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Maximising Synergy: The Benefits of a Joint Implementation of Knowledge Management and Artificial Intelligence System Standards

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Abstract: Implementing management systems in organisations of all types and sizes often raises the following question: "What benefits will this bring?" Initial resistance and criticism are common as potential challenges are identified during the implementation process. To address this, it is essential to highlight the advantages of these systems and engage stakeholders in supporting management efforts. While the planning, implementation, use, maintenance, auditing, and improvement of management systems are generally voluntary, certification is frequently driven by external factors, particularly customer demands. Employees also stand to gain significantly, with knowledge and information serving as valuable resources, especially for leveraging artificial intelligence. This article explores the management's readiness to adopt and fully utilise two management systems based on international standards: the ISO 30401 Knowledge management system (KMS) and the ISO/IEC 42001 Artificial intelligence management system (AIMS). Through interviews, we assess the challenges and solutions associated with implementing these systems, whether planned or partially adopted. The findings illustrate the synergistic benefits of integrating the KMS and AIMS, demonstrating how their combined use can enhance Integrated Management Systems (IMSs). Such integration supports comprehensive planning, operation, and performance evaluation of processes and services while also promoting continuous improvement.

Keywords: knowledge; artificial intelligence; management systems; standards; drivers of standards implementation; ISO 30401; ISO/IEC 42001; KMS; AIMS; AI

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1. Introduction

Emerging AI capabilities, including KM, are expected to become integral to various organisational activities. Building a partnership between humans and AI can support KM activities, and understanding the implications for AI system development and management is crucial. This involves considering people, infrastructure, and processes [1].

In response to the increasing importance of knowledge as a key competitive advantage and its role in value creation, the International Organisation for Standardization (ISO) introduced the management system standards (MSSs) for knowledge management [2]. This initiative is significant because it encourages organisations to view knowledge strategically, enhancing their processes to better address challenges. Joining and later integrating another management system relevant to the KMS, such as ISO/IEC 42001 [3], can have a positive synergistic effect.

This article's primary intention is to address the lack of a comprehensive overview of joint implementation and, later, the integration of ISO 30401 and ISO 42001. It aims to determine how these standards help solve practical problems in creating and developing a

knowledge management system supported by artificial intelligence (AI) and demonstrate their synergistic benefits when used together.

1.1. Knowledge and Management System

Each organisation works in a certain environment, dealing with customers, clients, suppliers, governmental and non-governmental organisations, employees, and owners.

Knowledge is a widely discussed concept in the field of strategic management because it provides a sustainable competitive advantage. Knowledge management can be analysed from several angles: as a state of mind, an object, a process, a condition of having access to information, or a capability [4]. Additionally, it may be examined from various perspectives, such as human resources management, strategic management, IT systems management, or an integrated approach combining multiple management functions. Some authors have chosen definitions that reflect these different approaches and research perspectives in knowledge management [5].

Knowledge fosters the creation of new products or services, enhances existing ones, refines business processes, and prevents repetitive and unnecessary work. Organisations aim to use knowledge to achieve their goals rather than merely acquire and collect it.

However, many organisations struggle to implement effective knowledge management systems and seek guidance for this process. Applying ISO 30401 helps set precise purposes, define necessary actions and elements, appoint responsible individuals, and control the entire process.

Organisations often face difficulties while implementing knowledge management systems, and the reasons for failure vary. The ISO 30401 standard helps avoid these mistakes and addresses the reasons for implementation failures. Additionally, the standard aims to achieve a high level of quality in existing knowledge management and to benefit from this achievement. The standard points out requirements that may be considered as guidance on managing policies and processes to achieve specific objectives and creating a culture that facilitates the continuous cycle of self-estimation, change, and improvement of organisational operations and processes [6].

To achieve these benefits, organisations need to manage knowledge effectively. The knowledge management system (KMS) ISO 30401 comprises a set of procedures and actions designed to facilitate and improve the creation, acquisition, maintenance, and administration of knowledge within the organisation. The KMS helps organisations adapt to dynamic environments, minimise business risks, and enhance both personal and organisational learning and performance. Section 3.2 further explains the problems organisations face using information from the literature review. In addition, Section 3 describes the challenges that we collected through the interview.

1.2. Artificial Intelligence and AI Management Systems

The implementation of AI in knowledge management has been conducted across various continents, mainly in the general field. AI can be applied to fundamental knowledge management processes, decision-making, knowledge forecasting, and knowledge exchanges. The implementation of AI in knowledge management is growing, and the research topic continues to develop [7].

Following are some conceptual frameworks that will help us understand the nature of this nascent technology.

AI is a branch of computer science that has been evolving since 1950. The term was first coined by the American cognitive scientist and inventor John McCarthy in a 1956 paper presented at the Dartmouth College Conference. At that time, the ambition was to create a machine that mimics the human brain's activities during the learning process. In McCarthy's mind, by automating different learning tasks a human brain goes through, we may be able to program a machine to learn and behave similarly to humans.

Artificial intelligence (AI) refers to the scientific and technical field dedicated to developing engineered systems that generate outputs such as content, forecasts, recom-

mendations, or decisions based on human-defined objectives [8]. Haugeland [9] describes AI as the effort to create machines capable of thinking, potentially acquiring human-like abilities such as abstract thinking, emotions, feelings, and consciousness. Kurzweil [10] emphasises AI's capability to build machines that can act and react appropriately, adapting their responses to situational demands, thus highlighting AI's intelligent behaviour. These definitions collectively suggest that AI not only aims to replicate human cognitive functions but also strives to produce systems capable of intelligent adaptation and decision-making.

Furthermore, AI techniques offer powerful tools for developing knowledge management systems, enhancing their capability to manage and utilise knowledge effectively [11].

It is important to remind the reader of the distinction between the three types of AI. Figure 1 provides a summary of the different types.

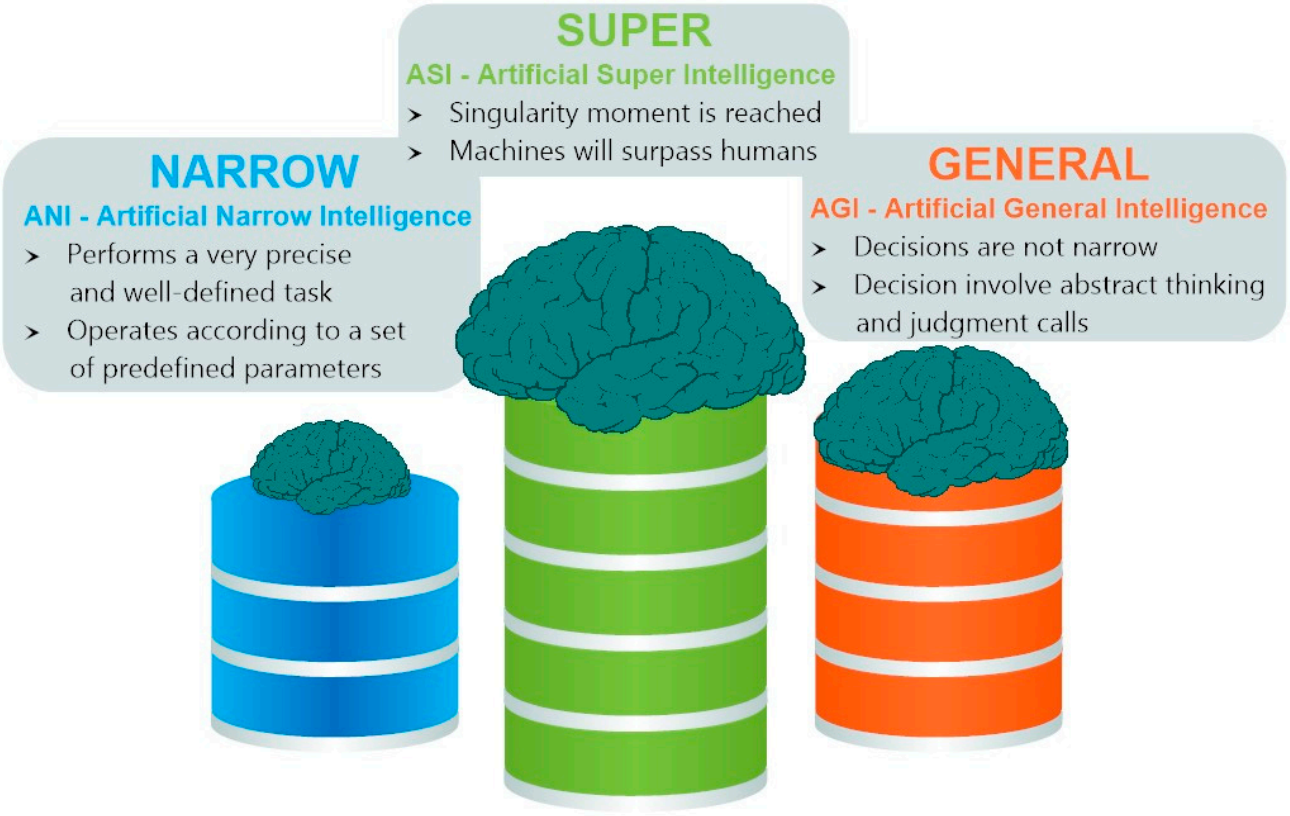

Figure 1. Different types of artificial intelligence [11].

AI is just a practical tool, not a panacea. It is only as good as the algorithms and machine learning techniques that guide its actions. AI can perform a specific task well but takes tons of data and repetition. It simply learns to analyse large amounts of data, recognise patterns, and make predictions or decisions based on that data, continuously improving its performance over time. This AI meaning has evolved beyond mere data processing to include the development of machines capable of learning, reasoning, and problem-solving. Machine learning has become so "competent" that it generates everything from software code to images, articles, videos, and music. This is the next level of AI, so-called generative AI, which differs from traditional AI in its capabilities and application. While traditional AI systems are primarily used to analyse data and make predictions, generative AI goes a step further by creating new data, like its training data [12].

Because data and information are the "fuel" for artificial intelligence, effective AI implementation requires targeted data management, information processing, and correct management of the AI itself.

Applications of artificial intelligence are already revolutionising how businesses operate. Advancements in machine learning and deep learning in particular are creating a paradigm shift in virtually every industry sector. Spanning areas as diverse as healthcare, finance, and information technology, AI has pioneered innovations and optimisations in numerous fields. Central to these advancements are AI management systems. With increasing integration across various industries, the importance of ensuring the quality and reliability of up to now used AI software cannot be overstated. Despite the risks involved, AI still suffers from a lack of regulation. This is where AI management systems can help.

The AI management system, as specified in ISO/IEC 42001:2023, is a set of interrelated or interacting elements of an organisation intended to establish policies and objectives, as well as processes to achieve those objectives, in relation to the responsible development, provision, or use of AI systems. This standard specifies the requirements and provides guidance for establishing, implementing, maintaining, and continually improving an AI management system within the context of an organisation [13].

Table 1 below lists some of the benefits of AI system integration.

Table 1. The main benefits of implementing an artificial intelligence management system.

Main Benefits of Implementing AIMS
Framework for managing risk and opportunities;
Demonstration of responsible use of AI;
Traceability, transparency, and reliability;
Bridging information asymmetries between partners;
Increased the level of trust and confidence among partners;
Cost savings and efficiency gains.

Using the concept of the harmonised or consolidated structure of High-Level Structure (HLS) management standards, it is possible to comprehensively analyse knowledge and AI management [14]. This approach allows for drawing conclusions that facilitate a deeper understanding and enable the establishment, implementation, maintenance, continuous improvement, and documentation of all processes in both management systems [15].

The successful application and beneficial use of management systems based on ISO standards are crucial for any organisation that decides to implement them. However, these systems can sometimes fall prey to administrative inefficiencies, creating obstacles rather than achieving the desired synergistic effects. Our research investigates whether combining management systems, specifically knowledge management systems (KMSs) and artificial intelligence management systems (AIMSs), can lead to more effective and enhanced management of business entities.

In our research, we selected two management systems supported by relatively new standards with significant potential to gain widespread adoption, akin to the widely recognised ISO 9001 [16]. This research offers a novel perspective that may attract the interest of managers, researchers, and other stakeholders.

Quality management is nowadays an integral part of the overall management system within the organisation. It represents the coordination of a set of activities focused on the management and leadership of the organisation with an emphasis on quality, i.e., satisfying customer requirements [17].

2. Materials and Methods

The materials used in our research pertain to knowledge management, artificial intelligence management, and their respective systems. Specifically, we focused on ISO 30401:2018—Knowledge Management Standard and ISO/IEC 4200:2023—Information Technology—Artificial Intelligence. The selection was based on twelve years of experience with management system standards, as reflected in our previous research [17–19]. The

chosen standards demonstrate significant potential and promise to accelerate their adoption within organisations.

The methods employed included a literature review and an analysis of the application of these management system standards. We synthesised individual clauses, terms, definitions, and annexes of the standards. Additionally, we utilised the unique concept of the harmonised structure of ISO standards, which facilitates the effective combination and adaptation of management systems within organisations.

One of the fundamental principles is that all the standards can work together. Those who already use an MSS in one part of their business and are considering implementing additional ones in another area will find that the process has been made as intuitive as possible. That is thanks to the harmonised structure (HS). The concept of HS is that management standards are structured in the same way, regardless of the domain of application. Users familiar with one MSS will immediately feel at ease with another, even when using it for the first time [20].

2.1. Knowledge Management Systems According to ISO 30401:2018

The international standard ISO 30401:2018 was prepared by the Technical Committee ISO/TC 260 Human Resource Management as a document that sets requirements and presents guidelines for establishing, implementing, maintaining, reviewing, and sustainably improving an effective management system for knowledge management. This standard helps any organisation, regardless of its type or size or the products and services, to provide all the applicable requirements.

ISO 30401's purpose is to support subjects in developing a management system that effectively promotes and enables value creation through knowledge. Knowledge management (KM) is a discipline focused on how organisations create and use knowledge.

KM has no accepted definition, and no global standards predate this management system standard. Many well-known barriers to successful KM still need to be overcome, including confusion with other disciplines for example such as information management. Other barriers include common misconceptions about how to do KM or that simply buying a technology system will be enough for KM to add value.

Each organisation will craft a KM approach specific to its business and operational environment, reflecting its specific needs and desired outcomes.

The intent of ISO 30401 is to set sound KM principles and requirements as follows:

(a) As guidance for organisations that aim to be competent in optimising the value of organisational knowledge;
(b) As a basis for auditing, certifying, evaluating, and recognising such competent organisations by internal and external recognised auditing bodies.

Two amendments provide additional content to the standard. The first amendment, published in 2022, contains a more complex interpretation and clarification of terms and definitions for ISO 30401:2018. The second amendment, published in 2024, concerns climate action changes [2].

By supporting organisations to maximise the benefits of international standardisation and ensure the uptake of ISO standards, the International Organisation for Standardization supports some of the goals of United Nations Sustainable Development:

Goal 4: Quality Education, which ensures inclusive and equitable quality education and promotes lifelong learning opportunities for all;

Goal 8: Decent Work and Economic Growth, which promotes sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all [21].

2.2. Artificial Intelligence Management Systems According to ISO/IEC 42001:2023

The international standard ISO/IEC 42001:2023 was prepared by Technical Committee ISO/IEC JTC 1/SC 42 Artificial Intelligence as a document that specifies requirements for establishing, implementing, maintaining, and continually improving an artificial intelligence management system (AIMS) within organisations of any size involved in developing, providing, or using AI-based products or services.

It is designed for subjects providing or utilising AI-based products or services, ensuring responsible development and use of AI systems. This standard is applicable across all industries and relevant for public sector agencies as well as companies or non-profits.

ISO/IEC 42001 is intended to help the organisation develop, provide, or use AI systems responsibly in pursuing its objectives and meeting applicable requirements, obligations related to interested parties, and expectations from them.

This standard is the world's first AIMS standard, providing valuable guidance for this rapidly changing field of technology. It addresses AI's unique challenges, such as ethical considerations, transparency, and continuous learning. For organisations, it sets out a structured way to manage risks and opportunities associated with AI, balancing innovation with governance [3].

This standard relates to seven United Nations Sustainable Development Goals:

Goal 5: Gender Equality, which achieves gender equality and empowers all women and girls;

Goal 7: Affordable and Clean Energy, which ensures access to affordable, reliable, sustainable, and modern energy for all;

Goal 8: Decent Work and Economic Growth, which promotes sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all;

Goal 9: Industry, Innovation, and Infrastructure, which builds resilient infrastructure, promotes inclusive and sustainable industrialisation, and fosters innovation;

Goal 10: Reduced Inequalities, which reduces inequality within and among countries;

Goal 12: Responsible Consumption and Production, which ensures sustainable consumption and production patterns;

Goal 14: Life Below Water, which conserves and sustainably uses the oceans, seas, and marine resources for sustainable development [21].

ISO/IEC 42001:2023, the same as the standard ISO 30401:2018, applies the harmonised structure (identical clause numbers, clause titles, text, common terms, and core definitions) developed to enhance alignment among management system standards (MSS). The AI management system provides requirements specific to managing the issues and risks arising from using AI in an organisation. This common approach facilitates implementation and consistency with other management system standards, e.g., quality, safety, security, and privacy [3].

ISO/IEC 42001:2023 is in the initial stage of its implementation, auditing and certification.

In addition to the literature review and standards analysis, we conducted interviews. In November 2023, over 60 business entities were contacted to obtain relevant information; however, only some of them provided us with complete answers to our questions within the specified time interval. The final research targeted 30 medium-sized European organisations, each with up to 250 permanent employees. Their fields of business included mechanical engineering and metallurgy. Three-fifths of these organisations were members of the European Union, while the remaining were located on the European continent but were not part of the EU. We utilised our university's and partner universities' internal databases with similar study programs. Specifically, graduates from our faculty's "Human Resource in an Industrial Enterprise" program played a crucial role in this research.

The database included professional contacts of former university graduates currently employed as HR managers. After reaching out to these graduates and presenting the research, these HR managers interviewed top and middle management, providing insights based on their experience and observations. The interviews were often performed intermittently and repeatedly due to the busy working schedules of the managers. This research

phase lasted from December 2023 to March 2024, the interval determined by our supporting project. Interview participants identified common problems and key tasks related to implementing and maintaining knowledge management (KM) within their organisations. The collected and processed information was compiled into a table. Most data were provided electronically via emails, while some were shared through audio or audiovisual means during phone or online meetings.

Table 2 is an overview of interview questions and answers. It is important to note that the interview was conducted as an open dialogue with a combination of open and closed questions.

Table 2. Interview questions.

1	Does your organisation use knowledge management (including adjacent disciplines, for example, QMS, quality management systems according to ISO 9001)?
2	What strategies and tools do you use to manage knowledge within your organisation?
3	What challenges does your organisation encounter regarding knowledge management?
4	Are there plans to implement a knowledge management system (KMS) in your organisation?
5	Are there plans to implement an artificial intelligence management system (AIMS) in your organisation?

3. Results

During the interview, we noticed that the respondents made a significant distinction between a task and a problem.

A problem was typically defined as an issue that requires immediate resolution, corrective actions, or the prevention of potential risks that have not yet occurred. In contrast, a task was a planned action where the respondent was aware of the possible implications and confident there was enough time to address them.

All organisations responded positively to the first question. Differences emerged with the second question. Overall, 93.33% of organisations (28) reported using a combination of their own systems adapted to local conditions and the ISO 9001 standard. This information is not surprising, because the QMS standard is an important document for sustainable business, and QMS certification is often requested by the stakeholders, particularly customers. Two organisations used their own system but were not ISO 9001 certified. However, none of the organisations used ISO 30401. Thus, we identified an opportunity to inform stakeholders about this management system, which also allowed us to derive benefits from the information obtained in the interviews.

When identifying the problems faced by these organisations, we gathered responses summarised in Table 3.

Finally, 50% of organisations confirmed plans to implement a KMS, and 97% planned to implement an AIMS. Figure 2 illustrates the percentage of organisations addressing the identified issues (IP01 to IP10) in blue, the percentage of organisations planning to implement KM and AI management systems in red, and the percentage of organisations with an already implemented QMS in green.

In the following sections, we will address the drivers for implementation and the benefits and challenges of implementation and system deployment.

Table 3. Answers to interview question No. 3.

Identified Problems (IP)	Number of Organisations Dealing with the Problem	Percentage (%)
(IP01) Inconsistency of KM with general goals	20	66.67
(IP02) Lack of detailed planning and timing for KM projects and infrastructure	25	83.33
(IP03) Lack of understanding of the importance of KM	12	40.00
(IP04) Organisational mismatch	28	93.33
(IP05) Lack of knowledge sharing	15	50.0
(IP06) Inefficient reward system	19	63.33
(IP07) Overwhelming with irrelevant information	22	73.33
(IP08) Overwhelming irrelevant persons with relevant information	23	76.67
(IP09) Low understanding of the context related to the importance of adjacent disciplines, including AI	29	96.67
(IP10) Absence of insight ability in KM	25	83.33

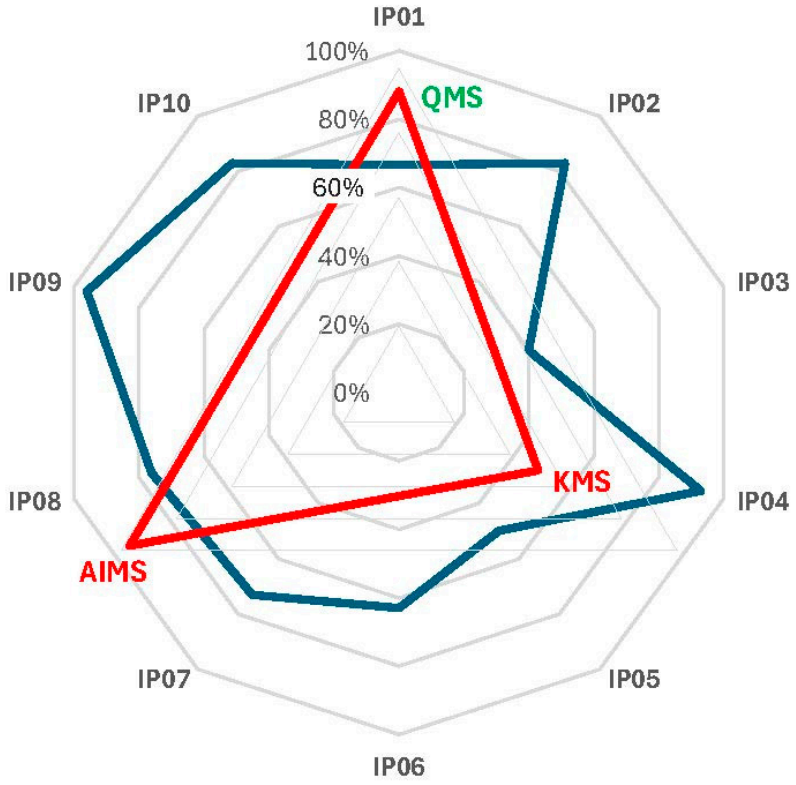

Figure 2. Percentage of organisations addressing identified problems (blue) and planning to implement KM and AI management systems (red).

3.1. Drivers for Implementing the KM

The organisation's standards help make dealings more transparent and predictable, but the drivers for standards implementation may vary from company to company.

The drivers may be external or internal and may lead to different benefits. External drivers appear when a whole market requires changes, pushing the organisation to use new technologies, approaches, and business models to stay competitive and effective. Internal drivers, on the other hand, concern internal processes, the organisation's image, or strategy.

The implementation benefits may be explicit or implicit and manifest themselves shortly or with delayed effect.

Figure 3 summarises internal and external drivers and possible implementation benefits of knowledge management standards.

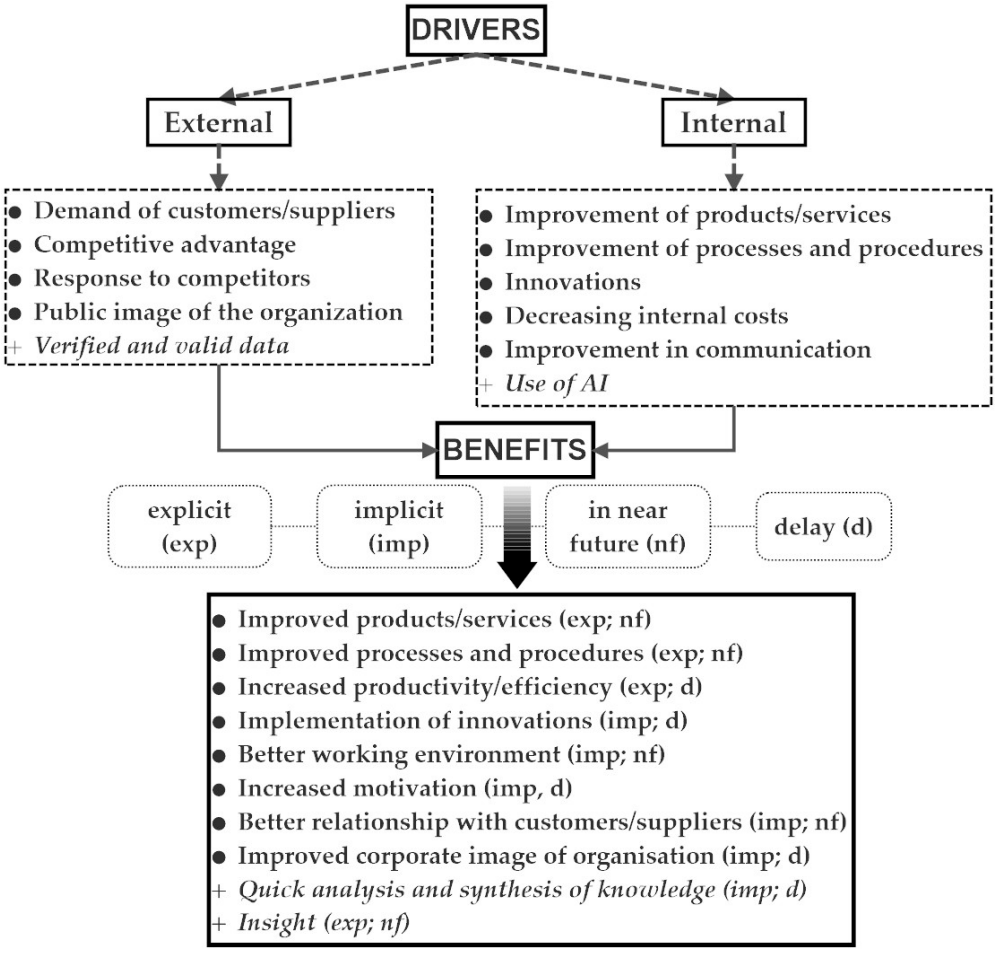

Figure 3. Overview of external and internal drivers and benefits in KMSs (authors' work based on [22]).

Adopting a powerful tool that aligns with the management system and follows the latest trends is essential to enhance the benefits of using knowledge management in an organisation. One such tool is the AI management system based on the ISO/IEC 42001:2023 standard. By incorporating "AI Management" into adjacent disciplines and updating Figure 3 with "+ Use of AI" for internal drivers and "+ Verified and valid data" for external drivers, organisations can achieve faster and more insightful processing of knowledge. This will result in "Quick analysis and synthesis of knowledge" and "Insight."

External drivers, internal intentions, and promising benefits encourage organisations to establish and develop knowledge management systems (KMSs). Of course, the main benefit of certification is bridging information asymmetries between partners, because the implemented ISO certification shows others that some managerial practices are made and function well. This increases the level of trust and confidence among partners, as it indicates serious intentions of managers in doing business and consistency and stability in its functioning.

3.2. Challenges in Knowledge Management Implementation

Storey and Barnett were the first researchers to define the two key problems. The first problem dealt with the kind of interventions managers are invited to make to effect and

implement a knowledge perspective on business strategy. The second problem touched upon some difficulties that might have been anticipated in this endeavour [23] (p. 146). The increasing number of KM implementation failures suggests that organisations still face significant problems during implementation.

Khazieva and Caganova identified the most common problems in implementing and running KM, summarised in Table 4 [24].

Table 4. Most common problems during implementation and deployment of knowledge management based on the literature review [24].

Inconsistency of KM with general goals. The organisation should determine its general goals before developing any knowledge management system. This refers to making a profit and formulating clear, consistent, and reachable goals.
A lack of detailed planning and timing for the KM project and infrastructure. Organisations often do not indicate the deadlines, resources, working time distribution, and responsible people for implementing and running KM. An absence of special technical tools and software limits data collection and analysis.
Organisational mismatch. The organisation does not explain to its employees what it assumes from them regarding KM, nor when or how it correlates with their main duties and what is expected.
Lack of knowledge sharing. Sometimes, employees are unable or unwilling to share their knowledge. The main reasons for this are protecting their position and benefits within the organisation, distrust among employees, and an unfriendly environment as a whole.
Inefficient reward system. Participation in any KM is usually an additional task for employees, and employees believe that this performance should be appropriately appreciated.

Based on the answers collected during the interviews, we can confirm that the listed challenges remained consistent and that organisations continue to face the same problems.

Understanding these problems allows companies to prevent knowledge management failures proactively. However, analysing potential issues and finding solutions demands significant effort and resources.

However, many organisations do not know how to start the KM process and what they need. In this sense, ISO 30401 is "an opportunity to create a common language for global conversations about KM that might help organisations manage knowledge more effectively" [25]. The main aim of this standard is "to support organisations to develop a management system that effectively promotes and enables value-creation through knowledge" [2]. This means that any KMS does not exist in isolation from the organisation's goals. KM is created and operates in accordance with the company's vision, mission, and objectives. It is developed to create and increase the value of the company's products or services.

Some scholars have attempted to analyse ISO 30401. Corney summarised the advantages and disadvantages of ISO 30401 according to their experience in the drafting process [26]. Kudryavtsev and Sadykova studied how ISO 30401 may be included in enterprise architecture models, combining knowledge management with other management systems and with technologies and IT systems in the organisation [27]. Maximo et al. first visualised the standard's structure and determined crucial strengths and weaknesses for practical implementation [4]. Pawlowsky et al. analysed how ISO 30401 relates to the theoretical origins of KM and Intellectual Capital research. The authors discuss how ISO 30401 may contribute to value creation [28].

3.3. Knowledge Management Life Cycle

It is well known that knowledge must first be captured, codified, and presented in a format that is accessible to the user for it to be shared. The goal is to convert knowledge into actionable insights or transform individual learning into organisational learning. This paper incorporates the life cycle into its framework.

The AI life cycle, shown in Figure 4, is the iterative process of moving from a business problem to an AI solution that solves that problem. Each of the steps in the life cycle is revisited many times throughout the design, development, and deployment phases.

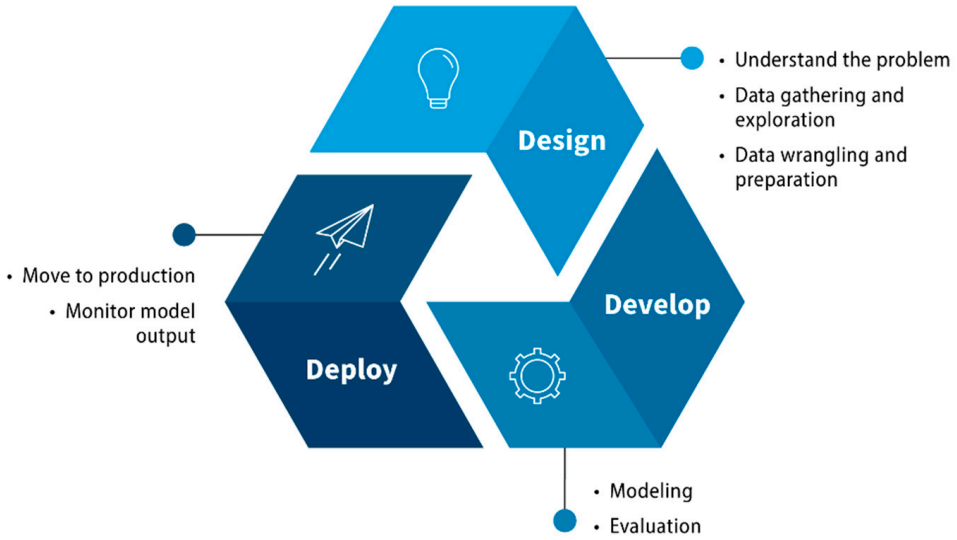

Figure 4. AI life cycle [29].

The life cycle is usually a prerequisite for effective knowledge transfer and sharing. According to [30], Figure 5 illustrates knowledge transfer within the KM system-building life cycle.

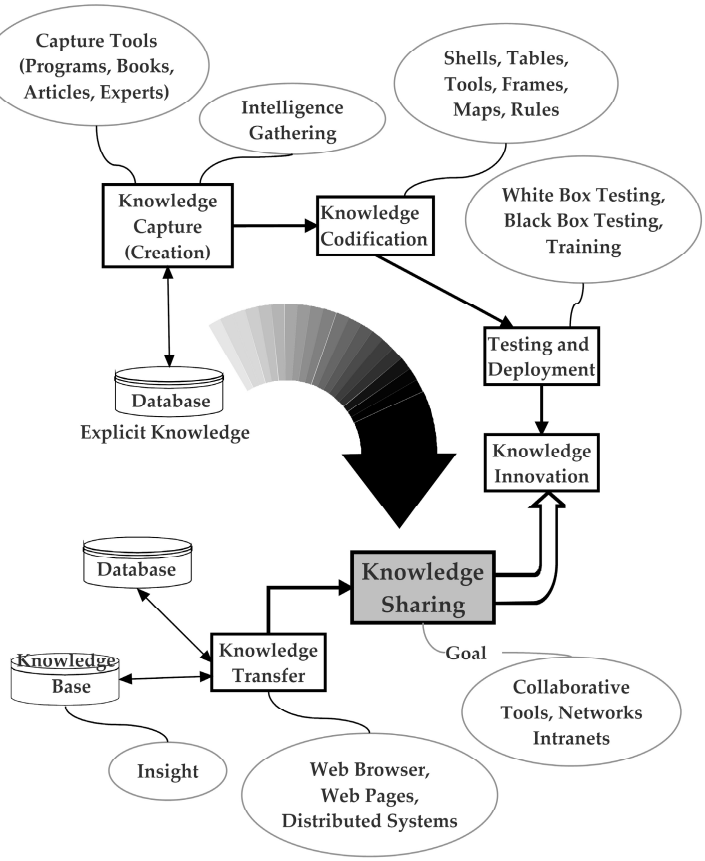

Figure 5. Knowledge transfer in the KM system-building life cycle [30].

ISO 30401 includes an important informative section, its Annex B, titled "Relation between Knowledge Management and Adjacent Disciplines." This Annex highlights the synergy between knowledge management and other management systems. Since the standard was released in 2018, it does not yet include the newly developed AI management system. However, ISO 30401, its Annex B outlines specific disciplines. We have extended these to include AI and summarised them in Figure 6.

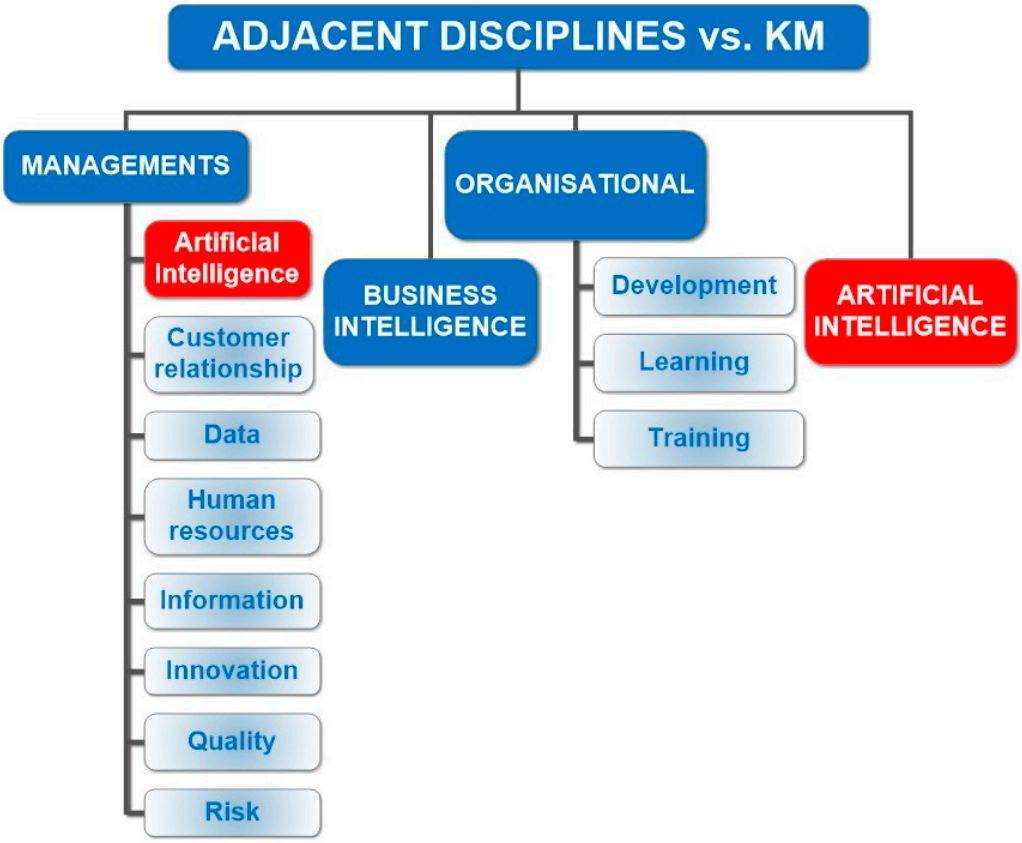

Figure 6. Relationship between knowledge management and adjacent disciplines (authors' work inspired by Annex B, [2]).

In determining the close connections between knowledge management and artificial intelligence management and their presentation, the following ideas emerge, which point to the synergistic effect between these two disciplines.

The life cycle of knowledge management (KM) is intricately linked with artificial intelligence (AI) alongside other adjacent disciplines. From our model, several key conclusions emerge. First, no AI solution can succeed without a clear and precise understanding of the business challenge being addressed and the desired outcome. Second, data are the foundation of any AI solution; a model cannot be utilised effectively without thoroughly comprehending the required data and their composition. Lastly, data preparation is often the most challenging and time-consuming phase of the AI life cycle.

Organisations often struggle to implement knowledge management (KM) systems effectively, seeking guidance and recommended steps. Applying the ISO 30401 standard helps set clear purposes, determine necessary actions and elements, appoint responsible individuals, and control the entire process.

Implementing KM systems is challenging for many organisations, leading to failures for various reasons. The ISO standard helps to avoid mistakes and address these reasons during KM system implementation. Additionally, it aims to achieve a high level of quality in existing KM practices and benefit from this achievement. Companies frequently lack clarity on where to start and the desired outcomes. In this context, applying established

standards like ISO 30401 can help eliminate the challenges and difficulties associated with KM implementation. The standard identifies requirements that may be considered as guidance on managing policies and processes to achieve specific objectives and creating a culture that facilitates the continuous cycle of self-estimation, change, and improvement of organisational operations and processes [6].

3.4. ISO 30401:2018 and ISO 9001:2015

ISO 30401 has a format and structure comparable to ISO 9001, where organisational knowledge is part of quality management. During the interviews, the organisations identified the parts of ISO 9001 they most often used in their knowledge management implementation process, as shown in Table 5.

Table 5. Overview of identified ISO 9001:2015 [16] clauses for KM implementation.

Clause Number	Clause
4.1	Understanding the organisation and its context
4.2	Understanding the needs and expectations of interested parties
5.1.2	Customer focus
5.3	Organisational roles, responsibilities, and authorities
7.1.2	People
7.1.6	Organisational knowledge
7.2	Competence
7.3	Awareness
7.5.2	Creating and updating (documented information)
7.5.3	Control of documented information
8	Operation (selective)
9.1.2	Customer satisfaction
9.1.3	Analysis and evaluation
9.3	Management review

Both standards have some similarities and differences in relation to their objectives. Table 6 notes the most significant similar parts.

Table 6. Overview of common characteristics of ISO 9001 [16] and ISO 30401 [2].

Context of organisation means determination of interested parties and their requirements and establishment, implementation, maintenance, and continual improvement of the system, including needed processes and their interactions;
Leadership means the role and responsibilities of top management to support the process;
Planning means establishing objectives and how they can be reached;
Support means needed resources and capabilities, communicational channels, creating and updating information, and documenting;
Performance evaluation means identifying points to monitor and evaluate, methods, and analysing the results;
Improvements mean continually improving the system's suitability, adequacy, efficiency, and effectiveness.

Identifying the overlapping clauses is extremely helpful for future work with the standards, especially for their partial and/or complete integration.

ISO 30401 exclusively emphasises the role of leadership and culture in KMS. Top managers should develop a culture that values, supports, and enables KM and direct,

motivate, inspire, empower, and support persons who contribute to the effectiveness of the KMS. Moreover, top managers should manage a balance between knowledge sharing and knowledge protection.

Using structural coding [28] helped visualise the process of KM and identify the main components of KMS according to ISO 30401: Knowledge Development, Knowledge Transformation, and Enablers (see Figure 7). Knowledge Development involves the following activities: acquiring new knowledge, applying this knowledge, retaining this knowledge, and operating with outdated knowledge. Knowledge Transformation means that an organisation should support knowledge flows across levels (individuals, teams, and a whole organisation) and includes human interaction; recording, documentation, or coding of knowledge; structuring or classified codified knowledge; and storage for accessibility and internalisation. Suitable human resources, processes, technology and infrastructure, culture, and governance enable the existence of Knowledge Transformation and Knowledge Development. At the same time, the authors of the current paper believe that it is also necessary to include another component—Knowledge Creation—because employees have their own experience and are able to learn and, as a result, are capable of creating new knowledge. Knowledge Creation is especially important for companies whose competitive advantage is based on innovation and technologies.

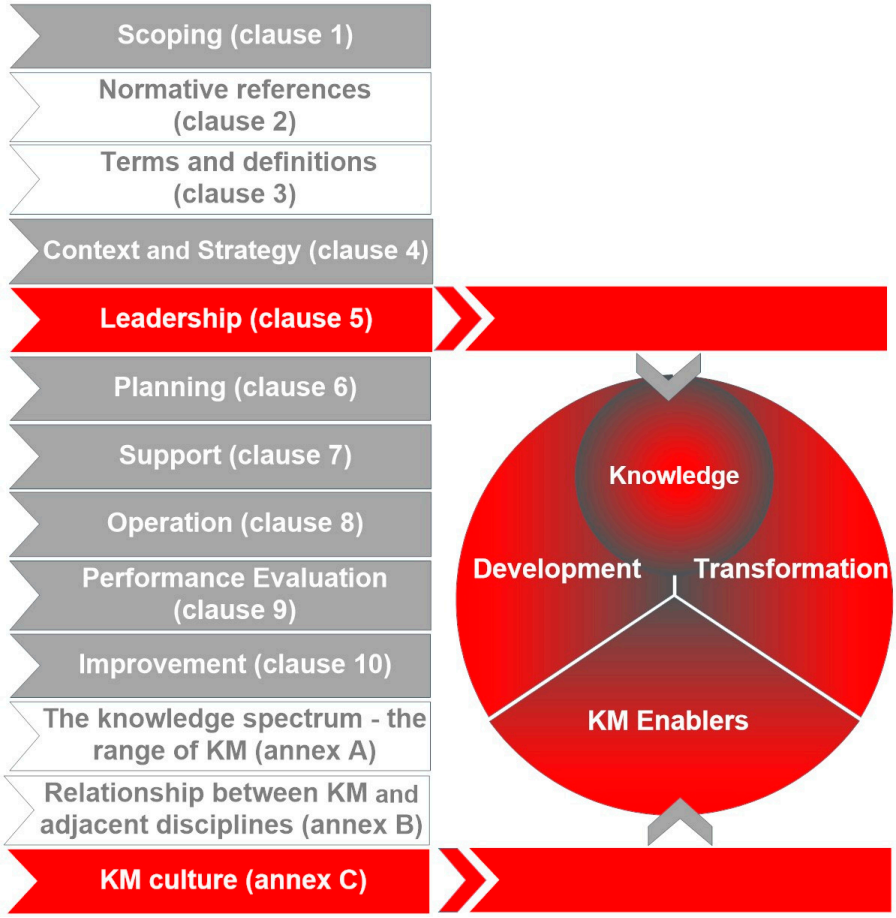

Figure 7. Content of the ISO 30401:2018 KMS standard [28].

As with any logic and software development, the use of an agile approach to continually retain and refresh the model is a must. However, AI systems require "extra attention". They must undergo rigorous and continuous monitoring and maintenance to continue performing as trained, meet the desired outcome, and solve the business challenges [23].

Additionally, to the main components, the KMS is set up in the organisation and is supported by the organisation. Thus, the standard suggests two key connectors for the

KMS and the organisation—leadership and culture. This suggestion meets business needs because knowledge management fails due to a lack of support from management and the absence of strong leadership and motivation (both monetary and non-monetary). That is why ISO 30401 emphasises that knowledge management is a holistic endeavour and that all parts of KMS are interdependent. Therefore, a conscious approach to creating and managing the KMS will allow for achieving organisational goals since the KM is closely connected with the organisation's strategic management.

When correctly determining and effectively solving the main problems of KM implementation, taking into account ISO/IEC 42001 and their common consolidated structure, it is essential to be aware of the possibilities of suitable solutions and the limitations of ISO 30401, as shown in Figure 8.

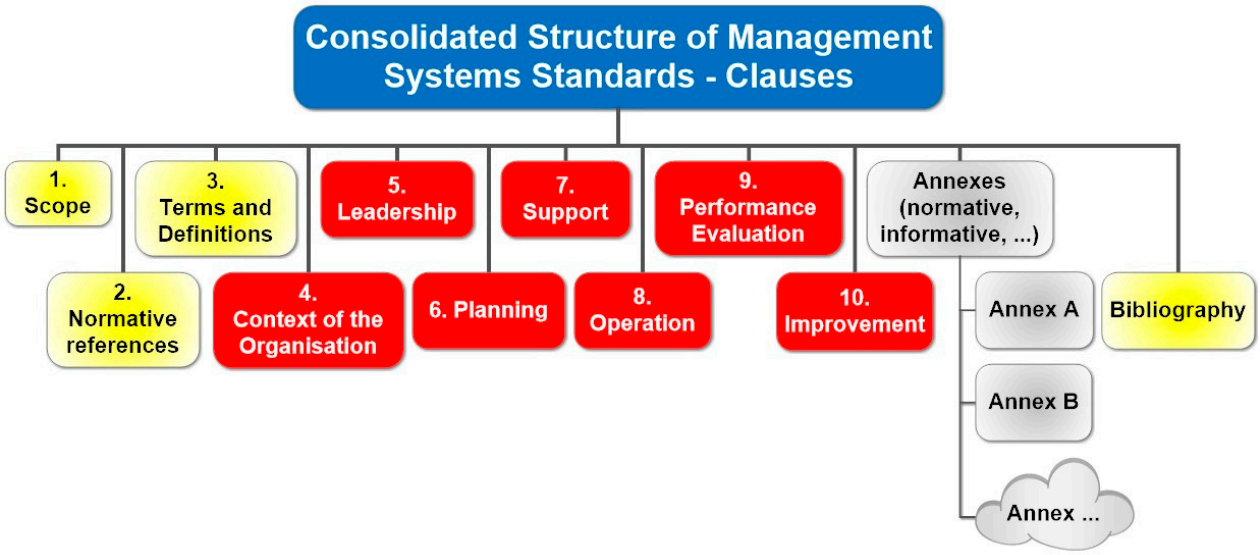

Figure 8. Consolidated structure of management system standards [31].

Without offering one KM solution that fits all organisations, IS0 30401 suggests that a KMS is adaptive and may prevent the most common problems when implementing and running KM. Table 7 summarises the suggestions of ISO 30401 with the support of ISO/IEC 42001. As the authors stated, the initial phase must be concerned with tasks to define the business objectives and translate them to machine learning objectives to collect and verify the data quality [32]. Setting objectives when defining tasks and solving problems during KM implementation is also essential. If we include AI in this process, our efforts can verify the quality of the obtained data much more effectively. These recommendations can be especially valuable for people encountering knowledge and AI management systems for the first time.

As shown in Table 7 and Figure 6, implementing KM and AI management systems helps organisations address common problems (by reducing or eliminating them) and tackle specific tasks (by improving efficiency in affected units or activities). This combination creates a synergistic effect, enabling the use of tools from both standards. The AIMS can be seen as an extension of the KMS, elevating it to a new level through advanced software and hardware support (e.g., Quantum IT) and the availability of vast amounts of data and information.

Table 7. Overview of problem prevention suggestions according to ISO 30401:2018 and ISO/IEC 42001:2023 [2,3].

The Most Common Problems and Tasks When Implementing and Running KM	The Suggestions of ISO 30401:2018 with the Support of ISO/IEC 42001:2023
Inconsistency of KM with the general goals	The organisation should determine external and internal issues that are relevant to its purpose and that affect its ability to achieve the intended outcome(s)/result(s) (4.1 KMS and AIMS) * The organisation should establish objectives at relevant functions and levels. The objectives shall (a) be consistent with the policy; (b) take into account applicable requirements; (c) be measurable; (d) be monitored; (e) be communicated; and (f) be updated as appropriated (6.2 KMS and AIMS) The organisation shall identify and document objectives to guide the responsible development systems, take those objectives into account, and integrate measures to achieve them in the development life cycle (Annex A, A6.1.2 and A9.3 AIMS) The organisation should implement processes for the responsible design and development of systems (Annex B, B.6.1.and B.9.3 AIMS) Potential AI-related organisational objectives and risk sources can be considered by the organisation when managing risks (Annex C, C.2 AIMS)
Lack of detailed planning and timing for KM project and infrastructure	When planning for the system, the organisation shall (a) give assurance that the system can achieve its intended outcome(s)/ result(s); (b) prevent or reduce undesired effects; and (c) achieve continual improvement (6.1 KMS and AIMS) The organisation shall plan actions to address risks and opportunities to integrate and implement the actions into system processes and evaluate the effectiveness of these actions (6.1 KMS and AIMS)
Organisational mismatch	When planning how to achieve its objectives, the organisation shall determine (a) what will be done; (b) what resources will be required; (c) who will be responsible; (d) when it will be completed; and (e) how the results will be evaluated (6.2 KMS and AIMS) The organisation shall identify and document objectives to guide the responsible use of systems (Annex A, A.9.3 and Annex B, B.9.3 AIMS) Top management shall demonstrate leadership and commitment by (a) ensuring the policy objectives are established, compatible, and aligned with strategic direction; (b) ensuring the integration of the system requirements into the organisation's business and project processes; (c) ensuring that resources are available; (d) communicating the importance of effective management and of conforming to the system requirements; (e) ensuring that the system achieves its intended outcome(s)/results; (f) promoting improvement; and (g) supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility (5.1 KMS and AIMS) Top managers shall ensure that the responsibilities and authorities for relevant roles within the system are assigned and communicated within the organisation (5.3 KMS and AIMS) Roles and responsibilities should be defined and allocated according to the organisation's needs (Annex A, A.3.2 and Annex B, B.3.2 AIMS) The organisation shall consider the competence level required for various types of workers (7.2 KMS and AIMS, Annex B, B.4.6 AIMS)

Table 7. *Cont.*

The Most Common Problems and Tasks When Implementing and Running KM	The Suggestions of ISO 30401:2018 with the Support of ISO/IEC 42001:2023
Lack of knowledge sharing	The organisation shall determine and provide the resources needed for the establishment, implementation, maintenance, measurement, and continual improvement of the system (7.1 KMS and AIMS, Annex A, A.4 and Annex B, B.4 AIMS) The organisation shall (a) determine the necessary competence of person(s) doing work under its control that affects its performance; (b) ensure that these persons are competent based on appropriate education, training, or experience; (c) where applicable, take actions to acquire the necessary competence and evaluate the effectiveness of actions; and (d) retain appropriate information as evidence of competence (7.2 KMS and AIMS, Annex B, B.4.6 AIMS) Documented information shall be controlled to ensure (a) its availability and suitability for use, where and when it is needed, and (b) it is adequately protected. To control the organisation, it shall address the distribution, access, retrieval, and use; (b) storage and preservation; (c) control of changes; and (d) retention and disposal. Documented information of external origin determined by the organisation to be necessary for the planning and operation of the system shall be identified, as appropriate, and controlled (7.5.3 KMS and AIMS)
Inefficient reward system	The organisation shall determine (a) what needs to be monitored and measured; (b) the methods for monitoring, measurement, analysis, and evaluation needed to ensure valid results; (c) when the monitoring and measuring shall be performed; and (d) when the results from monitoring and measurement shall be analysed and evaluated. The organisation shall evaluate the performance and the effectiveness of the system (9.1 KMS and AIMS) Top management shall review the organisation's system at planned intervals to ensure its continuing suitability, adequacy, and effectiveness. The management review shall consider (a) the status of actions from previous management reviews; (b) changes in external and internal issues that are relevant to the system; (c) information on the performance, including nonconformities and corrective actions, monitoring and measurement results, and audit results; (d) opportunity for improvement (9.3 KMS and AIMS); and (e) changes in needs and expectations of interested parties that are relevant to the AI management system (9.3 AIMS)

* Numbers in brackets are the numbers for identification of the clauses as well as the annexes of ISO 30401:2018 (KMS) and ISO/IEC 42001:2023 (AIMS).

4. Discussion

Particular attention should be paid to the distinction between the interpretations of the concept of "information" in information systems management, linguistics, philosophy, and knowledge management systems [33].

The ISO proposes aligning the implementation of KMSs with organisations' strategic objectives and backgrounds. In contrast, ISO 30401 indicates several steps that help establish the KMS within the organisation, providing a guideline for managers and determining possible directions and necessary actions. Also, the standard indicates that "interactions between people" help KM create "shared understanding."

It is crucial to indicate that implementing ISO 30401 does not guarantee the success of full KMS implementation and the absence of any difficulties. Boyes identified several risks that may occur while receiving certification: the risk of low uptake, the risk of low-quality certification, the risk that organisations implement the KM standard symbolically rather than meaningfully, and the risk that the standard is not specific enough or too specific [34].

Additionally, some scientists criticise ISO 30401 because, aiming to improve performance, it provides incomplete recommendations for achieving them [4,27]. Different KM

initiatives and practices exist in a variety of industries, and conditions may vary. Wagner pointed out that the standards do not provide guidance on what works under which circumstances or concrete advice on what exactly KM practices should be used. At rest, it is difficult for managers and auditors to estimate the worth of established KMSs based on formal criteria [35].

Given the mentioned limitations, Pawlowsky et al. conclude that "ISO 30401:2018 is a signal for outsiders as well as agents within the organisation that knowledge as an asset is nourished, cultivated, and managed in an effective way, thus providing an element for closing such informational asymmetries and aligning incentives by means of management mechanisms that are consistently used to enhance the organisation's value" [28] (p.522).

Knowledge management and decision support are interdependent activities in many organisations. Artificial intelligence is a key but also criticised building block for advancing these activities. Further research is needed to develop the next generation of decision-support environments that leverage AI technologies [36].

Despite implementing various AI technologies in KM, there remains a lack of systemic understanding of their application. Further studies are needed to address this gap and enhance the integration of AI methods in KM systems [37].

In future developments, we should aim not only for the simultaneous implementation of these standards but also consider their partial or full integration into existing organisational systems. For instance, a partial integration could involve combining ISO 9001 and ISO 30401 while maintaining ISO 42001 as an autonomous standard. On the other hand, full integration could be exemplified by the merger of ISO 9001 with IATF 16949 or ISO 9001 with ISO 13485. Such strategic integrations will enhance efficiency and ensure comprehensive compliance within the organisational framework. Moreover, what might be of interest to the European Foundation for Quality Management (EFQM) model implementers is incorporating the combined ISO 30401: 2018 and ISO/IEC 42001:2023 standards into the organisation's evaluation using this tool.

The knowledge management system standard can be useful for developing individual parts of the EFQM model, as are the First Direction, the Second Execution, and the Third Results in organisational entities.

For example, the Direction includes the following:

- First Criterion "Purpose, Vision & Strategy";
    - Subcriterion 1.5 "Designs & Implements a Performance Management & Governance System";
- Second Criterion "Organisational Culture & Leadership";
    - Subcriterion 2.3 "Enables Creativity & Innovation".

The Execution includes the following:

- Third Criterion "Engaging Stakeholders";
    - Subcriterion 3.2 "People—Attracts, Engages, Develops & Retains";
- Fifth Criterion "Driving Performance & Transformation";
    - Subcriterion 5.3 "Drives Innovation & Technology";
    - Subcriterion 5.4 "Leverages Data-Driven Insights & Knowledge".

The artificial intelligence management system standard can be useful for developing individual parts of the EFQM model, as described below.

The Execution includes the following:

- Fourth Criterion "Creating Sustainable Value";
    - Subcriterion 4.1 "Defines the Value & How it is Created";
    - Subcriterion 4.3 "Delivers the Value";
- Fifth Criterion "Driving Performance & Transformation";
    - Subcriterion 5.4 "Leverages Data-Driven Insights & Knowledge".

The Results include the following:

- Sixth Criterion "Stakeholder Perceptions";
  - Subcriterion 6.2 "People Perception Results";
- Seventh Criterion "Strategic & Operational Performances";
  - Subcriterion 7.10 "Predictive Measures for the Future".

However, this will require further research and validation of the results [38,39]. Finally, research should also focus on developing smart assistant systems for social benefits and competitive advantage [40].

5. Conclusions

In conclusion, integrating AI management with knowledge management (KM) creates a powerful synergy that enhances both systems' effectiveness. Properly managed AI can be highly beneficial, but mismanagement can lead to significant issues, such as replicating harmful information from unchecked data. KM systems play a crucial role in preventing uncontrolled AI training by regulating AI usage and minimising both known and unknown risks. Additionally, AI management systems ensure the correct handling of data, providing added security and reliability [41].

AI will significantly impact the future of work and how organisations manage their KM processes. Many KM initiatives fail to incorporate ongoing advances in AI, making it challenging for organisations to integrate AI into their environments. An adaptive, AI-specific approach to KM implementation supports KM strategy and research, offering knowledge managers tools to align KM with business strategy and technological progress in the AI context. No AI solution will succeed without a clear understanding of the business challenge being addressed and the desired outcome. Since data are the foundation of any AI solution, their preparation is often the most challenging and time-consuming phase of the AI life cycle. Therefore, a precise understanding of the required data and their composition is essential for effective AI utilisation [42].

Information gathering included both formal and informal methods, as structured questionnaires are often less favoured by busy top and middle managers. Consequently, the research is frequently constrained by the limited time top managers are willing to allocate to academic studies.

The research presented in this article validates our hypothesis regarding the synergistic potential of combining ISO standards 30401 and 42001. This combination is not yet widely adopted, with new standards often implemented independently. The ISO/IEC 42001 standard is in its early application stages, but it has already garnered significant interest from contacted organisations. This standard shows considerable promise for widespread implementation across various sectors. It has also been shown that when the standards are linked and/or later integrated [43], they create a tandem that increases the organisation's ability to develop and transform knowledge and effectively share it with stakeholders.

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