter 8. *Conclusions*, contains a summary of the main results and findings of the research.

The author has ensured that the graphic design is extensive, which facilitates the reception of the content. The material consists of 60 figures (including theoretical diagrams, maps, and an implementation model) and 29 tables (including sector data and the results of literature analyses). The whole has been correctly catalogued in the lists, and the individual elements have been given unambiguous titles and consistent numbering.

The bibliography includes as many as 413 items. The list of sources is dominated by current English-language publications from renowned journals and publishers, supplemented by selected domestic studies. The citation system and bibliographic descriptions have been applied consistently (in a standard similar to APA). The few inaccuracies in punctuation or DOI notation are marginal and do not affect the positive assessment of the bibliographic craftsmanship.

The language of the dissertation is correct, communicative, and maintained in the scientific convention appropriate for English-language publications in the field of management. The level of English is fully sufficient for a doctoral dissertation written by a non-native speaker. The author uses a rich, specialized vocabulary characteristic of the topics of cognitive technologies, digital transformation, and management in the business services sector. The (occasionally) complex sentences may sometimes pose a certain challenge to the reader, however, they result from the specific nature of the phenomena described. The editorial errors noted are usually of a technical nature and do not affect the positive assessment of the work as a whole.

### **3. Research methodology**

The research methodology adopted by the doctoral student is comprehensive, correct, and adequate to the complex nature of the research problem. The dissertation has a clear theoretical and empirical profile. The author consistently implements a mixed-methods strategy, integrating theoretical analysis with quantitative and qualitative research, supported by quantitative bibliometric analysis.

The starting point is a precise definition of the main goal, specific objectives, and research questions and hypotheses (12 research questions RQ1-RQ12 and 6 hypotheses H1-H6), directly resulting from the identified research gap in the area of cognitive technology implementation in the modern business services sector. The material, subject, and time scope of the research has been clearly defined in Chapter 2, which correctly embeds the methodology within the adopted research problem framework.

The research was organized into three related stages, reflected in the project framework (Fig. 4):

- Stage I - theoretical foundation and bibliometric analysis.
  - Critical analysis of the literature on cognitive technologies in management and the modern business services sector.
  - Bibliometric analysis of scientific output from the Scopus and Web of Science databases (total sample of 552 publications) using SciMAT and VOSviewer software to identify publication dynamics, thematic evolution, and research gaps.

The applied approach allowed not only for a synthetic overview of the achievements, but also for a quantitative assessment of the position of the studied area and diagnosis of insufficiently recognized aspects of cognitive technology implementation.

- Stage II - quantitative survey
  - A structured online questionnaire (Interankiety.pl) with a sequential layout of sections: personal details, context of technology use, followed by blocks of questions measuring four main domains: technological innovation and ethics, evaluation and readiness for change, management and leadership, experience and impact on employees.

A five-point Likert scale and composite indicators (Ethics Index, Readiness Index, Manager Competency Index, Employee Impact Index) were used, the reliability of which was confirmed by Cronbach's coefficients of  $\alpha \geq 0.70$ .

The sample was selected purposefully with snowball elements, and the target group consisted of professionals from the modern business services sector in Poland with at least one year of practical experience in implementing or using cognitive technologies. On this basis, 505 responses were collected, of which 489 complete questionnaires were included in the analysis (completeness rate 99.6%), which, with an estimated population of 2,500-3,500 people, exceeds the minimum sample sizes recommended in the literature and ensures the power of statistical tests at a level of  $\geq 0.80$  for average effects.

The data analysis was carried out in seven stages, using MS Excel and Statistica, and included, among others:

- assessment of the reliability of the scales,
- correlation and frequency analyses of barriers,

- factor analysis of managerial competencies,
- regression modelling,
- mediation and moderation tests,
- cluster analysis,
- elements of text mining of open-ended responses.

Particularly noteworthy is the development of a correspondence matrix (Fig. 25) linking 37 questionnaire questions with 12 research questions and 6 hypotheses, which significantly increases the transparency and replicability of the methodology.

- Stage III – qualitative validation of results

Ten semi-structured interviews were conducted with managers who have decision-making power in the implementation of cognitive technologies and at least one year of experience in projects of this type. The selection of participants was purposeful.

The interviews were conducted remotely, and the research material was systematically coded in QualCoder, identifying 11 main thematic categories and 264 code segments.

The qualitative analysis is closely related to the research questions and hypotheses, and the relevant subsections (6.2.1 and 6.2.2) reflect the validation of individual RQs and Hs based on the experts' statements.

The applied triangulation of methods (bibliometrics-survey-interviews) strengthens the reliability of the results obtained and is consistent with current methodological recommendations in management sciences.

A strong point of the adopted methodology is the careful linking of objectives, hypotheses, measurement tools, and analysis methods, documented in the form of a correspondence matrix. Also noteworthy is the large and well-characterized research sample with a high response rate, as well as the correct application of quantitative-qualitative triangulation, which allows for the comparison of survey results with the experiences of practitioners.

Like any research project, this work has certain limitations. These include, first and foremost, the non-random selection of the sample and the reliance of the analyses on self-reported data, which carries the risk of social approval bias and common method variance. Despite these reservations, I conclude that the research methodology was designed and implemented at a high level. It is consistent with the objectives of the dissertation, deeply rooted in methodological literature, and fully adequate to the requirements of the discipline of management and quality science.

#### **4. Conclusions**

The doctoral dissertation by Mariya Sira, MA, is a mature and valuable study of the implementation of cognitive technologies in the modern business services sector. The final conclusions are a logical consequence of the adopted research concept, correctly applied methodology, and empirical analyses. The main objective, the development and empirical verification of an integrated model for the effective implementation of cognitive technologies in organizations in the modern business services sector, has been achieved, and the research hypotheses and questions have been convincingly confirmed by the results of quantitative and qualitative research.

**I consider the following to be the doctoral student's original contribution to the development of the discipline of management and quality science:**

- Development and empirical justification of the “dual functionality paradigm,” an original concept of the dual functionality of cognitive technologies, which simultaneously perform operational and managerial functions, generating a synergy effect that significantly goes beyond classic approaches to automation. This paradigm has been theoretically defined, embedded in the literature, and confirmed by empirical research results.
- Designing and verifying an integrated model for the implementation of cognitive technologies in the modern business services sector, taking into account technological innovation, ethical and legal conditions, organizational readiness, managerial competencies, and employee perceptions, as well as mediation and moderation mechanisms. This model represents a significant development of existing concepts of technology adoption towards a strictly sectoral and socio-technical approach.

- Demonstrating, on the basis of empirical research, the superior role of ethical factors over innovative orientation in explaining the effectiveness of cognitive technology implementations. This shift in emphasis from “technological determinism” to the primacy of ethical frameworks is one of the most interesting and theoretically significant results of the dissertation.
- Creation of empirical benchmarks for the Polish modern business services sector in terms of the scale, methods, and effects of cognitive technology implementation, which fills a significant information gap and may serve as a reference point for future comparative studies.
- Formulation of a set of practical recommendations for stakeholders in digital transformation, including paths for transitioning from classic automation to advanced cognitive automation and implementation protocols that take into account organizational and competency barriers.

### **Critical remarks**

Mariya Sira, MA's dissertation is a valuable and mature work, but like any extensive research project, it is not free from certain imperfections. None of the following comments undermine the positive assessment of the work; they are mainly of an organizing and developmental nature.

- The conceptual scope of “cognitive technologies” – although the author consciously organizes definitions and proposes her own conceptualization, in the empirical part, this category remains very broad and covers a variety of solutions (ML, IPA, chatbots, BI, etc.). This may lead to a certain “blurring” of the effects and make it difficult to distinguish between the specific conditions of implementation of different classes of technologies.
- The research is strongly rooted in the realities of the Polish modern business services sector, which on the one hand is an advantage (consistency of the regulatory and cultural context), but on the other hand limits the possibility of generalizing the results to other markets and sectors (e.g., mature markets in Western Europe or non-European economies). The author herself points out this weakness in the section on research limitations.
- The cross-sectional quantitative research design used is correct and adequate at the stage of model construction and initial verification. However, it limits the ability to capture the dynamics of cognitive technology implementation processes over time (organizational learning, changing professional roles, evolution of organizational culture). From the perspective of further research, it would be reasonable to consider panel (longitudinal) studies, which would allow a transition from static relationships to the analysis of implementation trajectories.
- The primary source of data in the quantitative part are respondents' statements collected through an online survey. This solution is justified when studying perceptions, but it carries typical risks: the socially desirable response effect, common method variance, and selection of respondents who are more sensitive to the topic. The author partially compensates for these limitations through triangulation (expert interviews), but in future studies it would be worth considering supplementing self-reported data with objective indicators (e.g., process efficiency measures, HR data, service quality indicators).
- The qualitative part is based on interviews with managers responsible for the implementation of cognitive technologies. This is a key group from the point of view of decisions and strategy, but the voices of line employees and specialists who work directly with these solutions are less well represented. This may lead to a shift in emphasis towards the management perspective.
- The proposed model, which includes numerous constructs, composite indices, and mediating and moderating relationships, meets high methodological requirements and represents a significant theoretical contribution. However, from a practical point of view, the model developed in this form may be difficult to implement.

### **The doctoral student should present her position on the following issues:**

- Please clarify the procedure for constructing scales and composite indices (Ethics Index, Readiness Index, Manager Competency Index, Employee Impact Index) and the criteria for their validation. What threshold values for reliability coefficients and factor loadings were considered sufficient to leave a given item on the scale?

- Please clarify at what stage and how the results of quantitative and qualitative research were integrated. Did convergence (confirmation of results), explanation of discrepancies, or rather mutual complementarity of perspectives prevail?
- How does the doctoral student interpret the fact that ethical variables proved to be a stronger predictor of implementation effectiveness than innovation orientation?  
In light of the results obtained, should organizations be recommended to reevaluate their implementation priorities (ethics and governance first, then innovation), and if so, how would this look in management practice?
- How does the doctoral student define the “effectiveness of implementation” of cognitive technologies in theoretical and practical terms?  
To what extent does the set of indicators used in the study (process efficiency, employee experience, organizational results) reflect the complexity of the phenomenon, and what important dimensions (e.g., long-term changes in competencies, impact on organizational culture, stakeholder trust) remain outside the scope of measurement?
- In the doctoral student's opinion, is the developed model for implementing cognitive technologies universal, or is it strictly determined by the specifics of the Polish modern business services sector? Please indicate what adaptations of the model would be necessary to enable its implementation in different conditions, for example, in other legal environments, highly regulated sectors, or traditional manufacturing industries.
- How did the doctoral student verify the fulfilment of the assumptions of the regression models used to test the hypotheses, including mediation and moderation analyses?  
For what reasons did she decide to use a regression approach (e.g., Hayes' procedure) instead of classic structural equation models (SEM)?
- How does the doctoral student define the relationship between her integrated model and classical approaches such as TAM, UTAUT, or Diffusion of Innovations? Please indicate where the essence of the novelty of the proposed approach lies.
- The research results clearly indicate the key role of managerial competencies, training, and employee attitudes in the process of implementing cognitive technologies. In this regard, what key implications for HR policy and personnel development strategy in the business services sector do you see? Please characterize the desired competency profile of a modern manager and an operational-level employee (front/back office).

## 5. Final conclusion

I, the undersigned, hereby declare that the reviewed doctoral dissertation by Mariya Sira meets the conditions specified in Article 13 section (1) of the Act of March 14, 2003, on academic degrees and titles and degrees and titles in the field of art (consolidated text Journal of Laws of 2017, item 1789) and **I request the Discipline Council for Management and Quality Sciences of the Silesian University of Technology to admit Mariya Sira, MA, to the further stages of the procedure for awarding a doctoral degree in the field of social sciences in the discipline of Management and Quality Sciences.**

The reviewed work stands out in terms of the scope of the issues addressed, the complexity of the problem solved, and the level of documentation of scientific results. The originality of the proposed solutions allows me to conclude that Mariya Sira's dissertation meets the criteria for an outstanding work.

Therefore, **I request that the Discipline Council award the reviewed doctoral dissertation with distinction.**

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date of review

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reviewer's signature