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PROVIDER – CLIENT COLLABORATION: IMPLEMENTATION OF QUALITY MANAGEMENT FRAMEWORKS VERSUS AI-BASED MODELS

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Purpose: The paper analyzes the role of supplier–client collaboration in quality management system (QMS) implementation and compares traditional approaches with AI-based models.
Design/methodology/approach: The study examines QMS implementation projects conducted in Polish enterprises between 2014 and 2025. The research combines consulting case studies with comparative analysis of models generated by ChatGPT, Claude, and Bard.
Findings: Close supplier–client collaboration improves QMS implementation effectiveness. Market pressures and certification requirements accelerate implementation, while traditional models remain more aligned with practical organizational needs than AI-based models. AI can support QMS implementation through structured frameworks, although practical validation is required.
Research limitations/implications: The study is limited to Polish enterprises and selected ISO systems. Future research could include international comparisons and broader analysis of organizational culture and AI applications.
Practical implications: Organizations should combine consulting expertise with AI-supported tools to improve implementation effectiveness and certification readiness.
Social implications: The research may support improvements in quality standards, workplace safety, and environmental management.
Originality/value: The paper compares traditional QMS implementation approaches with AI-based models, providing new insights into supplier–client collaboration and AI-supported management systems.
Keywords: Quality Management Standards, Quality Management Frameworks, Supplier–Client Collaboration, Artificial Intelligence.
Category of the paper: Research paper.

1. Introduction

The implementation of quality management systems in Poland began in the early 1990s. The initial implementations of quality management systems were associated with a significant investment of time and effort, as well as the involvement of the entire enterprise. Often, during the implementation process, companies used the services of advisor companies', which provided their knowledge and experience to support organizations during the implementation process and the audit of the certification body.

Currently, in the case of large enterprises, there are dedicated organizational units such as the Quality Manager or the Quality Director, as well as internal auditors who carry out cyclical activities related to the maintenance of the system. Micro, small and medium-sized enterprises often do not have such capabilities. This situation creates an opportunity to establish cyclical cooperation with a supplier in the field of quality management systems.

In the subject of literature there is a large amount of literature dealing with implementation of quality management systems in organizations (Nowotarski, Pasławski, Kadler, 2018;19 In most cases, the literature presents the implementation of a selected standard using the example of a selected enterprise. Presenting research results based on a case study allows for in-depth analysis, but at the same time limits the generalizability of the findings. Other authors focus on selected issues related to Quality Management Systems, including risk management (Wysokińska-Senkus, Górna, 2021; Jedynak, 2017; Algheriani et al., 2019), Industry 4.0 (Santos et al., 2021; Carvalho, Lima, 2022; Zaidin et al., 2018), organizational efficiency (Milovanović, Paunović, Casadesús, 2023; Gremyr et al., 2021; Brooks et al., 2021), and corporate social responsibility (Majerník et al., 2022; Baltos, 2018).

An important gap exists in research examining the holistic implementation of management systems and the evolution of their objectives. To address this gap, the following research questions were posed:

Q1: How does collaboration between consulting providers and organizations affect the effectiveness of QMS implementation?

Q2: What circumstances accelerate the implementation of quality management systems (QMS)?

Q3: What differences in the development and implementation of quality management systems can be observed based on traditional case studies compared to AI-based models?

Q4: Could AI serve as a tool to simulate the implementation of quality management systems (QMS)?

The theoretical part presents a historical perspective on the development of quality systems in Poland. A literature review of quality management systems (QMS) and artificial intelligence as a tool of supporting the implementation process of QMS in organizations.

Through collaboration with an advisor company, the practical aspects of the research were introduced. The research conducted a sample of 37 organizations, including micro, small, medium, and large businesses, in which introduced various of quality standards. As part of implementation of Management Systems in organizations several actions were carried out: Diagnosis, Training, preparation of the Documentation, Audit and Management review. The scope of activities depended on the organization and its needs. The research was carried out between 2014 and 2025.

2. Theoretical background

The early 1990s witnessed the first implementations of the International Organization for Standardization's (ISO) quality management system (QMS) on Polish market (Krolas, 2020) The ISO 9000 series of standards, in operation for over three decades, remains a prominent offering within the International Organization for Standardization's (ISO) portfolio. Since its initial publication in 1987, the series has undergone significant revisions, with the most notable occurring in 2000. These revisions introduced a process-based approach and discontinued the use of ISO 9002 and 9003. The most recent update, published by ISO on September 15, 2015, for ISO 9001, incorporated several key changes. These include the integration of risk management, a heightened focus on customer empowerment and motivation, and an emphasis on the role of top management in implementing the standard's requirements (Midor, Wilkowski, 2021).

Over one million companies and institutions across 170 countries hold certifications according to ISO 9001. In Europe the number of issue certificates estimates about 400 000 (ISO, 2024).

ISO 9001: 2015 has emerged as the most popular QMS standard in Poland. Possession of this certification is often a prerequisite for participation in public tenders, highlighting its significance. The number of certificates issued by certification bodies changed has evolved over the years**.** At the beginning of the 1990s, large production organizations were the initial adopters of these standards, aiming to improve process efficiency, promote an objective focus on measurement, enhance employee competence, and establish the continuous improvement cycle mandated by ISO specifications (Krolas, Heilala, 2023). After years also medium and small organizations introduced the QMS. The number of ISO 9001 certificates has varied over time. Initially, a steady increase can be noted (from the 1990s to 2002). Subsequently, in the years following (2003-2005), there was a significant growth, which could be linked to Poland's accession to the EU on May 1, 2004. The highest number of issued certificates 12,000 was in 2009. Between 2011 and 2021, the number of issued certificates has maintained a similar level, with over 10,000 implemented and certified quality management systems (ISO, 2024) (Fig. 1).

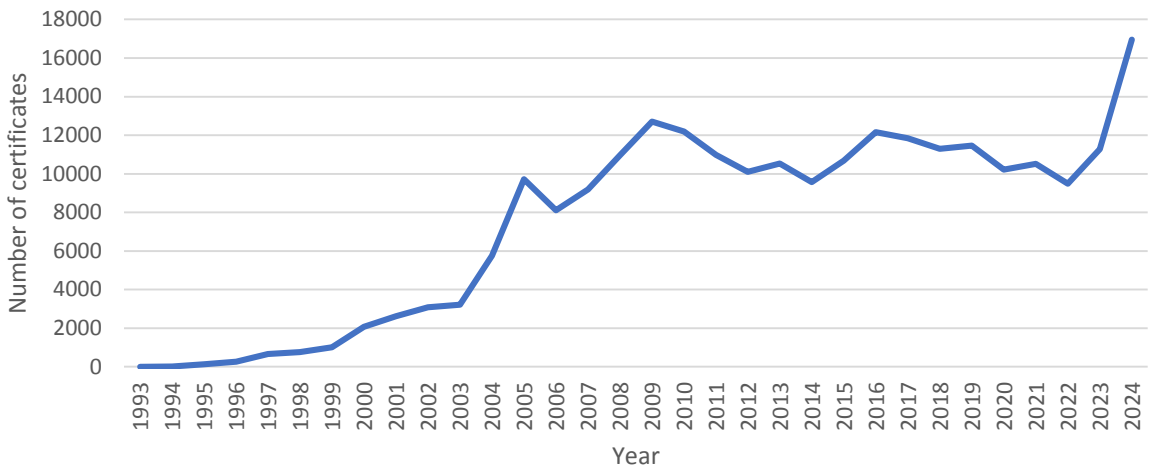

Figure 1. Number of certificates ISO 9001 issued in Poland.

Source: Own study based on www.iso.org

The beginnings of the ISO 14001 standard in 1996, when the ISO developed Environmental Management Systems (EMS) standard. This standard was created to provide organizations with a framework for establishing, implementing, maintaining, and improving an environmental management system (Lemkowska, Wiśniewska, 2021). Since its inception, ISO 14001 has gone through several revisions and updates (2004, 2015) to ensure that it remains relevant and effective in addressing evolving environmental challenges (ISO, 2024).

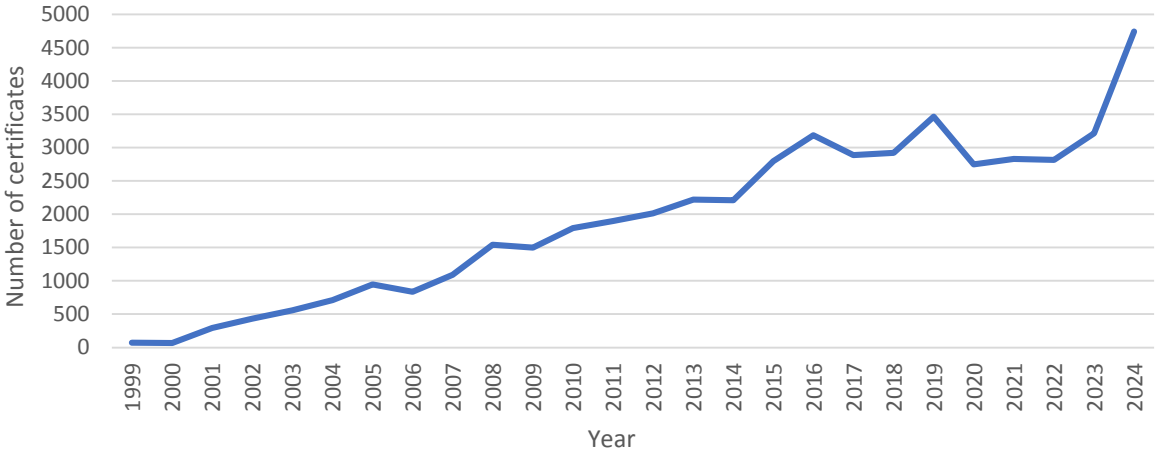

Figure 2. Number of certificates ISO 14001 issued in Poland.

Source: Own study based on www.iso.org

The number of ISO 14001 certificates granted in Poland has been steadily increasing since its inception in 1996. By 2021, the number of issued certificates had reached almost 3000 (ISO, 2024).

OHSAS 18001 (Occupational Health and Safety Assessment) was a standard developed for managing occupational health and safety. It was first issued in 1999 by the British organization BSI Group. This standard was developed in response to the needs of organizations that wanted to effectively manage risks associated with employee safety. OHSAS 18001 was accredited and

certified by certifying organizations in accordance with international standards (in Poland it was PN-N-18001). In 2018, the OHSAS 18001 standard was replaced by the international standard ISO 45001, which combines best practices related to managing safety and health at work. ISO 45001 provides organizations with a solid framework to identify and control health and safety hazards, as well as to continuously improve the management system in these areas (Šolc et al., 2022).

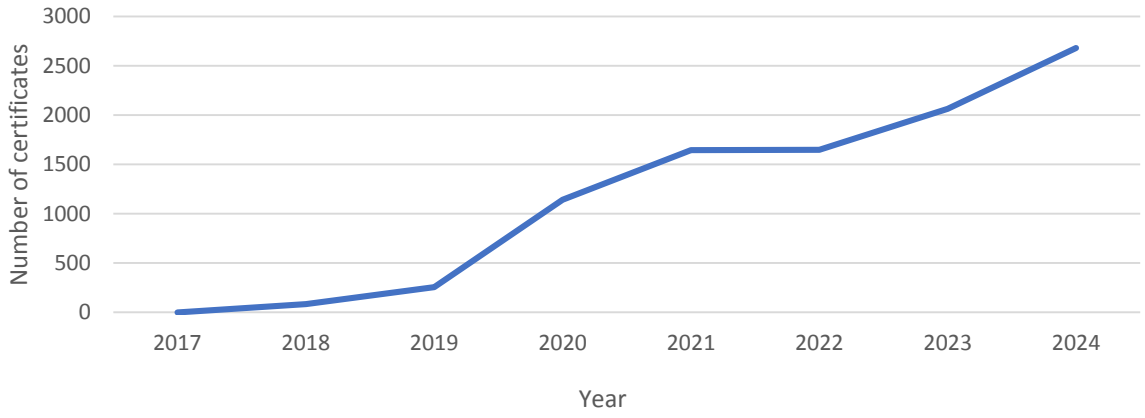

Figure 3. Number of certificates ISO 45001 issued in Poland.

Source: Own study based on www.iso.org

The number of issued certificates has increased rapidly over the years, reaching 1646 in 2021 (ISO, 2024). The adoption of ISO 45001 leads to a reduction in the occurrence of accidents and occupational diseases, decreased absenteeism, and improved productivity and work efficiency (Šolc et al., 2022).

The current ISO standards are structured according to a harmonized framework, ensuring uniformity in the core clauses across different management systems. This standardization facilitates the integration of multiple management systems within organizations and creates a consistent foundation for process improvement initiatives. In this context, the emergence of artificial intelligence (AI) technologies offers new opportunities to enhance the design, implementation, monitoring, and continuous improvement of ISO-based management systems.

The origins of artificial intelligence (AI) can be traced back to the 1950s. A pivotal moment was the Dartmouth Conference in 1956, where John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon introduced the term "artificial intelligence" and outlined the primary research directions for the field (McCarthy et al., 2006, p. 13). During this period, the first programs capable of performing logical reasoning tasks were developed. The early decades of AI research were marked by optimism, leading to the development of symbolic AI methods and early machine learning concepts. However, limitations in computational power and algorithmic approaches presented significant challenges, slowing the rapid progress initially anticipated.

A breakthrough occurred in the 1980s with the introduction of the backpropagation algorithm for training neural networks (Rumelhart, Hinton, Williams, 1986, pp. 533-536). The rise of machine learning enabled the creation of more complex and flexible models, reigniting enthusiasm for AI research. In the 21st century, AI development accelerated dramatically, driven by advances in computational power (e.g., GPUs), the availability of large datasets (big data), and innovations in deep learning. A landmark achievement was the victory of AlphaGo over Go world champion Lee Sedol in 2016 (Silver et al., 2016, pp. 484-489), demonstrating the effectiveness of combining deep learning with tree search methods. Contemporary AI research focuses on areas such as explainable AI (XAI), AI safety, and the development of AI management standards like ISO/IEC 42001:2023 (Benraouane, 2024, pp. 54-76).

A critical research gap exists concerning the comprehensive implementation and evolving objectives of management systems. To address this knowledge deficit, the present study examines the implementation trends and underlying rationale for quality systems in Poland over the past decade. The research was conducted within a selected consulting company, focusing specifically on the Polish market. Practical findings were compared with selected AI models, enabling a more holistic approach by incorporating current technological advancements.

3. Methodology

Research

Beta[1] is an advisor company with 40 years' experience on polish market. The main activity of the company is implementation, training, auditing and management reviewing of Quality Management Systems (QMS) of: ISO 9001, ISO 14001, ISO 45001, ISO 27001 and others. Beta has introduced about 350 QMS implementations on small, medium and large organization.

The research involved a sample of 37 organizations across various size categories (micro, small, medium, and large) that had implemented diverse quality standards. The author of the article leads the advisory unit at Beta organization and also holds the position of Quality Manager. Their work within the unit played an important role in the successful completion of the research. Beta has also developed, implemented, and obtained certification for the ISO 9001, ISO 14001, ISO 45001, and ISO 22000 systems. However, at present, only the ISO 9001 system is being actively maintained and certified.

The data collection spanned a ten-year period, from 2014 to 2024.

[1] The author of the publication was not authorized to publish the name of the organization presented in the case study. For the purposes of this article, the organization was named of the Greek alphabet – Beta.

Implementing a Management System at a client's site follows a three-stage process (Fig. 4). The first stage involves a thorough needs assessment to understand the client's specific requirements and objectives. Based on this assessment, a comprehensive proposal outlining the services, timeline, and costs was prepared. Negotiations often occurred during this stage, ultimately leading to a signed agreement for implementing the chosen ISO standard (9001, 14001, 45001, or an Integrated System).

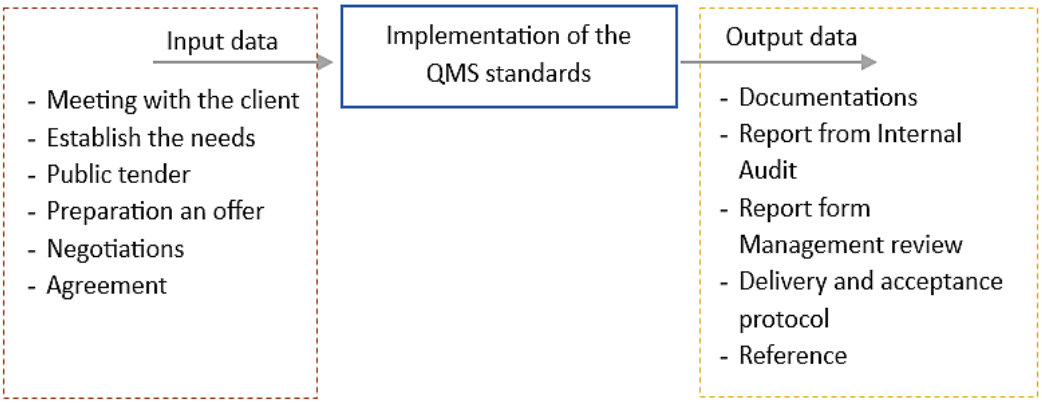

Figure 4. General process of Implementation of QMS.

Source: Own study.

The second stage involves the implementation of Quality Management standards in client organizations. Six different approaches were presented based on a sample of 37 organizations, as shown in Figures 7 to 9.

The final stage of implementation includes creating documentation, conducting an internal audit, and reviewing management practices. These activities allow for an evaluation of the organization's compliance with the ISO standards that have been implemented. The assessments helped determine if the organizations were ready for an audit by the certification body.

Furthermore, during this phase, a delivery and acceptance protocols were carried out, along with the issuance of a reference letter recognizing the successful collaboration. This ensures that all parties involved were satisfied with the results of the implementation process.

The research was conducted on 37 organizations, including (Fig. 5):

- 3 micro,
- 12 small,
- 16 average,
- 6 large.

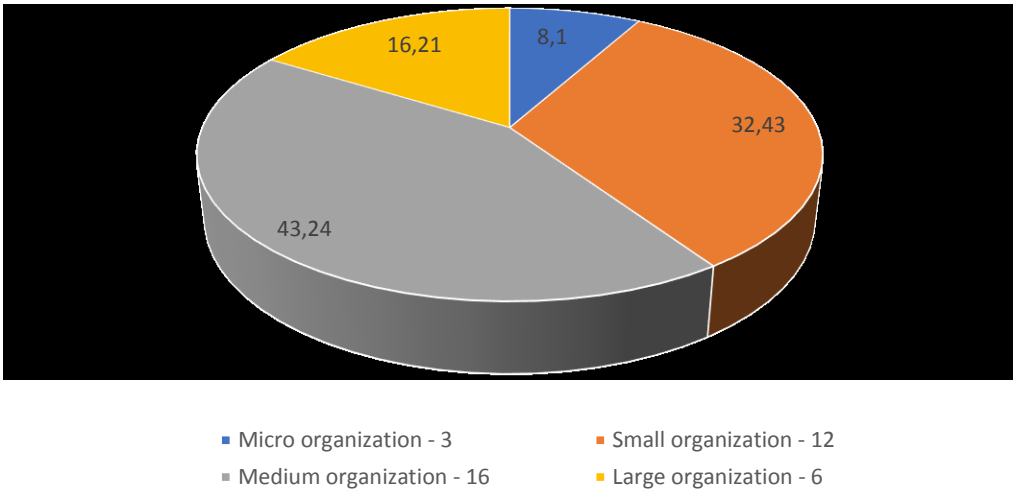

Figure 5. Size of the organizations implemented during the research.

All of the organizations were located in Poland.

The portfolio of implemented systems included (Fig. 6):

- Quality Management System According ISO 9001.
- Environmental Management System according ISO 14001.
- Integrated Management System according to ISO 9001, ISO 14001, ISO 45001.

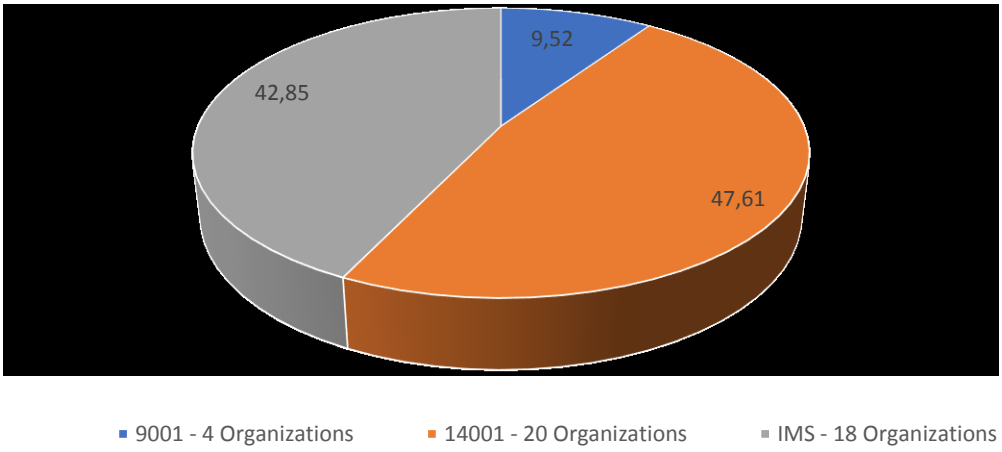

Figure 6. Types of Quantity Management standards implemented during the research.

The implementation time depended on the organization. The shortest implementations lasted 3 months (ISO 9001, small company) and the longest 7 months (ISO 9001, ISO 14001, ISO 45001, large organization).

Results of the research

The most popular variant of the implementations of Quality Management Systems included (Fig. 7 – variant 1):

- **Diagnosis of the current state** - the advisor company conducted an analysis of the current state of the enterprise Alpha, including its strategy, organizational structure, processes, and adherence to ISO standards.
- **Training: Requirements of ISO 9001 -** a training course was conducted to educate clients representatives on the requirements of ISO 9001.
- **Creation of Management System documentation -** development of Management System Documentation were established: Quality Manual, Procedures, and Instructions by Beta advisor company. Client organizations approved the documentations.
- **Consultations regarding the implementation of the 9001 standard -** consultations on QMS Implementation: Discussions were held to define and consult the required records from individual processes.
- **Conducting an internal audit ended with a report -** An internal audit was conducted to assess compliance with standards, identify strengths and non-conformities, and implement corrective actions.
- **Management review ended with the report -** following the requirements outlined in the ISO 9001 standard, a comprehensive summary of the activities within the implemented system was developed. The management board of the organizations, in collaboration with a advisor company, assessed the feasibility of participating in the certification body's audit.

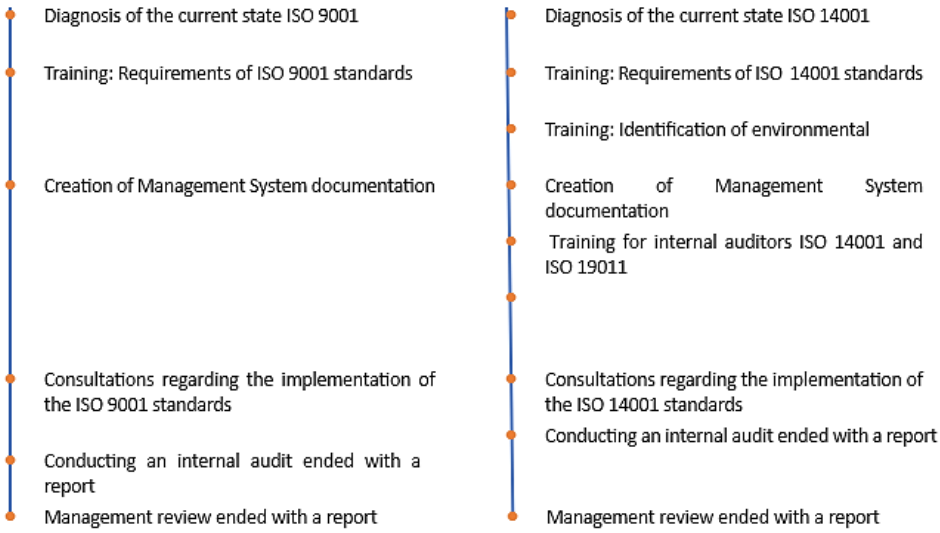

Figure 7. Implementations of Quality Management Standards – variant 1 (fundamental) and 2 (Common).

Out of the 37 organizations where Quality Management Systems were implemented, 20 of them (small and medium) implemented an Environmental Management System according to ISO 14001. The organizations were located in different regions of Poland (Fig. 7 – variant 2).

The individual phases of the implementation of ISO 14001 were similar to the basic variant in Figure 7. The differentiating element was the subject of implementation: ISO 14001 and a more extensive implementation schedule, which additionally took into account:

- **Training: Identification of environmental aspects** - training included identification and assessment of environmental aspects with is crucial element of ISO 14001 standard.
- **Training for internal auditors ISO 14001 and 19001 -** as part of the two-day training, candidates for internal auditors were introduced to auditing guidelines. The training lasted two days and ended with an exam.

Variant 3 and 4 of Implementations of Quality Management Standards include: quality - ISO 9001, environmental – ISO 14001 and safety ISO 45001 include extensive scope of training (Fig. 8):

- **Training: Quality, Environment, Health and Safety (IMS) requirements – management staff** – during the training, trainers from the advisor company presented the main requirements of the ISO 9001, ISO 14001, ISO 45001 standards, with particular emphasis on the responsibilities of the organization's management staff.
- **Training: Quality, Environment, Health and Safety (IMS) requirements – implementation team –** During the training session, the standards for quality, environment, and occupational health and safety were discussed in relation to operational activities and process owners. The presentation took into consideration the specific requirements of each standard and how they should be implemented in the workplace. Additionally, the training covered the method of work that should be followed during the execution of a project to ensure compliance with these standards.
- **Training: Risk Management –** during the training, participants were educated on the procedure for identifying and assessing risks according to ISO 9001, ISO 14001, and ISO 45001 standards. Additionally, they were given the chance to utilize a specialized risk management software tool.
- **Training: Internal and external context –** during the training, participants identified both internal and external factors that are important for the selected enterprise. This analysis was conducted using strategic analysis methods such as: SWOT and Porter's Five Forces Analysis.
- **Implementation of a computer program to risk management -** as per the terms of the agreement, Beta company created applications for the purpose of identifying and assessing risks. Upon completion of this phase, the application was officially handed over to the client, along with login credentials.

Figure 8. Implementations of Quality Management Standards – variant 3 (expanded) and 4 (consultation).

In case of implementations of Quality Management Standards – consultation variant (Fig. 8 – variant 4) the particular phases of implementations of QMS were similar as in Figure 7 – common variant). In the case most stages (except training) were based on consultations. This is due to the extensive knowledge of the implementation team on the client's side, maintaining the implemented systems for several years, as well as the great commitment of the management staff. The company where the implementation took place was affiliated with a foreign company, specifically a Mother-Daughter company relationship. Additionally, there were cyclical activities such as internal audits and management reviews conducted by chosen representatives from the parent company. This led to increased dedication among the staff of the daughter company and ensured that deadlines agreed upon with Beta were met.

During the COVID-19 pandemic, the implementations of Quality Management Standards (Fig. 9 – on-line variant) were carried out primarily online, with only the Diagnosis and Trainings elements taking place on-site. The organization utilized mobile phones, emails, and online meetings via communication platforms for most of the implementation process. Additionally, virtual audits by certification bodies were conducted online. Despite the challenges posed by the pandemic, the organization successfully implemented an integrated system covering quality, environment, and health and safety standards, ultimately receiving a certification for their efforts.

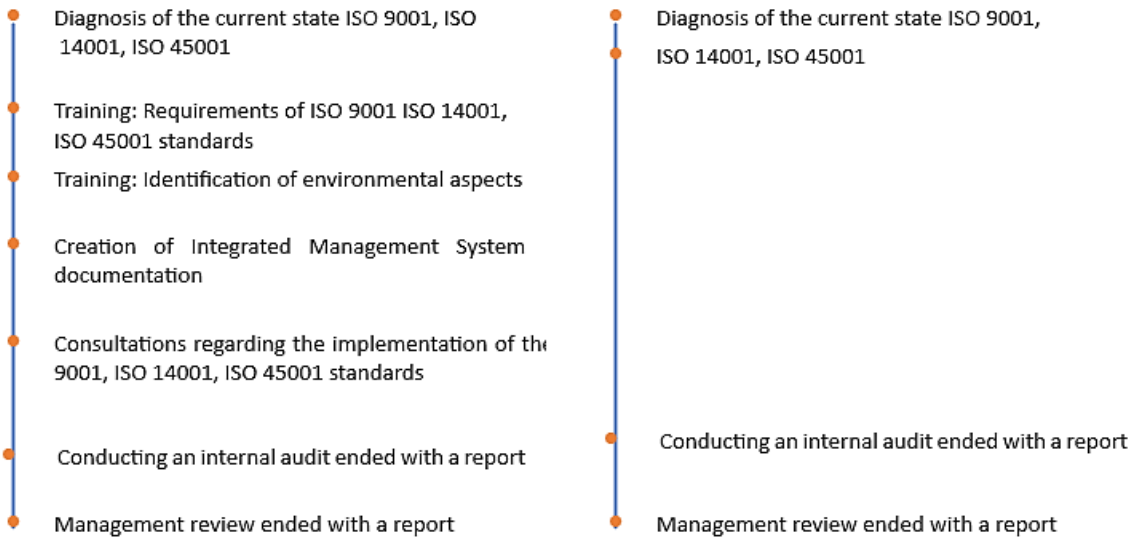

Figure 9. Implementations of Quality Management Standards – variant 5 (on-line) and 6 (supervision).

Figure 9 (variant 6) is structured around three key stages: Diagnosis, Internal Audit, and Management Review. While the company had initially put the system in place, subsequent operational and personnel changes prompted a decision to enlist external expertise to pinpoint crucial areas for system maintenance. This methodology enables an impartial evaluation of the existing systems and helps determine where corrective measures are needed.

The models presented in the study were based on implementation projects carried out between 2014 and 2025. These models reflect practical experiences accumulated over more than a decade of collaboration with enterprises of various sizes and sectors, providing a foundation for understanding the dynamics and challenges of quality management system deployment in real-world conditions. Building upon the insights gained from these traditional implementation models, the study further explores the potential of artificial intelligence in supporting management system development. To this end, three AI-based models were analyzed, utilizing advanced tools such as ChatGPT, Claude, and Bard. The integration of AI into the analysis marks a significant shift towards leveraging new technologies to enhance the efficiency, accuracy, and adaptability of management system implementations.

Figure 10 presents two models developed using AI tools, specifically ChatGPT and Claude. In both models, two critical stages are identified: the decision to implement the management system and the subsequent maintenance of the system as an integral part of the implementation process. When considering the collaboration between the service provider and the client organization, these stages may either form part of the negotiated service package or, in some cases, may not be explicitly included - particularly in relation to the ongoing maintenance of the system. In such instances, the responsibility for maintaining the management system rests primarily with the client organization where the system was implemented. Maintenance activities can, however, be formalized as a separate contractual agreement between the provider and the client if deemed necessary.

The models emphasize that while the initial decision to implement a management system typically involves negotiation and external support, the long-term upkeep of the system often becomes an internal responsibility. This distinction highlights the importance of clearly defining roles and responsibilities during the negotiation phase and underscores the potential for flexible arrangements tailored to the specific needs and capabilities of the client organization.

Importantly, none of the three AI models involved additional machine learning or model training for the purposes of this study. The same prompt was entered into ChatGPT, Claude, and Bard in order to ensure comparability of results. In two cases — ChatGPT and Claude — the generated responses were highly similar and reflected comparable implementation structures. In contrast, Bard generated a substantially different implementation model, indicating variations in interpretation and response structure despite the use of an identical prompt.

Figure 10: Implementations of Quality Management Standards – variant 7 (based on Chat GPT) and 8 (based on Claud).

Despite certain differences, the two models generated using ChatGPT and Claude demonstrate a strong alignment with the practical implementation patterns observed in the real-world projects labeled as Variants 1 through 5. Both AI-driven models closely reflect the sequence of decision-making processes, system deployment, and maintenance activities that were consistently reported during the actual consulting engagements. This close correlation

suggests that AI-based tools, when properly prompted and guided, are capable of accurately reproducing established best practices and implementation methodologies.

In contrast, a notably different situation emerges in the case of Figure 11 - Variant 9, which was generated using Bard.

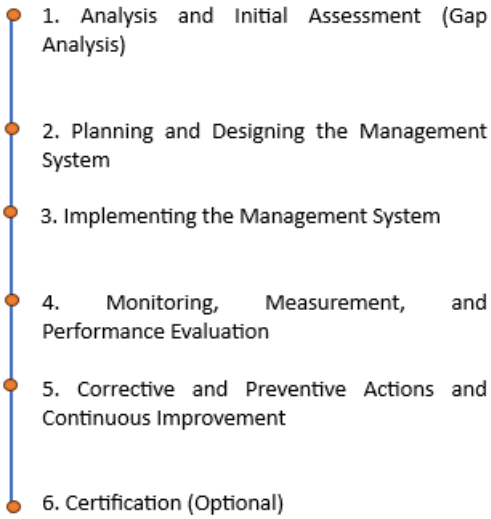

Figure 11. Implementations of Quality Management Standards – variant 9 (based on Bard).

Figure 11 presents the implementation model of Integrated Management Systems (quality, environmental, safety) based on Variant 9 generated by Bard. The model consists of six stages, beginning with a gap analysis, followed by system planning, implementation, monitoring, and improvement activities, and optionally culminating in certification. It emphasizes the organization's internal responsibility for maintaining and improving the system, with minimal reliance on external support. This approach reflects contemporary trends toward greater autonomy and flexibility in management system development.

4. Findings

Based on research conducted between 2014 and 2025, it is evident that provider–client collaboration significantly influences the effectiveness of quality management system (QMS) implementation. Organizations that engaged in close cooperation with external consultants were able to develop systems that were better aligned with market expectations, particularly in the context of tender participation and fulfilling strategic client requirements **(Q1)** (Figure 12). Strong collaboration enhanced both the efficiency and relevance of QMS deployment.

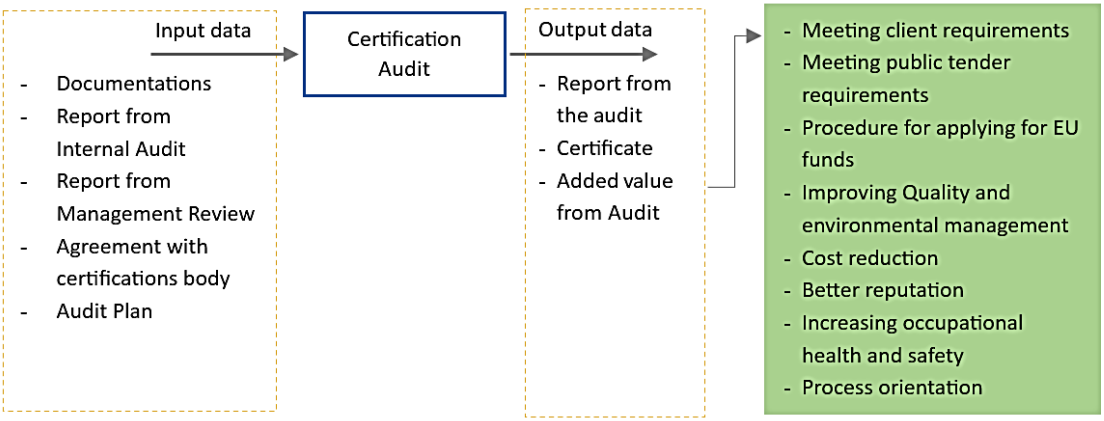

Figure 12. Value from certification of Quality Management Systems.

The study also indicates that external market pressures serve as key drivers accelerating the implementation of management systems. The necessity to obtain certifications such as ISO 9001, ISO 14001, and ISO 45001 — often as a prerequisite for maintaining business relationships or participating in competitive tenders — provided companies with a strong incentive to expedite the implementation process. At the same time, certification requirements contributed not only to faster implementation but also to improving the quality and effectiveness of implemented management systems. The risk of losing strategic partnerships in the absence of certification emerged as a decisive factor motivating rapid system development **(Q2).**

A comparison between traditional implementation models and AI-based models revealed notable differences. Traditional models, grounded in empirical consulting experience, closely reflect the realities of organizational constraints and client expectations. In contrast, AI-generated models propose more idealized, internally focused development paths that emphasize autonomy and continuous improvement. While AI models offer innovative perspectives, traditional approaches remain more attuned to external market conditions and the practicalities of provider–client collaboration **(Q3)**.

Finally, the findings confirm that artificial intelligence can serve as an effective tool for simulating the implementation of quality management systems. AI-based solutions, by integrating best practices and analyzing large volumes of data, can generate structured implementation frameworks. However, their practical application requires careful validation, especially in scenarios where external certification demands and business partner expectations are critical to the success of the management system **(Q4)**.

5. Conclusions

The study highlights the crucial role of provider–client collaboration in the successful implementation of quality management systems, particularly in environments driven by market and certification pressures. External demands serve as strong accelerators of system development, influencing both the pace and focus of implementation efforts. While traditional implementation models are firmly grounded in practical experience and external requirements, AI-based models offer new, internally oriented perspectives that, although innovative, require critical validation before practical application.

The research confirms that artificial intelligence can be a valuable supporting tool in simulating and designing management systems, provided that its outputs are carefully aligned with real-world organizational needs and market expectations. Furthermore, the growing role of AI in management system implementation is increasingly reflected in emerging international regulatory standards, including International Organization for Standardization/ IEC 42001:2023, which establishes requirements for artificial intelligence management systems. This demonstrates that AI-supported QMS implementation is becoming an important area of international standardization and organizational development.

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