Silesian University of Technology
Management and Quality Studies

ABSTRACT OF THESIS DOCTORAL DISSERTATION

Implementation of cognitive technologies in management in the modern business services sector

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PLAN

1. RESEARCH JUSTIFICATION

The strategic implementation of cognitive technology solutions within modern business services organizations has emerged as a fundamental management challenge requiring sophisticated organizational capabilities and leadership. The period following 2020 represents an era of unprecedented management challenges in cognitive technology adoption, driven by accelerated digital transformation requirements and fundamental shifts in service delivery expectations. Organizations across the modern business services sector face increasing pressure to integrate advanced technological solutions while maintaining service quality, managing organizational change, and addressing stakeholder expectations.

Contemporary research demonstrates limited knowledge regarding the effectiveness of implementation and coordination among entities involved in cognitive technology adoption, particularly within modern business services facing digital transformation challenges, evolving customer expectations, and rapidly changing technological landscapes. The complexity of cognitive technology implementation extends beyond technical considerations to encompass organizational readiness, managerial competencies, ethical frameworks, and employee experience dimensions. This necessitates research on determinants of organizing cognitive technology implementation activities and factors influencing their effectiveness in dynamically changing business environments.

The modern business services sector represents a critical domain for investigating cognitive technology implementation due to its knowledge-intensive nature, process complexity, and strategic importance to organizational competitiveness. This sector encompasses diverse service types including shared service centers, business process outsourcing, information technology outsourcing, and research and development centers, each presenting unique implementation challenges and opportunities.

The identification of research gaps reveals several critical areas warranting systematic investigation. A primary gap exists in theoretical frameworks bridging traditional management theories with cognitive technology implementation, despite increased research output in artificial intelligence and automation domains. The existing literature lacks sufficient theoretical underpinning for understanding the management paradigm transformation required by cognitive technology adoption. Insufficient research validates cognitive technology effectiveness in management processes, creating a significant empirical validation gap. Much of the existing discourse relies on conceptual frameworks, vendor claims, or limited case study evidence without robust empirical validation across diverse organizational contexts. The intersection of technological innovation priorities, ethical considerations, managerial competencies, and employee experiences in cognitive technology adoption remains critically underexplored within modern business services operations. Existing research tends to examine these dimensions in isolation rather than investigating their

complex interactions and combined effects on implementation outcomes. Research reveals significant disparity between manufacturing and modern business services sectors in cognitive technology investigation, with extensive academic attention devoted to Industry 4.0 and smart manufacturing contrasting sharply with limited investigation of unique modern business services implementation challenges. Existing research insufficiently explores integration mechanisms between cognitive technologies and established management practices, organizational transformation processes during adoption, and long-term implications on management practices and organizational capabilities.

2. RESEARCH AIMS, HYPOTHESES AND SCOPE

The main aim of this dissertation is to develop and empirically validate an integrated framework for effective cognitive technology implementation in modern business services organizations. This aim encompasses theoretical development through synthesis of existing knowledge and creation of novel conceptual frameworks, empirical investigation through systematic data collection and analysis, and practical validation through examination of real-world implementation contexts. The framework development addresses the multidimensional nature of cognitive technology implementation by integrating technological, organizational, human, and strategic dimensions into a coherent analytical structure.

The research operationalizes the main aim through specific objectives encompassing both theoretical-cognitive and utilitarian dimensions.

Theoretical-cognitive objectives:

- Systematization of knowledge in the field of cognitive technology solutions and their applications in management contexts
- Establishment of the role of various organizational units and competencies in cognitive technology implementation
- Determination of factors influencing effective cognitive technology adoption in modern business services
- Identification of critical success factors for cognitive technology implementation in organizational management contexts

Utilitarian objectives:

- Analysis of cognitive technology implementation processes in modern business services organizations
- Analysis and evaluation of key factors for successful cognitive technology adoption
- Assessment of the nature of managerial competencies and their impact on implementation effectiveness
- Evaluation of employee perceptions and experiences regarding cognitive technology impact
- Development of practical recommendations for decision-makers in cognitive technology implementation

The research tests six primary hypotheses examining different dimensions of the implementation phenomenon:

H1: Technological innovation orientation positively influences cognitive technology implementation effectiveness.

H2: Ethical framework robustness significantly affects implementation success.

H3: Organizational readiness determines implementation outcomes.

H4: Managerial competencies moderate implementation effectiveness.

H5: Employee experience quality impacts sustained technology utilization.

H6: Implementation barriers mediate relationships between organizational factors and outcomes.

The research examines cognitive technology implementation in management contexts across multiple interconnected dimensions. The subject scope encompasses technological innovation orientations, ethical considerations in deployment, organizational readiness factors, managerial competencies requirements, and employee experiences throughout implementation processes. This multidimensional focus addresses the complex interplay between technological, organizational, and human factors determining implementation effectiveness.

The entity scope focuses on modern business services organizations operating in Poland, including shared service centers, business process outsourcing, information technology outsourcing, and research and development centers implementing cognitive technology solutions across their operational and management processes. This sectoral focus enables deep understanding of implementation dynamics within a coherent industry context characterized by knowledge-intensive operations, process complexity, and strategic importance to organizational competitiveness.

The temporal scope covers the period 2020-2024, with empirical data collected during 2023-2024, capturing the current state of cognitive technology adoption in the post-pandemic business environment. This timeframe encompasses the significant acceleration of digital transformation initiatives driven by pandemic-related disruptions, enabling investigation of implementation patterns during a period of intensified technological change and organizational adaptation.

3. DISSERTATION STRUCTURE

The dissertation comprises six chapters presenting investigation of cognitive technology implementation in modern business services management. Each chapter addresses specific aspects of the research problem while contributing to the integrated understanding of implementation dynamics.

The first chapter establishes research justification by identifying gaps in existing knowledge, formulating the research problem, and outlining the dissertation structure. It provides essential context for understanding contemporary management challenges in cognitive technology adoption within the modern business services sector, examining the strategic importance of implementation capabilities and the complexity of organizational transformation required for successful adoption.

The second chapter develops conceptual foundations through critical literature review, presenting research aims, hypotheses, and scope. It describes the theoretical framework grounded in the dual functionality paradigm of cognitive technologies, which recognizes their simultaneous operational and managerial functions. The chapter outlines the research methodology integrating quantitative survey analysis with qualitative validation approaches, establishing the mixed-methods design enabling investigation across multiple organizational dimensions.

The third chapter examines conceptual foundations and evolution of cognitive technologies, developing an epistemological taxonomy tracing definitional evolution from 1985 to 2024. It presents a typology and characteristics of cognitive technology solutions, establishing the dual functionality paradigm that distinguishes operational dimensions – focusing on task automation and process optimization – from managerial dimensions emphasizing decision support and coordination capabilities. This theoretical development provides essential foundations for understanding how cognitive technologies differ from conventional automation solutions.

The fourth chapter analyzes the modern business services sector through bibliometric investigation and market examination. It examines sector evolution, characteristics, and development in Poland, assessing market structure, competitive dynamics, and regulatory environment. The chapter evaluates the impact of generative AI and emerging business transformation trends, providing essential context for understanding the implementation environment and strategic imperatives driving cognitive technology adoption across diverse organizational types within the sector.

The fifth chapter presents quantitative survey findings from 489 respondents examining implementation patterns, organizational characteristics, and hypothesis testing, complemented by qualitative validation through semi-structured interviews with 10 management-level professionals. It demonstrates methodological triangulation achieving 78% convergence rate between quantitative patterns and qualitative insights, providing robust empirical foundations for research conclusions. The chapter establishes the most significant discovery that ethical considerations exceed innovation orientation in determining implementation success, challenging prevalent technological-deterministic assumptions.

The sixth chapter synthesizes theoretical contributions including the dual functionality paradigm and ethical framework primacy, while providing practical recommendations across five priority areas addressing ethical governance, organizational readiness, employee experience, managerial competencies, and progressive implementation approaches. It acknowledges research limitations related to geographic specificity, cross-sectional design, and self-report data reliance, while identifying future research directions including longitudinal implementation studies, cross-national comparative investigations, and experimental validation of strategic recommendations.

4. RESEARCH DESIGN AND METHODOLOGY

The research model integrates multiple theoretical perspectives to provide the framework for understanding cognitive technology implementation dynamics within modern business services organizations (Figure 1). The model synthesizes insights from technology adoption theories, organizational capability frameworks, and managerial competency models while addressing specific characteristics of cognitive technologies distinguishing them from traditional automation approaches.

The central theoretical contribution of this research lies in the dual functionality paradigm, which conceptualizes cognitive technologies as simultaneously serving operational and managerial functions within organizational contexts (Figure 2). This paradigm represents a fundamental departure from traditional technology implementation frameworks that primarily emphasize operational efficiency gains.

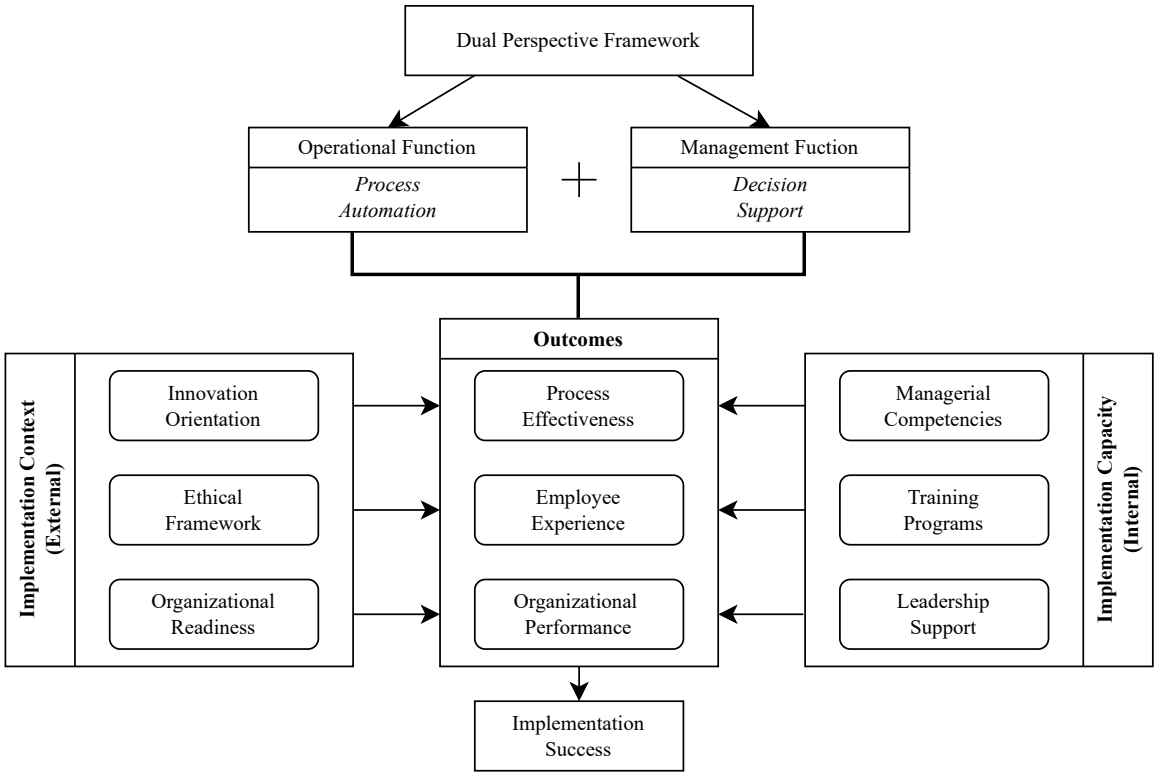

Figure 1. Theoretical framework for cognitive technology implementation in the modern business services.

Source: developed by the author.

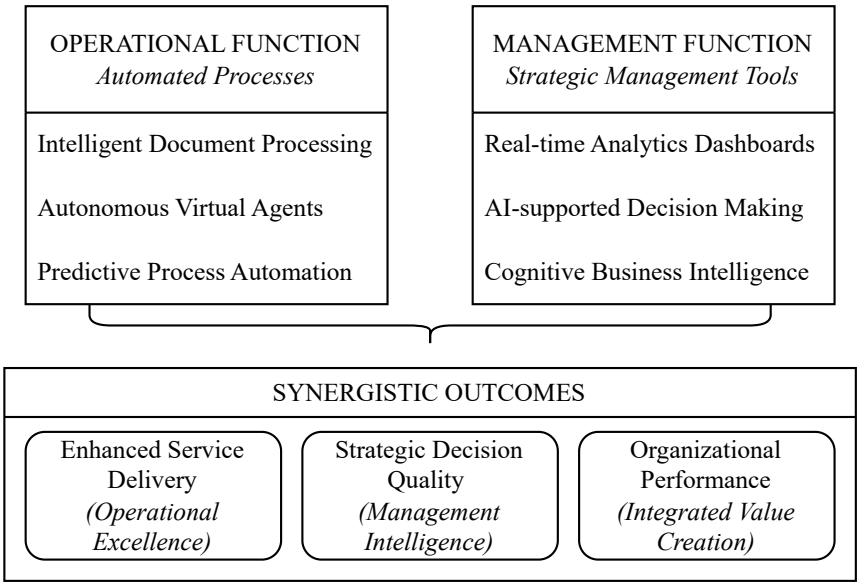

Figure 2. Dual perspective framework of cognitive technologies.

Source: developed by the author.

The research methodology employed to operationalize the theoretical framework is delineated in Figure 3.

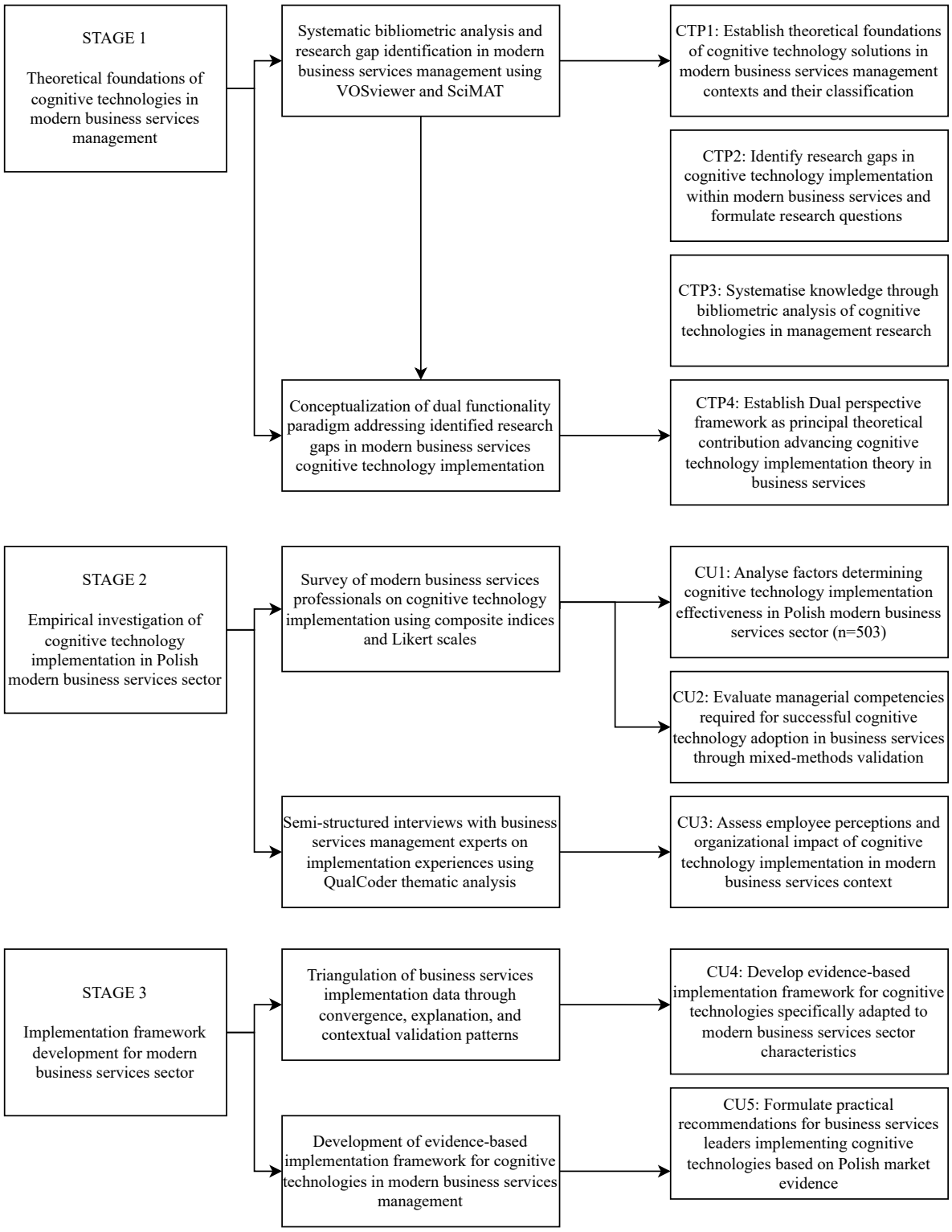

Figure 3. Research design framework for cognitive technology implementation investigation in business services.

Source: developed by the author.

The research methodology comprises three sequential phases designed to ensure methodological rigor and analysis of socio-technical transformations in business services. The first phase involved systematic bibliometric mapping to establish the theoretical foundation and chart the evolution of

scholarly discourse on cognitive technology implementation. Utilizing SciMAT v1.1.06 and VOSviewer v1.6.20, this phase examined 552 documents extracted from Web of Science (n=168) and Scopus (n=357) databases. The bibliometric analysis enabled identification of dominant research themes, emerging trends, and knowledge gaps in cognitive technology adoption, providing a robust theoretical framework for subsequent empirical investigation.

The second phase entailed large-scale empirical data collection through a validated survey instrument designed to test theoretical propositions derived from Phase 1. This phase employed a sequential multi-sector design encompassing 4 thematic domains with 5-point Likert scales complemented by open-ended questions. Data collection yielded 505 responses, with 489 respondents retained following screening procedures. The target population comprised business services professionals possessing hands-on cognitive technology experience (minimum 1-year tenure) operating within the Polish market, estimated at 2,500–3,500 individuals based on industry penetration rates. Sampling strategy combined purposive convenience approach with snowball sampling, following established protocols for accessing specialized professional networks. Statistical analysis generated demographic profiles, validated the measurement instrument, and identified patterns in organizational cogntive technology implementation practices.

The third phase comprised in-depth qualitative investigation designed to validate, contextualize, and interpret the quantitative findings from This phase involved 10 semi-structured interviews with management-level experts possessing strategic decision-making authority in cogntive technology implementation. Interview data generated 264 coded segments analyzed through QualCoder 3.7 software, with sessions conducted via Zoom to ensure geographic reach and participant convenience. Thematic analysis provided nuanced understanding of organizational contexts, implementation challenges, and success factors that quantitative metrics alone could not capture, thereby enriching the interpretation of survey results and strengthening the overall validity of research conclusions.

Table 1 presents the research model relationships and hypotheses testing results, systematically documenting the statistical evidence supporting theoretical propositions regarding managerial competency influences.

Table 1.
Research model relationships: hypotheses testing results

No.	Relationship	Hypothesis	Role
1	Innovation → Employee Engagement	H1	Independent variable → Dependent variable
2	Ethics → Employee Engagement	H1	Independent variable → Dependent variable
3	Employee Engagement → Implementation Effectiveness	H4	Independent variable → Dependent variable (mediation)
4	Change Readiness → Implementation Effectiveness	H2	Independent variable → Dependent variable

5	Competencies → Training Programs	H3	Independent variable → Dependent variable
6	Competencies → Implementation Effectiveness	H4	Independent variable → Dependent variable
7	Training Programs → Employee Outcomes	H6	Independent variable → Dependent variable
8	Perceptions → Training Programs	H5	Independent variable → Dependent variable
9	Perceptions → Employee Outcomes	H5, H6	Independent variable → Dependent variable
10	Training → Implementation Effectiveness	H3, H4	Independent variable → Dependent variable (mediation)
M1	Leadership moderates arrow 3	H4	Moderator
M2	Leadership moderates arrow 6	H4	Moderator

Source: developed by the author.

5. EMPIRICAL FINDINGS AND RESULTS

The demographic profile of survey participants establishes essential context for understanding research findings and demonstrates the representativeness of the investigated sample across multiple dimensions. Demographic analysis of the sample revealed notable concentration within the 25-34 age cohort (60%), with younger professionals aged 18-24 comprising 9% of respondents. More experienced professionals were represented across two cohorts: 35-44 years (21%) and 45-54 years (8%). This age distribution provides robust representativeness across generational cohorts while enabling analysis of potential age-related differences in technology adoption patterns and implementation experiences.

Professional experience analysis revealed a relatively balanced distribution: 49% of respondents reported less than three years of experience, 27% possessed four to six years of domain expertise, and 24% demonstrated seven or more years of professional experience in business services contexts. This experience distribution suggests the sample encompasses both emerging professionals relatively new to cognitive technology implementations and seasoned practitioners with extensive organizational transformation experience, enabling examination of experience-related variations in perceptions and implementation approaches.

The organizational position hierarchy spans multiple levels from individual contributors through senior leadership, with the distribution reflecting realistic organizational structures within modern business services operations. Organizational size analysis revealed predominance of large enterprises (>1,000 employees), representing 63% of respondents. Medium-sized organizations (250-999 employees) accounted for 19%, while smaller organizations (<250 employees) comprised 18% of the sample. This size distribution suggests cognitive technology implementation occurs most prevalently within larger organizations possessing greater resources for technological investment, though substantial adoption exists across the organizational size spectrum.

Functional area analysis revealed notable diversity across business operations. Customer operations represented the largest departmental contingent (62%), followed by other functions (15%) and procurement (12%), while finance and accounting, human resources, and IT services collectively comprised the remaining 10% of respondents. This functional distribution indicates cognitive technology applications span diverse operational domains rather than concentrating within isolated functional silos, suggesting broad organizational integration of these technological capabilities.

Investigation of cognitive technology adoption revealed widespread implementation across surveyed organizations, with near-universal adoption rates evident: 98% of respondents confirmed organizational adoption of cognitive technologies, while only 2% reported absence of such implementations. This overwhelming adoption rate establishes cognitive technologies as integral components of contemporary business services operations rather than experimental or peripheral technological initiatives. The technological landscape encompasses multiple cognitive technology types with machine learning emerging as the cornerstone technology demonstrating 67 percent integration frequency, while virtual assistants, natural language processing, robotic process automation, and computer vision collectively establish a diverse technological ecosystem supporting varied operational requirements.

Engagement patterns with cognitive technologies demonstrate intensive utilization frequencies, wherein 46 percent of respondents report multiple daily interactions with cognitive technologies and an additional 43 percent indicate daily usage patterns, collectively totaling 89 percent minimum daily engagement. This high-frequency interaction pattern suggests cognitive technologies have transitioned from occasional tools to essential operational infrastructure embedded within routine work processes. Furthermore, analysis reveals strategic technology integration approaches wherein 85 percent of organizations implement multiple cognitive technology types concurrently rather than pursuing single-technology deployments, with particular emphasis on complementary capability combinations such as machine learning paired with virtual assistants demonstrating 21 percent co-implementation rates.

The transformation strategy framework encompasses multiple organizational priorities, with process automation achieving 91.3 percent adoption indicating widespread commitment to efficiency improvement through technological substitution, standardization at 79.8 percent reflecting emphasis on consistent process execution and quality assurance, and artificial intelligence implementation at 70.2 percent demonstrating substantial cognitive technology integration beyond traditional automation approaches. Additionally, 66.4 percent of organizations report global headquarters supervision of transformation initiatives, indicating centralized strategic direction while enabling local implementation flexibility through distributed execution models.

The investigation of innovation priorities and ethical aspects yields the most significant discovery of this research, fundamentally challenging prevailing assumptions regarding cognitive technology implementation success factors. Statistical analysis demonstrates that ethical considerations, as measured by the Ethics Index, exert stronger influence on implementation effectiveness compared to innovation orientation, with standardized regression coefficients of $\beta=0.421$ ($p<0.001$) for ethical considerations substantially exceeding $\beta=0.257$ ($p<0.001$) for innovation prioritization. This finding represents a paradigm shift from technological determinism assumptions prevalent in management literature, establishing ethical frameworks as primary success drivers rather than supplementary considerations addressed after technology selection.

Despite strong organizational emphasis on technological innovation, with 84 percent of organizations reporting innovation prioritization as strategic imperative, the empirical evidence reveals a 46 percentage-point gap between compliance-driven approaches achieving 83 percent agreement and ethical considerations achieving only 50 percent agreement. This substantial gap indicates systematic deficit in ethical frameworks beyond minimal regulatory compliance, suggesting organizations have not yet fully recognized or operationalized ethical considerations as strategic implementation determinants. The robust correlation between ethical considerations and implementation success ($r=0.422$, $p<0.001$) demonstrates superior explanatory power compared to innovation orientation ($r=0.276$, $p<0.001$), necessitating organizational reconsideration of implementation priorities with ethics elevated from supplementary concern to foundational requirement.

The interaction model testing documented through three-dimensional scatterplot visualizations and regression analysis demonstrates significant overall model fit with Multiple $R=0.541$, $R^2=0.292$, and Adjusted $R^2=0.232$, achieving statistical significance at $F=4.837$ ($p<0.001$). These statistics indicate that the combined interaction between innovation orientation and ethical considerations explains approximately 29 percent of variance in implementation effectiveness, substantially exceeding the explanatory power of either factor independently. This synergistic relationship extends responsible innovation theory by empirically demonstrating that ethical integration enhances rather than constrains technological effectiveness, refuting zero-sum assumptions wherein ethical considerations supposedly compromise innovation velocity or operational performance.

Organizational readiness emerges as the strongest single predictor of implementation success throughout the investigation, demonstrating correlation coefficient of $r=0.491$ ($p<0.001$) with implementation effectiveness. This substantial correlation magnitude indicates that organizations exhibiting higher preparedness levels across technological infrastructure, organizational structures, and human capital dimensions achieve significantly superior implementation outcomes compared to organizations pursuing cognitive technology adoption without adequate foundational capabilities.

The readiness construct encompasses multiple dimensions including technological infrastructure adequacy, organizational change management capabilities, workforce skill profiles, leadership commitment levels, and cultural receptivity to technological transformation.

The systematic barrier identification framework developed through frequency analysis reveals that technical integration issues constitute the most prevalent implementation challenge at 55.8 percent occurrence rate, followed by resource constraints, organizational resistance patterns, and competency gaps collectively demonstrating 89 percent barrier coverage completeness. Analysis of challenges across business processes revealed differential barrier patterns: certain process types encountered primarily technical obstacles, while others faced predominantly organizational or human factors impediments, indicating variation in implementation challenge profiles. This systematic categorization enables targeted intervention strategies addressing specific barrier types rather than generic mitigation approaches.

Statistical analysis through one-way ANOVA procedures demonstrates significant group differences in implementation effectiveness based on barrier count levels, with F-statistics achieving statistical significance and Tukey HSD post-hoc testing identifying specific pairwise differences between barrier count categories. Organizations reporting fewer implementation barriers consistently demonstrate higher effectiveness scores, establishing negative correlation between barrier prevalence and implementation success. The analysis identifies 67 percent effectiveness improvement potential through competency-specific mitigation approaches, suggesting substantial opportunity for performance enhancement through proactive barrier management strategies informed by empirical frequency distributions and impact assessments.

Factor analysis of managerial competency variables reveals a two-dimensional structure underlying leadership effectiveness in cognitive technology contexts, as documented through principal component extraction with Varimax rotation achieving Kaiser-Meyer-Olkin measure of sampling adequacy of 0.847. The first dimension encompasses strategic competencies including vision formulation and communication skills, while the second dimension comprises operational competencies spanning change process management, resource management, coordination capabilities, and balance maintenance between competing priorities. This dimensional structure suggests that effective cognitive technology leadership requires both strategic orientation establishing direction and meaning alongside operational capabilities executing implementation activities and managing transformation dynamics.

The regression analysis demonstrates that managerial competencies collectively explain approximately 25 percent of variance in implementation effectiveness as measured by $R^2=0.248$, achieving statistical significance at $F(5,483)=12.34$ ($p<0.001$). However, examination of individual competency contributions reveals differentiated impact patterns wherein only certain operational

competencies demonstrate statistically significant effects. Specifically, change process management emerges as the strongest individual predictor with standardized coefficient $\beta^*=0.366$ ($p<0.001$), followed by resource management at $\beta^*=0.182$ ($p=0.004$), while strategic competencies including vision and communication fail to achieve statistical significance in predicting implementation effectiveness.

Correlation analysis further illuminates these differential competency impacts, revealing that change process management demonstrates the strongest correlation with effectiveness at $r=0.475$, followed by resource management at $r=0.417$, while other competencies show weaker correlations including vision at $r=0.312$, communication at $r=0.327$, and coordination alongside balance both at $r=0.280$. This pattern suggests that implementation success depends more critically upon operational execution capabilities managing transformation processes and allocating resources effectively than upon strategic vision articulation or communication proficiency, though these latter competencies may serve important enabling functions not captured through direct effectiveness prediction.

Survey data triangulation reveals substantial development challenges across multiple competency dimensions, with coordination achieving only 33 percent agreement regarding adequate development, communication reaching 34 percent agreement, and balance maintenance attaining 31 percent agreement on sufficiency. These low agreement levels indicate significant improvement potential through targeted competency development initiatives, particularly given the substantial explanatory power of managerial competencies coupled with current underdevelopment. Organizations investing in competency enhancement programs addressing both strategic and operational dimensions could substantially improve implementation outcomes, with 24.76 percent variance explanation suggesting high-impact potential for such investments.

The investigation of employee experiences with cognitive technology implementation yields the strongest empirical relationship observed throughout the entire study, specifically the correlation between perceived performance improvements and career development opportunities achieving $r=0.613$ ($p<0.001$). This robust correlation magnitude substantially exceeds all other bivariate relationships examined, establishing that cognitive technologies create skill development opportunities fundamentally impacting career advancement prospects when implementations succeed in enhancing employee performance capabilities. The finding suggests that successful cognitive technology adoption transcends operational efficiency gains to encompass human capital development dimensions with strategic implications for talent retention and organizational capability building.

The relationship between performance perceptions and job satisfaction similarly demonstrates substantial strength at $r=0.468$ ($p<0.001$), validated through multiple regression analysis yielding standardized coefficient $\beta=0.198$ ($p<0.05$) when controlling for other factors. This statistical evidence

quantifies the positive impact of cognitive technologies on employee satisfaction levels, demonstrating that workforce experiences constitute critical success metrics alongside operational performance indicators. Organizations neglecting employee experience dimensions risk implementation failure despite achieving technical deployment milestones, as sustainable utilization depends upon workforce acceptance and engagement rather than merely technological functionality.

Managerial competencies exert moderate influence on employee experiences with cognitive technology implementation, explaining approximately 25 percent of variance in employee impact as measured through the Employee Impact Index. This relationship demonstrates domain-specific variation wherein managerial competencies show stronger influence on day-to-day job satisfaction than on career development aspects, suggesting managers more directly affect immediate work experiences rather than long-term career trajectories during technological transitions. Regression analysis reveals presence of outliers empirically confirming that in certain cases, factors beyond managerial competencies significantly shape employee technology experiences, including organizational culture dimensions, peer support networks, and individual difference variables such as technological self-efficacy and change readiness.

The analysis of role changes across organizational position levels through one-way ANOVA procedures demonstrates that cognitive technology impacts vary systematically across the organizational hierarchy, with differential effects on decision-making authority, strategic responsibilities, operational efficiency demands, collaboration requirements, skill utilization patterns, and engagement levels. Senior positions experience greater enhancement of strategic and decision-making dimensions, while operational roles realize more substantial efficiency and automation benefits, reflecting the dual functionality paradigm wherein cognitive technologies simultaneously serve operational process automation and managerial decision support functions at different organizational levels.

The empirical investigation achieved substantial hypothesis confirmation across six theoretical propositions, with five hypotheses receiving full empirical support and one hypothesis demonstrating partial validation. The substantial explanatory power ($R^2 = 0.74$) and strong predictive validity (68% cross-validation accuracy) establish considerable utility
of the developed dual functionality paradigm and empirically validated implementation framework.

Hypothesis 1 regarding the combined impact of innovation and ethics received empirical confirmation through interaction model testing yielding Multiple $R=0.541$, $R^2=0.292$, and Adjusted $R^2=0.232$ with overall model significance at $F=4.837$ ($p<0.001$). However, the critical finding emerges from comparing individual coefficient magnitudes wherein ethical considerations at $\beta=0.421$ exceed innovation orientation at $\beta=0.257$, representing a 64 percent stronger effect size. This disproportionate influence challenges technological determinism assumptions and necessitates

fundamental reconsideration of implementation priorities, establishing ethics as primary rather than supplementary success determinant. Process improvement dimension analysis provides additional validation, demonstrating that cognitive technologies simultaneously enhance both efficiency and speed at 91 percent alongside quality and accuracy at 70 percent, refuting assumptions that velocity achievements compromise precision outcomes.

Hypothesis 2 concerning evaluation and readiness impact achieved robust confirmation through correlation analysis demonstrating organizational readiness as the strongest single predictor at $r=0.491$ ($p<0.001$), substantially exceeding all other independent variable correlations with implementation effectiveness. This finding emphasizes the foundational importance of organizational preparedness encompassing technological infrastructure, workforce capabilities, leadership commitment, and change management systems as prerequisites for successful cognitive technology deployment. Organizations attempting implementation without adequate readiness face substantially elevated failure risks regardless of technology sophistication or strategic importance, suggesting that readiness assessment and capability development should precede major technology investments.

Hypothesis 3 regarding managerial competencies' process impact received partial confirmation, with overall model achieving $R^2=0.248$ explaining approximately 25 percent of implementation effectiveness variance at $F(5,483)=12.34$ ($p<0.001$) statistical significance. However, detailed coefficient analysis reveals that not all competency dimensions contribute equally, with only operational competencies demonstrating statistically significant effects through change process management at $\beta^*=0.366$ ($p<0.001$) and resource management at $\beta^*=0.182$ ($p=0.004$), while strategic competencies fail to achieve significance. This differentiated pattern suggests targeted competency development programs emphasizing change management and resource allocation capabilities yield superior returns compared to generic leadership enhancement initiatives.

Hypothesis 4 concerning competent managers enhancing effective utilization achieved confirmation through standardized coefficient $\beta=0.267$ ($p<0.01$), though correlation pattern analysis reveals differential effectiveness across barrier types. Managerial competencies demonstrate strong negative correlation with training barriers at $r=-0.425$ and leadership barriers at $r=-0.368$, indicating substantial mitigation capability for human-centric impediments. However, technical obstacles show weak correlation at $r=0.124$, suggesting managerial capabilities possess limited direct influence on technological integration challenges requiring specialized technical expertise rather than leadership intervention.

Hypothesis 5 addressing perception impact on skill development and career progression achieved the strongest empirical support throughout the investigation at $r=0.613$ ($p<0.001$), establishing cognitive technologies' capacity to create meaningful career advancement opportunities when implementations enhance employee performance capabilities. This finding extends beyond

operational efficiency considerations to encompass strategic human capital development implications, suggesting organizations should evaluate cognitive technology investments partially through workforce development lenses rather than exclusively through cost reduction or productivity metrics.

Hypothesis 6 regarding perception impact on job satisfaction received confirmation through correlation analysis at $r=0.468$ ($p<0.001$) alongside regression coefficient $\beta=0.198$ ($p<0.05$), quantifying positive relationships between performance perceptions and employee satisfaction levels. This empirical validation demonstrates that successful implementation requires systematic attention to employee experience metrics encompassing satisfaction, engagement, and perceived career impact alongside traditional operational performance indicators.

The empirical investigation provides robust validation of the theoretical dual functionality paradigm through multiple converging analytical approaches. Table 2 presents the dual functionality framework of cognitive technologies, systematically documenting operational and managerial dimensions alongside their respective effectiveness patterns.

Table 2.
Dual functionality framework of cognitive technologies

As operational processes	As management tools
Intelligent document processing	Real-time analytics dashboards
Automated OCR, NLP, and ML-driven document analysis reduces manual processing by 90% (Nair, 2025)[1]	Executive dashboards providing predictive insights for the 47% of leaders expecting AI to transform at least 30% of their work this year (Mayer et al., 2025)[2]
Autonomous virtual agents	AI-supported decision making
Customer service automation achieving up to 50% reduction in human-serviced contacts through cognitive chatbots and intelligent routing systems (McKinsey Global Institute, 2023)[3]	Recommendation engines and DSS contributing to the 87% of companies expecting AI-driven revenue growth within three years (Mayer et al., 2025)[4]
Predictive process automation	Cognitive business intelligence
ML algorithms preventing system failures and optimizing workflows across the 65.2% of organizations implementing IPA solutions (ABSL, 2024)[5]	Advanced analytics platforms generating strategic insights with 74% of advanced cognitive initiatives meeting or exceeding ROI expectations (Deloitte AI Institute, 2024)[6]

[1] Nair, S. (2025). 50 Key Statistics and Trends in Intelligent Document Processing (IDP) for 2025. Retrieved from: https://www.docsumo.com/blogs/intelligent-document-processing/intelligent-document-processing-market-report-2025, 15.07.2025.
[2] Mayer, H., Yee, L., Chui, M., Roberts, R. (2025).AI in the workplace: A report for 2025. McKinsey Digital. Retrieved from: https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/superagency-in-the-workplace-empowering-people-to-unlock-ais-full-potential-at-work, 15.07.2025.
[3] Chui, M., Hazan, E., Roberts, R., Singla, A., Smaje, K., Sukharevsky, A., Yee, L., Zemmel, R. (2023). The economic potential of generative AI: The next productivity frontier. McKinsey & Company.
[4] Mayer, H., Yee, L., Chui, M., Roberts, R. (2025).AI in the workplace: A report for 2025. McKinsey Digital. Retrieved from: https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/superagency-in-the-workplace-empowering-people-to-unlock-ais-full-potential-at-work, 15.07.2025
[5] Association of Business Service Leaders (2024). Business Services Sector in Poland 2024. Warsaw: Association of Business Service Leaders.
[6] Deloitte AI Institute (2024). State of generative AI in the enterprise Q4 2024. New York: Deloitte. Retrieved from: https://www2.deloitte.com/us/en/pages/consulting/articles/state-of-generative-ai-in-enterprise.html, 15.07.2025.

Note. The dual functionality framework represents an original theoretical contribution by the author. Specific technology applications and performance metrics within each category are empirically supported by cited literature.

Source: developed by the author based on literature synthesis.

Statistical analysis demonstrates 67 percent framework support through research question investigation and 74 percent explanatory power through hypothesis testing, while descriptive findings document asymmetric effectiveness patterns wherein operational dimensions achieve 86.1 to 91 percent effectiveness in task automation and process optimization compared to managerial dimensions realizing only 19.7 to 56.5 percent effectiveness in decision support and coordination capabilities.

This asymmetric duality confirms theoretical predictions regarding simultaneous yet differentially mature operational and managerial dimensions, suggesting cognitive technologies evolve through distinct maturity phases progressing from robotic process automation foundations achieving 65 percent success rates through intelligent process automation reaching 78 percent effectiveness toward sophisticated cognitive automation demonstrating 82 percent performance improvement. The observed operational prevalence versus management deficit indicates hierarchical implementation differential wherein organizations more readily achieve process automation benefits than strategic decision enhancement capabilities, potentially reflecting greater complexity of managerial applications requiring nuanced judgment rather than rule-based execution.

The synergistic value creation documented through dual functionality substantially exceeds traditional automation approaches focused exclusively on operational efficiency gains. Organizations leveraging cognitive technologies across both operational and managerial dimensions realize combined benefits through enhanced process execution alongside improved strategic decision quality, creating complementary value streams not achievable through single-dimensional deployment strategies. Assessment of implementation impact on overall management effectiveness revealed that organizations experiencing substantial improvement attributes employed integrated dual functionality deployment rather than isolated operational automation approaches.

The empirical investigation establishes multiple validated assessment instruments with reliable composite indices measuring ethics, readiness, competencies, and employee impact achieving Cronbach's alpha exceeding 0.70 for all measures, providing organizations with psychometrically sound evaluation tools for implementation planning and monitoring purposes. Table 3 presents the integrated results matrix with strategic implications, systematically synthesizing empirical findings into actionable organizational guidance across multiple stakeholder categories.

Table 3.
Integrated results matrix with strategic implications

Research dimension	Statistical evidence	Theoretical interpretation	Strategic imperatives
RQ1: Innovation prioritization effect	• C10_Innovation with G34_Effectiveness: $r = 0.276$, $p<0.05$ • Regression coefficient: $\beta = 0.257$ • Process_Impact_Average: $r = 0.215$, $p<0.05$ • G31_Impact_Decision_Score: $r = 0.223$, $p<0.05$	The moderate positive correlation between innovation prioritization and implementation effectiveness demonstrates that while innovation contributes significantly to implementation success, its moderate magnitude suggests a complex implementation ecosystem where innovation represents one factor within a constellation of determinants. The regression coefficient provides quantifiable evidence that each unit increase in innovation prioritization yields a 0.257-unit enhancement in implementation effectiveness.	• Institutionalize innovation assessment frameworks with multi-dimensional metrics reflecting both direct and indirect outcomes. • Establish cross-functional innovation governance structures with explicit decision-making protocols. • Develop innovation capacity indices calibrated to organizational structural variables. • Implement innovation-readiness diagnostics prior to cognitive technologies deployment.
RQ2: Ethical-legal integration	• Ethics_Index_Full with G34_Effectiveness: $r = 0.422$, $p<0.05$ • Ethics_Index_Reduced with G34_Effectiveness: $r = 0.298$, $p<0.05$ • Ethics regression coefficient: $\beta = 0.421$ • Ethics_Index_Full with Employee_Impact_Index: $r = 0.506$	The robust correlation between ethical frameworks (including legal components) and implementation effectiveness demonstrates the superior explanatory power of ethics ($r = 0.422$) compared to innovation priorities ($r = 0.276$. The differential between Ethics_Index_Full and Ethics_Index_Reduced coefficients empirically validates the critical inclusion of legal considerations within ethical frameworks. The substantial correlation with employee impact metrics further substantiates the human-centric benefits of ethically oriented implementations.	• Develop ethical governance frameworks with explicit legal compliance protocols. • Implement ethics-by-design methodologies in technology evaluation processes. • Establish ethics review committees with cross-functional representation and decision-making authority. • Create ethical implementation monitoring systems with quantifiable metrics. • Develop ethical competency enhancement programs across organizational levels.

Cont. Table 3.
Integrated results matrix with strategic implications

Research dimension	Statistical evidence	Theoretical interpretation	Strategic imperatives
RQ3: Implementation barriers analysis	• Mean effectiveness: 4.29/5 (SD = 0.737) • Barrier frequency: Training (38.38%), Communication (32.93%), Technical (29.09%) • Barrier_Count with G34_Effectiveness: r = -0.187, Barrier_Count with Employee_Impact_Index: r = -0.251 • Barrier_Count with Process_Impact_Average: r = -0.061	The differential negative correlation between barriers and employee impact (r = -0.251) versus process impact (r = -0.061) empirically establishes the disproportionate vulnerability of human factors to implementation barriers. The mean barrier counts of 1.64 (SD = 1.03) demonstrates that organizations typically encounter multiple concurrent obstacles, necessitating systemic rather than isolated intervention strategies. The hierarchy of barrier frequencies provides empirical guidance for resource allocation priorities.	• Implement multi-dimensional barrier assessment protocols with particular emphasis on human-factor metrics. • Develop barrier mitigation strategies calibrated to organizational structural variables. • Establish longitudinal barrier tracking mechanisms with threshold triggers for intervention. • Create barrier-specific intervention protocols with measurable resolution metrics. • Institutionalize barrier pattern analysis to identify organizational vulnerability profiles
RQ4: Managerial competencies and barrier reduction	• Manager_Competency_Index with Barrier_Count: r = -0.258 • Competency with training barriers: r = -0.425 • Competency with leadership barriers: r = -0.368 • Competency with technical barriers: r = 0.124	The significant negative correlation between managerial competencies and implementation barriers empirically establishes the barrier-reduction function of management capabilities. The differentiated correlation pattern across barrier types reveals empirically distinct domains of managerial influence, with efficacy in addressing training and leadership barriers but comparative limitations regarding technical obstacles. The positive correlations with technical barriers suggest either heightened recognition capabilities or domain-specific limitations of managerial competencies.	• Develop differential competency development programs targeting specific barrier domains. • Implement competency-barrier mapping diagnostics to identify organizational vulnerability patterns. • Establish technical support augmentation protocols for complementing managerial capabilities. • Create integrated technical-managerial development initiatives to address positive correlation domains. • Implement barrier-specific escalation protocols calibrated to competency assessments.

Cont. Table 3.
Integrated results matrix with strategic implications

Research dimension	Statistical evidence	Theoretical interpretation	Strategic imperatives
RQ5: Systematic evaluation impact	• D14_Evaluation with G34_Effectiveness: r = 0.296 • D14_Evaluation with Process_Impact_Average: r = 0.071 • Regression equation: G34_Effectiveness = 3.4154 + 0.2433 * D14_Evaluation	The moderate correlation between systematic evaluation and implementation effectiveness empirically establishes evaluation as a significant determinant of implementation outcomes. The regression coefficient provides quantifiable evidence that each unit enhancement in evaluation rigor yields a 0.2433-unit improvement in implementation effectiveness. The marked differential between effectiveness correlation and process impact correlation suggests evaluation operates through multiple pathways beyond immediate process enhancement.	• Develop multi-dimensional evaluation frameworks with weighted criterion matrices. • Implement stage-gate evaluation protocols with empirically validated decision thresholds. • Establish evaluation governance structures with cross-functional representation. • Create evaluation outcome tracking systems with feedback mechanisms. • Develop predictive evaluation models calibrated to organizational structural variables.
RQ6: Organizational readiness influence	• Readiness_Index with G34_Effectiveness: r = 0.491 • Readiness_Index with Barrier_Count: r = -0.248 • Position-specific coefficients: senior management (0.582), middle management (0.562)	The robust correlation between readiness and implementation effectiveness empirically establishes organizational preparedness as the strongest single predictor of implementation success among examined variables. The position-differentiated coefficients reveal empirically distinct patterns of readiness influence across organizational hierarchies, with particular importance at senior and middle management levels. The mediation analysis empirically validates dual pathways of readiness influence: direct effectiveness enhancement and indirect barrier reduction.	• Develop hierarchically calibrated readiness assessment protocols with weighted dimensional scores. • Implement position-specific readiness enhancement programs with particular emphasis on management levels. • Establish readiness-barrier mapping diagnostics to identify organizational vulnerability patterns. • Create longitudinal readiness monitoring systems with intervention thresholds. • Develop readiness enhancement methodologies with empirically validated efficacy metrics.

Cont. Table 3.
Integrated results matrix with strategic implications

Research dimension	Statistical evidence	Theoretical interpretation	Strategic imperatives
RQ7: Managerial competency framework	• Factor analysis: Two distinct competency dimensions explaining 83.66% variance • Operational Competencies: 44.94% variance • Strategic Competencies: 38.72% variance • Manager_Competency_Index with G34_Effectiveness: r = 0.369	The factor analysis empirically validates a two-dimensional competency framework with complementary operational and strategic domains. The substantial variance explanation (83.66%) demonstrates the robustness of this framework for conceptualizing managerial capabilities in cognitive technologies contexts. The differentiated correlation patterns between specific competencies and implementation outcomes empirically establish competency-outcome linkages with particular significance for balance (r = 0.643 with strategic impact) and coordination (r = 0.617 with strategic impact, r = 0.560 with operational impact).	• Develop dual-dimension competency development frameworks addressing both strategic and operational domains. • Implement competency-outcome mapping diagnostics to calibrate development priorities. • Establish competency assessment protocols with empirically validated dimensional weights. • Create competency enhancement programs with targeted outcome metrics. • Develop integrated competency governance structures aligned with organizational hierarchies.
RQ8: Leadership moderation effects	• Leadership vision: Wilks' $\lambda = 0.924$, $F(8,920) = 4.604$, $p<0.001$ • Leadership communication × operational competencies: Wilks' $\lambda = 0.964$, $F(8,920) = 2.128$, $p = 0.031$ • Leadership vision × strategic competencies: $p = 0.063$	The significant interaction between leadership communication and operational competencies empirically validates the selective moderating function of leadership within managerial effectiveness contexts. The differential significance patterns across interaction terms demonstrates empirically distinct moderation effects, with particular importance for communication-operational alignment. The direct effect significance of all four predictor variables empirically establishes the concurrent importance of both leadership and competency dimensions.	• Establish leadership moderation diagnostics to identify organizational vulnerability patterns. • Create communication enhancement programs specifically calibrated to technology implementation contexts. • Develop integrated leadership-management assessment frameworks with interaction term analysis.

Cont. Table 3.
Integrated results matrix with strategic implications

Research dimension	Statistical evidence	Theoretical interpretation	Strategic imperatives
RQ9: Training mediation effect	• Manager_Competency_Index with F25_Training: r = 0.551 • F25_Training with G34_Effectiveness: r = 0.504 • Mediation analysis: direct effect reduction from β ≈ 0.61 to β ≈ 0.43	The significant correlations between managerial competencies, training quality, and implementation effectiveness empirically establish the integrated nature of these variables. The mediation analysis quantifiably demonstrates that approximately 30% of managerial competency impact occurs through training quality enhancement, empirically validating training as a critical mechanism through which managerial capabilities influence implementation outcomes. The continued significance of the direct effect confirms the dual-pathway nature of managerial influence.	• Develop integrated management-training enhancement programs with dual-path metrics. • Implement training quality assessment protocols with managerial capability dimensions. • Establish training-management alignment diagnostics to identify organizational vulnerability patterns. • Create manager-as-trainer capability enhancement programs with empirically validated efficacy metrics. • Develop training governance structures with explicit managerial integration mechanisms.
RQ10: Employee experience patterns	• Employee_Impact_Index mean: 3.98/5 (SD = 0.580) • Employee_Impact_Index correlations with: o F24_Performance: r = 0.802 o F26_Career: r = 0.795 o F28_Satisfaction: r = 0.785 o F27_Role_Score: r = 0.142	The strong correlations between employee impact and performance, career, and satisfaction metrics empirically establish these as primary dimensions of employee experience during cognitive technologies implementation. The markedly weaker correlation with role changes empirically validates the superior importance of outcome dimensions over process modifications in employee experience formation. The high impact mean with substantial range (1.25-5.0) demonstrates generally positive but highly variable employee experiences across implementation contexts.	• Develop multi-dimensional employee experience assessment frameworks with empirically weighted component scores. • Implement performance-career-satisfaction enhancement programs calibrated to technology implementation contexts. • Establish employee experience governance structures with empirically validated intervention thresholds. • Create targeted communication strategies emphasizing performance and career enhancement potential. • Develop longitudinal employee experience monitoring systems with predictive modelling capabilities

Cont. Table 3.
Integrated results matrix with strategic implications

Research dimension	Statistical evidence	Theoretical interpretation	Strategic imperatives
RQ11: Hierarchical impact variation	• Position-specific impact means: o Senior management: 4.333 o Team leaders: 4.134 o Specialists: 3.995 o Entry-level: 3.944 o Middle management: 3.793	The hierarchical pattern of impact scores empirically establishes position-dependent variation in cognitive technologies experience. The counter-intuitive positioning of middle management with the lowest impact scores empirically validates the challenges faced at this organizational level. The absence of significant performance perception differences despite overall impact variations empirically demonstrates the dissociation between performance-specific and general impact perceptions across organizational levels.	• Develop hierarchically calibrated implementation strategies with position-specific success metrics. • Implement targeted middle management support programs addressing empirically identified experience challenges. • Establish cross-hierarchical implementation teams with structured knowledge transfer protocols. • Create position-specific experience enhancement programs with empirically validated efficacy metrics. • Develop integrated position-impact assessment frameworks with comparative analytics capabilities.
RQ12: Managerial influence on employee experience	• Manager_Competency_Index with Employee_Impact_Index: r = 0.501 • Competency with job satisfaction: r = 0.540 • Competency with career development: r = 0.231	The substantial correlation between managerial competencies and employee impact empirically establishes managers as critical determinants of employee experience during cognitive technologies implementation. The differential correlation pattern across experience dimensions demonstrates empirically distinct domains of managerial influence, with efficacy regarding immediate job satisfaction compared to long-term career perceptions. The regression model with outliers empirically validates the complex, multi-determined nature of employee experience beyond managerial factors.	• Develop multi-dimensional manager-as-experience-facilitator programs with domain-specific capability enhancement. • Implement managerial influence assessment protocols with empirically validated dimensional weights. • Establish employee experience governance structures with explicit managerial accountability mechanisms. • Create integrated manager-employee feedback systems with empirically validated enhancement protocols. • Develop supplementary experience enhancement strategies addressing non-managerial determinants.

Source: developed by the author

These practical contributions enable evidence-based decision-making regarding cognitive technology adoption through quantified success probability metrics informed by empirical validation rather than speculative projections or vendor claims.

Sectoral benchmarks establish typical performance ranges enabling comparative organizational positioning wherein leadership can assess internal capabilities and outcomes against empirically derived industry standards. Organizations achieving below-average performance on composite indices can identify specific improvement priorities through diagnostic assessment, while above-average performers can benchmark best practices for dissemination across organizational units or industry peer networks. The implementation roadmaps documented through Tables 4-11 provide stakeholder-specific strategic implementation matrices addressing senior leadership, human resources, information technology, and middle management constituencies with differentiated guidance reflecting distinct responsibilities and implementation contributions.

Table 4.
Strategic implementation matrix

Service Type	Innovation-Ethics Balance	Implementation Approach	Governance Structure
BPO Services	Higher ethics weighting (60:40)	Ethics-led innovation with formal compliance structures	Ethics committee with innovation representation
Shared Services & R&D	Balanced approach (50:50)	Parallel innovation and ethics processes with integration points	Joint innovation-ethics governance board
BPO, R&D & Other Services	Contextual calibration with regular reassessment	Integrated assessment framework with weighted decision matrices	Adaptive governance with rotating leadership

Source: developed by the author.

Table 5.
Readiness dimension matrix

Readiness dimension	Assessment metrics	Enhancement strategy	Integration mechanism
Structural readiness	Infrastructure capability index, integration potential assessment	Technical infrastructure enhancement, integration pathway development	Technical readiness committee with implementation authority
Process readiness	Process flexibility measures, documentation completeness index	Process reengineering initiatives, documentation enhancement programs	Process integration team with cross-functional representation
Human readiness	Skills gap analysis, change receptivity assessment	Targeted training programs, change management initiatives	Human readiness taskforce with HR integration
Cultural readiness	Innovation receptivity index, risk tolerance measures	Cultural enhancement programs, innovation climate development	Cultural transformation team with leadership sponsorship

Source: developed by the author.

Table 6.
Competency enhancement matrix

Competency domain	Key components	Development approach	Assessment methodology
Strategic competencies	Vision development (0.901), communication effectiveness (0.787)	Strategic thinking workshops, communication mastery programs	360-degree assessment with weighted dimensional scoring
Operational competencies	Coordination capability (0.744), resource management (0.830), balance maintenance (0.820)	Operational excellence programs, resource optimization workshops, balancing skills development	Performance-based assessment with scenario simulations
Technical domain knowledge	Technology understanding, integration awareness, technical constraint recognition	Technical literacy programs, integration masterclasses, constraint management workshops	Knowledge assessment with practical application evaluation
Implementation leadership	Barrier identification, resolution facilitation, stakeholder management	Barrier management training, resolution methodology workshops, stakeholder engagement programs	Implementation effectiveness metrics with stakeholder feedback

Source: developed by the author

Table 7.
Experience enhancement matrix

Strategic domain	Empirical foundation	Implementation approach	Governance structure
Strategic alignment	Combined innovation-ethics model explaining 29% effectiveness variance	Balanced strategic framework development with contextual calibration	Integrated strategy committee with cross-functional representation
Service contextualization	Significant service-type moderation ($F = 8.451$ and $F = 9.334$, $p<0.001$)	Service-specific strategy development with empirically validated dimensional weights	Service-specific implementation teams with executive sponsorship
Ethical governance	Ethics-effectiveness correlation ($r = 0.422$) exceeding innovation-effectiveness ($r = 0.276$)	ethical framework development with legal integration	Ethics governance council with implementation authority
Readiness development	Readiness-effectiveness correlation ($r = 0.491$) representing strongest predictor	Organization-wide readiness enhancement with hierarchical calibration	Readiness steering committee with executive leadership

Source: developed by the author.

Table 8.
Strategic implementation matrix

Strategic Domain	Empirical Foundation	Implementation Approach	Governance Structure
Strategic Alignment	Combined innovation-ethics model explaining 29% effectiveness variance	Balanced strategic framework development with contextual calibration	Integrated strategy committee with cross-functional representation
Service Contextualization	Significant service-type moderation ($F = 8.45$ and $F = 9.33$, $p<0.001$)	Service-specific strategy development with empirically validated dimensional weights	Service-specific implementation teams with executive sponsorship
Ethical Governance	Ethics-effectiveness correlation ($r = 0.422$) exceeding innovation-effectiveness ($r = 0.28$)	ethical framework development with legal integration	Ethics governance council with implementation authority
Readiness Development	Readiness-effectiveness correlation ($r = 0.491$) representing strongest predictor	Organization-wide readiness enhancement with hierarchical calibration	Readiness steering committee with executive leadership

Source: developed by the author.

Table 9.
HR implementation matrix

HR domain	Empirical foundation	Implementation approach	Integration mechanism
Competency development	Two-factor competency structure explaining 83.66% variance	competency development with strategic and operational dimensions	Competency council with implementation integration
Position-specific support	Hierarchical impact variation with middle management showing lowest impact (mean = 3.793)	Targeted position-specific programs with empirically validated enhancement approaches	Hierarchical support network with cross-level coordination
Career integration	Performance-career correlation ($r = 0.613$) with regression coefficient $\beta = 0.625$	Career pathway development with technology proficiency integration	Career development council with technology implementation representation
Training enhancement	Training-effectiveness correlation ($r = 0.504$) with significant mediation effect	High-quality training program development with manager integration	Training excellence committee with managerial representation
Reward alignment	Satisfaction progression across performance levels with 0.375 unit increase per level	Reward system modification with cognitive technologies adoption recognition	Reward alignment taskforce with implementation integration

Source: developed by the author.

Table 10.
IT implementation matrix

IT domain	Empirical foundation	Implementation approach	Integration mechanism
Barrier mitigation	Barrier frequency analysis with training, communication, and technical barriers dominant	Systematic barrier mitigation program development with empirically validated priority weighting	Barrier mitigation taskforce with cross-functional representation
Evaluation framework	Evaluation-effectiveness correlation (r = 0.296) with regression coefficient β = 0.243	evaluation framework development with ethical integration	Evaluation committee with strategic alignment
Integration support	Integration barrier frequency (24.04%) and positive correlation with competencies (r = 0.124)	Specialized integration support program development with managerial augmentation	Integration excellence team with management coordination
Technical training	Training barrier frequency (38.38%) and strong negative correlation with competencies (r = -0.425)	Technical training resource development with competency alignment	Training development council with competency integration
Process adaptation	Differential barrier impact on employee outcomes (r = -0.251) versus process outcomes (r = -0.061)	Process adaptation approach development with employee impact consideration	Process transformation team with employee representation

Source: developed by the author.

Table 11.
Middle management implementation matrix

Management domain	Empirical foundation	Implementation approach	Integration mechanism
Communication alignment	Leadership communication × operational competencies interaction (p = 0.031)	Communication alignment program development with operational coordination	Communication alignment taskforce with operational integration
Barrier management	Strong competency correlations with training barriers (r = -0.425) and leadership barriers (r = -0.368)	Barrier identification and management program development with empirically validated priority weighting	Barrier management committee with implementation authority
Employee' experience management	Competency-employee impact correlation (r = 0.501 with stronger satisfaction relationship (r = 0.540)	Employee' experience enhancement program development with satisfaction prioritization	Experience management council with employee representation
Implementation balance	Balance-strategic impact correlation (r = 0.643) representing strongest competency relationship	Balanced implementation approach development with technological-human integration	Balance excellence team with cross-functional coordination
Hierarchical coordination	Hierarchical impact variation with middle management showing lowest impact (mean = 3.793)	Cross-level coordination mechanism development with empirically validated interaction protocols	Hierarchical coordination network with multi-level representation

Source: developed by the author.

The barrier identification framework with 67 percent effectiveness improvement potential through competency-specific mitigation approaches enables proactive implementation planning wherein organizations anticipate challenges based on empirical frequency distributions rather than reactive problem-solving after difficulties emerge. This anticipatory approach substantially enhances implementation success probability through early intervention strategies addressing predictable obstacles, resource pre-allocation for known challenge areas, and stakeholder preparation through transparent communication regarding expected difficulties alongside mitigation plans.

The empirically validated frameworks combining theoretical rigor with practical applicability provide foundation for both academic understanding and organizational practice in this critical domain of contemporary management. Organizations pursuing cognitive technology implementation must develop systematic approaches integrating technological innovation through assessment and selection processes, ethical governance through responsible deployment frameworks emphasizing transparency and accountability, organizational readiness through capability development across technological, organizational, and human dimensions, managerial competencies through targeted enhancement programs emphasizing change management and resource allocation skills, and employee experience through workforce engagement and development initiatives recognizing human capital implications. Success requires systematic integration of these dimensions through evidence-based frameworks informed by empirical research, continuous capability development adapting to evolving technological possibilities and organizational requirements, and adaptive implementation strategies responsive to organizational context while maintaining adherence to fundamental success principles established through this investigation.

6. LIST OF FIGURES

7. LIST OF TABLES

8. REFERENCES

The doctoral dissertation draws on 413 sources, of which 100 key items are presented below:

1. Agrawal, A., Gans, J., Goldfarb, A. (2018). *Prediction machines: The simple economics of artificial intelligence*. Boston: Harvard Business Review Press, pp. 1-272.
2. Argyris, C., Schön, D. (1978). *Organizational learning: A theory of action perspective*. Reading: Addison-Wesley, pp. 1-356.
3. Association of Business Service Leaders (2020). *Business Services Sector in Poland 2020*. Warsaw: Association of Business Service Leaders.
4. Association of Business Service Leaders (2021). *Business Services Sector in Poland 2021*. Warsaw: Association of Business Service Leaders.
5. Association of Business Service Leaders (2022). *Business Services Sector in Poland 2022*. Warsaw: Association of Business Service Leaders.
6. Association of Business Service Leaders (2023). *Business Services Sector in Poland 2023*. Warsaw: Association of Business Service Leaders.
7. Association of Business Service Leaders (2024). *Business Services Sector in Poland 2024*. Warsaw: Association of Business Service Leaders.
8. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *Vol. 17, Iss. 1,* pp. 99-120, doi.org/10.1177/014920639101700108.
9. Benbya, H., Ning, N., Tanriverdi, H., Youngjin, Y. (2022). Artificial intelligence in organizations: Current state and future opportunities. *Journal of the Association for Information Systems, Vol. 23, Iss. 2*, pp. 277-293, doi.org/10.17705/1jais.00662.
10. Boston Consulting Group (2024). *AI adoption in 2024: 74% of companies struggle to achieve and scale value*. Retrieved from: https://www.bcg.com/press/24october2024-ai-adoption-in-2024-74-of-companies-struggle-to-achieve-and-scale-value, 12.09.2025.
11. Braun, V., Clarke, V. (2021). *Thematic analysis: A practical guide*. London: SAGE Publications, pp. 1-376.

12. Brock, J. K., von Wangenheim, F. (2019). Demystifying AI: What digital transformation leaders can teach you about realistic artificial intelligence. *California Management Review*, *Vol. 61, Iss. 4,* pp. 110-134, doi.org/10.1177/1536504219865226.
13. Brynjolfsson, E., McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. New York: W. W. Norton & Company, pp. 1-306.
14. Business Research Insights. (2025). *Shared Services Market Analysis Report | 2025 To 2033*. Retrieved from: https://www.businessresearchinsights.com/market-reports/shared-services-market-113713, 12.09.2025.
15. Campbell, D. T., Fiske, D. V. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, Vol. 56, Iss. 2,* pp. 81-105, doi:10.1037/h0046016.
16. Chui, M., Hazan, E., Roberts, R., Singla, A., Smaje, K., Sukharevsky, A., Yee, L., Zemmel, R. (2023). *The economic potential of generative AI: The next productivity frontier*. Retrieved from: https://www.mckinsey.com/~/media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/the%20economic%20potential%20of%20generative%20ai%20the%20next%20productivity%20frontier/the-economic-potential-of-generative-ai-the-next-productivity-frontier.pdf, 15.01.2025.
17. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdale: Lawrence Erlbaum Associates, pp. 1-567.
18. Creswell, J. W., Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.)*. Thousand Oaks: SAGE Publications, pp. 1-487.
19. Daugherty, P. R., Wilson, H. J. (2018). *Human + machine: Reimagining work in the age of AI*. Boston: Harvard Business Review Press, pp. 1-264.
20. Davenport, T. H. (2018). *The AI advantage: How to put the artificial intelligence revolution to work*. Cambridge: MIT Press, pp. 1-231.
21. Davenport, T. H., Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review, Vol. 96, Iss. 1, pp. 108-116*. Retrieved from: https://hbr.org/2018/01/artificial-intelligence-for-the-real-world, 15.07.2025.
22. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *Vol. 13, Iss. 3,* pp. 319-340. doi.org/10.2307/249008.
23. Deloitte AI Institute (2024). *State of generative AI in the enterprise Q4 2024. New York: Deloitte*. Retrieved from: https://www2.deloitte.com/us/en/pages/consulting/articles/state-of-generative-ai-in-enterprise.html, 15.07.2025.
24. Deming, W. E. (1986). *Out of the crisis*. Cambridge: MIT Press, pp. 1-500.
25. Denzin, N. K. (1978). *The Research Act: A Theoretical Introduction to Sociological Methods (2nd ed.)*. New York: McGraw-Hill, pp. 1-370.
26. DeVellis, R. F. (2016). *Scale development: Theory and applications (4th ed.)*. Thousand Oaks, CA: Sage Publications, pp. 1-280.
27. Dillman, D. A., Smyth, J. D., Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method (4th ed.)*. Hoboken: Wiley, pp. 1-528.
28. DiMaggio, P. J., Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *Vol. 48, Iss. 2,* pp. 147-160, doi.org/10.2307/2095101.
29. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., Medaglia, R., Le Meunier-FitzHugh, K., Le Meunier-FitzHugh, L. C., Misra, S., Mogaji, E., Sharma, S. K., Singh, J. B., Raghavan, V., Raman, R., Rana, N. P., Samothrakis, S., Spencer, J., Tamilmani, K., Tubadji, A., Walton, P., Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, Vol. 57, No. 101994,* doi.org/10.1016/j.ijinfomgt.2019.08.002.
30. Evans, J. R., Mathur, A. (2018). The value of online surveys: A look back and a look ahead. *Internet Research, Vol. 28, Iss. 4*, pp. 854-887, doi.org/10.1108/IntR-03-2017-0089.

31. Fountaine, T., McCarthy, B., Saleh, T. (2019). Building the AI-powered organization. *Harvard Business Review*, *Vol. 97, Iss. 4,* pp. 62-73.
32. Furr, R. M. (2021). *Psychometrics: An introduction (4th ed.)*. Thousand Oaks: SAGE Publications, pp. 1-456.
33. Gartner. (2024). *Gartner predicts generative AI projects abandonment trends*. Retrieved from: https://www.gartner.com/en/newsroom/press-releases/2024-07-29-gartner-predicts-30-percent-of-generative-ai-projects-will-be-abandoned-after-proof-of-concept-by-end-of-2025, 12.09.2025.
34. Gordon, S. C., Smith, A. (2004). Quantitative leverage through qualitative knowledge: Augmenting the statistical analysis of complex causes. *Political Analysis*, *Vol. 12, Iss. 3*, pp. 233-255.
35. Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, Vol. 17, Iss. S2,* pp. 109-122, doi.org/10.1002/smj.4250171110.
36. Haataja, M., Bryson, J. J. (2021). What costs should we expect from the EU's AI Act? *SocArXiv*, doi: 10.31235/osf.io/8nzb4.
37. Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.)*. Thousand Oaks: SAGE Publications, pp. 1-384.
38. Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach (3rd ed.).* New York: The Guilford Press, pp. 1-732.
39. Hennink, M., Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine, Vol. 292*, pp. 1-10, doi.org/10.1016/j.socscimed.2021.114523.
40. Jackson, P. (1986). *Introduction to expert systems*. Reading: Addison-Wesley, pp. 1-246.
41. Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons, Vol. 61, Iss. 4,* pp. 577-586. doi.org/10.1016/j.bushor.2018.03.007.
42. Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., Buckley, N. (2015). *Strategy, not Technology, Drives Digital Transformation: Becoming a Digitally Mature Enterprise*. Retrieved from: http://sloanreview.mit.edu/projects/strategy-drives-digital-transformation/, 15.01.2025.
43. Kaplan, R. S., Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Boston: Harvard Business School Press, pp. 1-322.
44. Kaplan, R., Bresnan, J. (1982). Lexical-functional grammar: A formal system for grammatical representation. In: J. Bresnan (Ed.), *The mental representation of grammatical relations (pp. 173-281)*. Cambridge: MIT Press.
45. Kotter, J. P. (1995). Leading Change: Why Transformation Efforts Fail. *Harvard Business Review, Vol. 73,* pp. 59-67.
46. Krejcie, R. V., Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, Vol. 30, Iss. 3,* pp. 607-610, doi.org/10.1177/001316447003000308.
47. Kuzior, A. (2024). Technologie kognitywne [Cognitive technologies]. In: *Słowniki społeczne* (pp. 372-386). Kraków: Ignatianum.
48. Kuzior, A., Kwilinski, A. (2022). Cognitive technologies and artificial intelligence in social perception. *Management Systems in Production Engineering, Vol. 30, Iss. 2*, pp. 109-115. doi.org/10.2478/mspe-2022-0014.
49. Kuzior, A., Sira, M., Brożek, P. (2023). Ethical implications and social impacts of integrating artificial intelligence into sustainability efforts. *Zeszyty Naukowe Politechniki Śląskiej. Organizacja i Zarządzanie, No. 176*, pp. 333-346, doi.org/10.29119/1641-3466.2023.176.20.
50. Kuzior, A., Sobotka, B., Postrzednik-Lotko, K. A., Smołka-Franke, B. (2023). Managing competences of generation Y and Z in the opinion of the employees in the modern business services sector in Poland in the post-pandemic period. *Sustainability, Vol. 15, Iss. 20,* pp. 14925. doi.org/10.3390/su152014925.

51. Lichtenthaler, U. (2020). Beyond artificial intelligence: Why companies need to go the extra step. *Journal of Business Strategy, Vol. 41, Iss. 1*, pp. 19-26, doi.org/10.1108/JBS-05-2018-0086.
52. Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, Vol. 22, Iss. 140*, pp. 5-55.
53. Liu, S., Xing, J., Zhang, H., Wu, T. (2024). Cognitive neuroscience and robotics: Advancements and future research directions. *Robotics and Computer-Integrated Manufacturing*, *Vol. 85*, *No. 102610*, doi.org/10.1016/j.rcim.2023.102610.
54. ManpowerGroup. (2024). *Talent Shortage 2024 Global Trends*. Retrieved from: https://go.manpowergroup.com/hubfs/Talent%20Shortage/Talent%20Shortage%202024/MPG_TS_2024_GLOBAL_Infographic.pdf, 12.09.2025.
55. McCarthy, J. (1959). Programs with commonsense. In: D. V. Blake, A. M. Uttley (Eds.), *Proceedings of the Symposium on Mechanisation of Thought Processes*, vols. 1 and 2 (pp. 77-84). London: Her Majesty's Stationary Office.
56. McKinsey & Company (2023). *The state of AI in 2023: Generative AI's breakout year. New York: McKinsey Digital*. Retrieved from: https://www.mckinsey.com/~/media/mckinsey/business%20functions/quantumblack/our%20insights/the%20state%20of%20ai%20in%202023%20generative%20ais%20breakout%20year/the-state-of-ai-in-2023-generative-ais-breakout-year_vf.pdf, 15.07.2025.
57. Minsky, M. L. (1986). *The society of mind*. New York: Simon and Schuster, pp. 1-339.
58. Modha, D. S., Ananthanarayanan, R., Esser, S. K., Ndirango, A., Sherbondy, A. J., Singh, R. (2011). Cognitive computing. *Communications of the ACM*, *Vol. 54, Iss. 8,* pp. 62-71, doi.org/10.1145/1978542.1978559.
59. Nair, S. (2025). *50 Key Statistics and Trends in Intelligent Document Processing (IDP) for 2025*. Retrieved from: https://www.docsumo.com/blogs/intelligent-document-processing/intelligent-document-processing-market-report-2025, 15.07.2025.
60. Negash, S., Gray, P. (2008). Business intelligence. In: F. Burstein & C. W. Holsapple (Eds.), *Handbook on decision support systems 2: Variations* (pp. 175-193). Berlin: Springer, doi.org/10.1007/978-3-540-48716-6_9.
61. Newell, A. (1990). *Unified theories of cognition*. Cambridge: Harvard University Press, pp. 1-549.
62. Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science, Vol. 5, Iss. 1,* pp. 14-37, doi.org/10.1287/orsc.5.1.14.
63. Norman, D. A. (2013). *The design of everyday things (Revised and expanded edition)*. New York: Basic Books, pp. 1-368.
64. Oliver, C. (1991). Strategic responses to institutional processes. *Academy of Management Review, Vol. 16, Iss. 1,* pp. 145-179, doi.org/10.5465/amr.1991.4279002.
65. Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health, Vol. 42, Iss. 5*, pp. 533-544, doi.org/10.1007/s10488-013-0528-y.
66. Patton, M. Q. (2015). *Qualitative research & evaluation methods (4th ed.)*. Thousand Oaks: SAGE Publications, pp. 1-806.
67. Porter, M. E., Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review, Vol. 92, Iss. 11,* 64-88.
68. Raisch, S., Krakowski, S. (2021). Artificial intelligence and management: The automation–augmentation paradox. *Academy of Management Review*, *Vol. 46, Iss. 1,* pp. 192-210, doi.org/10.5465/amr.2018.0072.
69. Ransbotham, S., Kiron, D., Gerbert, P., Reeves, M. (2017). Reshaping business with artificial intelligence: Closing the gap between ambition and action. *MIT Sloan Management Review*, *Vol. 59, Iss. 1,* pp. 1-17.
70. Rogers, C. R. (1961). *On becoming a person: A therapist's view of psychotherapy.* Boston: Houghton Mifflin, pp. 1-420.

71. Rogers, E. M. (2003). *Diffusion of innovations (5th ed.)*. Free Press, pp. 1-576.
72. Rousseau, D. M. (2006). Is there such a thing as "evidence-based management"? *Academy of Management Review, Vol. 31, Iss. 2,* pp. 256-269, doi.org/10.5465/amr.2006.20208679.
73. Russell, S. (2019). *Human compatible: Artificial intelligence and the problem of control*. New York: Viking, pp. 1-352.
74. Russell, S., Norvig, P. (2020). *Artificial intelligence: A modern approach (4th ed.)*. Boston: Pearson, pp. 1-1115.
75. Sacavém, A., de Bem Machado, A., dos Santos, J. R., Palma-Moreira, A., Belchior-Rocha, H., Au-Yong-Oliveira, M. (2025). Leading in the Digital Age: The Role of Leadership in Organizational Digital Transformation. *Administrative Sciences*, *Vol.15, Iss.2, No. 43*, doi.org/10.3390/admsci15020043.
76. Saunders, M., Lewis, P., Thornhill, A. (2023). *Research methods for business students (9th ed.)*. Harlow: Pearson Education, pp. 1-759.
77. Schank, R. C. (1999). *Dynamic memory revisited (2nd ed.)*. Cambridge: Cambridge University Press, pp. 1-302.
78. Schatsky, D., Muraskin, C., Gurumurthy, R. (2015). Cognitive technologies: The real opportunities for business. *Deloitte Review, Issue 16,* pp. 114-129.
79. Schwab, K. (2016). The fourth industrial revolution. *Geneva: World Economic Forum*, pp. 1-192.
80. Seeber, I., Bittner, E., Briggs, R. O., de Vreede, T., de Vreede, G. J., Elkins, A., Maier, R., Merz, A. B., Oeste-Reiß, S., Randrup, N., Schwabe, G., Söllner, M. (2020). Machines as teammates: A research agenda on AI in team collaboration. *Information & Management, Vol. 57, Iss. 2, No. 103174*, doi.org/10.1016/j.im.2019.103174.
81. Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday, pp. 1-424.
82. Shneiderman, B. (2020). Human-centered artificial intelligence: Reliable, safe & trustworthy. *International Journal of Human–Computer Interaction*, *Vol. 36, Iss. 6,* pp. 495-504, doi.org/10.1080/10447318.2020.1741118.
83. Simon, H. A. (1969). *The sciences of the artificial*. Cambridge: MIT Press, pp. 1-123.
84. Tabachnick, B. G., Fidell, L. S. (2019). *Using multivariate statistics (7th ed.)*. Boston: Pearson, pp. 1-832.
85. Tarafdar, M., Beath, C. M., Ross, J. W. (2019). Using AI to enhance business operations. *MIT Sloan Management Review*, *Vol. 60, Iss. 4,* pp. 37-44.
86. Teece, D. J., Pisano, G., Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, Vol. 18, Iss. 7,* pp. 509-533, doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z.
87. Vaccaro, M., Malone, T. W., Almaatouq, A. (2024). When humans and AI work best together—and when each is better alone. *MIT Sloan Management Review*, *Vol. 65, Iss. 2*, pp. 1-8.
88. Vela, D., Sharp, A., Zhang, R., Nguyen, T., Hoang, A., Pianykh, O. S. (2022). Temporal quality degradation in AI models. *Scientific Reports*, *Vol. 12,* pp. 11654, doi.org/10.1038/s41598-022-15245-z.
89. Venkatesh, V. (2022). Adoption and use of AI tools: A research agenda grounded in UTAUT. *Annals of Operations Research, Vol. 308,* pp. 641-652. doi.org/10.1007/s10479-020-03918-9.
90. Verganti, R., Vendraminelli, L., Iansiti, M. (2020). Innovation and design in the age of artificial intelligence. *Journal of Product Innovation Management*, *Vol. 37, Iss.3,* 212-227, doi.org/10.1111/jpim.12523.
91. Vitale, D. C., Armenakis, A. A., Feild, H. S. (2008). Integrating qualitative and quantitative methods for organizational diagnosis: Possible priming effects? *Journal of Mixed Methods Research, Vol. 2, Iss. 1,* pp. 87-105, doi:10.1177/1558689807309968.
92. Vitale, D. C., Armenakis, A. A., Feild, H. S. (2008). Integrating qualitative and quantitative methods for organizational diagnosis: Possible priming effects? *Journal of Mixed Methods Research, Vol. 2, Iss. 1,* pp. 87-105, doi:10.1177/1558689807309968.

93. von Krogh, G. (2018). Artificial intelligence in organizations: New opportunities for phenomenon-based theorizing. *Academy of Management Discoveries*, *Vol. 4, Iss. 4,* pp. 404-409, doi.org/10.5465/amd.2018.0084.
94. Walker, W. R., Herrmann, D. J. (Eds.). (2004). *Cognitive technology: Essays on the transformation of thought and society*. Jefferson: McFarland & Company, pp. 1-224.
95. Watson, J., Hatfield, S., Wright, D., Howard, M., Witherick, D., Coe, L., Horton, R. (2019). *Automation with intelligence: Reimagining the organisation in the 'Age of With'*. London: Deloitte Insights.
96. Westerman, G., Bonnet, D., McAfee, A. (2014). *Leading digital: Turning technology into business transformation*. Boston: Harvard Business Review Press, pp. 1-292.
97. Wilson, H. J., Daugherty, P. R. (2018). Collaborative intelligence: Humans and AI are joining forces. *Harvard Business Review, Vol. 96, Iss. 4,* pp. 114-123.
98. Woods, D. D. (1985). Cognitive technologies: The design of joint human-machine cognitive systems. *AI Magazine, Vol. 6, Iss. 4,* pp. 86-92, doi.org/10.1609/aimag.v6i4.511.
99. Zintegrowany System Kwalifikacji (2023). *Sektorowa rada ds. kompetencji nowoczesne usługi biznesowe (NUB). Warsaw: Ministry of Education and Science*. Retrieved from: https://kwalifikacje.edu.pl/sektorowa-rada-ds-kompetencji-nowoczesne-uslugi-biznesowe-nub/, 15.07.2025.
100. Trunk, A., Birkel, H., Hartmann, E. (2020). On the current state of combining human and artificial intelligence for strategic organizational decision making. *Business Research*, *Vol. 13, Iss. 3*, pp. 875-919, doi.org/10.1007/s40685-020-00133-x.