Towards Architecting a Knowledge Management System: Requirements for an ISO Compliant Framework

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Abstract. Nowadays, enterprises must be knowledge-driven to be competitive and survive in knowledge economy. It means that knowledge must be a key value-creating resource for such organizations, and knowledge management system shall be embedded into overall enterprise management system. Knowledge management is now not only a possible best practice of industrial leaders and a topic of academic research, but also a "must have" element of every company. Accordingly, knowledge management has been recently included into ISO 9001:2015 and ISO 30401 standards specifying requirements for knowledge management systems. The main research question of the current paper is how to embed knowledge management requirements of ISO into frameworks for enterprise architecture modeling and management? This paper analyses and summarizes knowledge management-related ISO requirements for enterprise management system and transform them into requirements for domain-specific modeling language. Knowledge management-oriented enterprise modeling frameworks are further studied and compared against ISO requirements. This comparison demonstrates fragmented support of ISO requirements. Thus, the research highlights the need for ISO compliant knowledge-oriented extension for existing, proven EM frameworks and provides requirements for it.

1   Introduction

1.1   Motivation and Problem statement

Knowledge has become a key resource in modern economy. Companies need to learn how to create value and make money out of knowledge. Key capabilities of a 21st-century company are acquiring new knowledge, applying current knowledge, retaining current knowledge and handling outdated or invalid knowledge. Knowledge man-

agement (KM), a rather new discipline, helps companies to establish these capabilities. "The inclusion of Knowledge Management within the recently released ISO 9001:2015 marks a huge change within the world of KM. For the first time, one of the global business standards explicitly mentions knowledge as a resource, and speci-fies expectations for the management of that resource. This provides a long-awaited level of legitimacy for KM which could be a game-changer." [1] Even more, ISO 30401 was published in 2018, and it contained requirements for knowledge management system (KMS). Thus, today many companies begin to implement knowledge-related ISO requirements. These implementations require enterprise trans-formation.

On the other hand, enterprise modeling (EM), enterprise engineering (EE) and architecture management (EAM) are proven approaches for coordinating business trans-formations [2,3,4]. Enterprise Modelling, according to [5] "is concerned with representing the structure, organisation and behaviour of a business entity, be it a single or networked organisation, to analyse, (re-)engineer and optimise its operations to make it more efficient". Enterprise models include "concepts that are suited to support the conjoint analysis and design of information system and action system" [6]. Enterprise engineering (EE) and architecture management (EAM) are strongly connected to EM. These disciplines are concerned with designing or redesigning business entities, typically, using enterprise models. EAM and EE "provide methods and techniques for an aligned development of all parts of an enterprise" [7].

It seems reasonable that knowledge-driven companies and KMS (as management systems) complying with ISO requirements should be designed and implemented involving EM and EAM frameworks. So the final goal of our research is to suggest ISO compliant knowledge-oriented extension for existing, proven EM and EAM frameworks. Such an extension will not only help to design, implement and support KMS, but also seamlessly integrate it into overall enterprise architecture of a company. This extension will be used by enterprise architects and their teams; it can be also useful for chief knowledge officers or knowledge managers, if they are familiar with EM and EAM.

It seems reasonable that knowledge-driven companies and KMS (as management systems) complying with ISO requirements should be designed and implemented involving EM and EAM frameworks.

Although there are many papers integrating EM/EA and KM (e.g. [8, 9, 10, 11]), they consider this link from very different perspectives, and it is unclear if there are existing KM-oriented enterprise modeling frameworks which satisfy requirements on domain-specific modeling language and EAM method.

1.2   Research Questions and Approach

The current paper addresses the following research question:

How to embed KM-related requirements of ISO into frameworks for enterprise architecture modeling?

In order to answer this question, the following subquestions are suggested:

- What are KM-related ISO requirements for EM language?

- Do existing KM-oriented enterprise modeling frameworks satisfy the requirements for this language?

Answers to these questions will provide the basis for the future design-oriented research [12] aimed at creating and evaluating of ISO compliant knowledge-oriented extension for existing, proven EM frameworks.

Although it is also necessary to have ISO compliant EAM method for architecting, implementing and supporting KMS and knowledge-driven organization, due to the size limitations the analysis of requirements for EAM method is out of the scope of the current paper.

Specification of the KM-related ISO requirements for EM language is based on the [13]. In order to find or design the necessary extension for EM languages/framework, we follow the method proposed by Frank (2010), which has already been successfully applied in other projects. The method suggests a macro process model for developing domain-specific modeling languages. The macro process consists of 7 steps [13]: 1. Clarification of scope and purpose, 2. Analysis of generic requirements, 3. Analysis of specific requirements, 4. Language Specification (abstract syntax), 5. Design of Graphical Notation (concrete syntax) and 6. optional Development of Modelling Tool. The process ends with the evaluation and iterative refinement of developed artefacts (7). Within this paper, we focus on the first 3 steps.

The current paper starts with the analysis of KM-oriented requirements for enterprise management system within ISO 9001:2015 and ISO 30401:2018 standards (section 2). Then it synthesizes KM-oriented ISO requirements for EM language (section 3). Overview and categorization of approaches at the intersection of KM and EM/EAM helped to identify relevant KM-oriented enterprise modeling approaches (section 4.1). The selected modeling approaches were compared with the KM-oriented ISO requirements for EM language (section 4.2).

2   Analysis of KM-oriented requirements in ISO standards

KM-related ISO requirements for enterprise management system are provided in ISO 9001:2015 and in ISO 30401:2018. This section analyzes these two standards and elicit integrated KM-related ISO requirements for EM language from them. The analysis starts from informal description of main KM-related elements within the standards, after that a detailed semantic analysis of the texts of standards is provided. The text analysis identifies required concepts for ISO compliant knowledge-oriented EM extension.

ISO 9001 was revised in 2015. The revised standard, ISO 9001:2015, includes the new clause 7.1.6 Organizational knowledge. The requirements of this clause are:

"Determine the knowledge necessary for the operation of its processes and to achieve conformity of products and services.

This knowledge shall be maintained and made available to the extent necessary.

When addressing changing needs and trends, the organization shall consider its current knowledge and determine how to acquire or access any necessary additional knowledge and required updates.

NOTE 1: Organizational knowledge is knowledge specific to the organization; it is generally gained by experience. It is information that is used and shared to achieve the organization's objectives.

NOTE 2: Organizational knowledge can be based on: a) Internal Sources (e.g., intellectual property, knowledge gained from experience, lessons learned from failures and successful projects, capturing and sharing undocumented knowledge and experience; the results of improvements in processes, products and services); b) External Sources (e.g., standards, academia, conferences, gathering knowledge from customers or external providers)."

As Nick Milton of Knoco Limited notes, "this new clause is not a Knowledge Management standard, nor does it require an organization to have Knowledge Management in place as a formal requirement. As a clause in a Quality standard, it simply requires that sufficient attention is paid to knowledge to ensure good and consistent quality of goods and services." [1]

The text analysis of the KM-related fragment is presented in table 1.

Table 1. Analysis of clause 7.1.6 Organizational knowledge in ISO 9001:2015

Text of the ISO standard	Required objects	Required activities
Determine the knowledge necessary for the operation of its processes and to achieve conformity of products and services.	Knowledge Necessary knowledge Knowledge necessary for the operation of its [organization] processes Processes Knowledge necessary to achieve conformity of products and services Products and services	Determine necessary knowledge
This knowledge shall be maintained and made available to the extent necessary.		Maintain knowledge Make knowledge available
When addressing changing needs and trends, the organization shall consider its current knowledge and determine how to acquire or access any necessary additional knowledge and required updates.	Needs Trends Organization Current knowledge	Consider its [organization] current knowledge Determine how to acquire any necessary additional knowledge Determine how to access any necessary additional knowledge Determine required knowledge updates

ISO 30401:2018 "Knowledge management systems – Requirements" was published in November 2018.

"The purpose of this standard for knowledge management is to support organizations to develop a management system that effectively promotes and enables value-creation through knowledge" [14].

This standard is led by principles – it starts from KM guiding principles: Nature of knowledge; Value; Focus; Adaptive; Shared understanding; Environment; Culture; Iterative. These principles can be transformed into the corresponding principles of EAM framework.

Main KM definitions in ISO 30401:2018 standard:

"Knowledge – human or organizational asset enabling effective decisions and action in context" [14].

"Knowledge management – management with regard to knowledge" [14]. Where management is considered as "management process of planning, organizing, directing and controlling the outcomes of people, groups or organizations" [15]

"Knowledge management system – part of a Management system with regard to knowledge. Note 1 to entry: The system elements include the organization's knowledge management culture, structure, governance and leadership; roles and responsibilities; planning, technology, processes and operation, etc." [14]. Where management system according to [14] is a set of inter-related or interacting elements of an organization to establish policies, and objectives and processes to achieve those objectives.

According to [14] "the organization shall establish, implement, maintain and continually improve a knowledge management system, including the strategy, processes needed and their interactions, in accordance with the requirements of this international standard."

ISO 30401:2018 includes KM-specific part and universal part, which is applicable for any management system. The description of a KM system is a specific part, while management activities, which "establish, implement, maintain and continually improve" KM system, are standardized and follows the template from the proposals for management system standards (see ISO/IEC Directives Part 1 and Consolidated ISO Supplement, Annex SL [16]). These management activities correspond to steps of PDCA-cycle and are the following: Context of the organization; Leadership; Planning; Support; Operation; Performance evaluation & Improvement.

Clause 4.4 of the ISO 30401:2018 includes the description of KMS, which shall be established, implemented, maintained and continually improved by an organization. This clause was used for eliciting the requirements for KM-oriented EM language (see table 2). In several cases, where the text of the standard made references to other clauses, these clauses were analyzed and necessary concepts were extracted. Some fragments of ISO standards text were considered as explanatory and were not used for extracting required concepts (objects and activities).

Table 2. Analysis of clause 4.4 Knowledge management system in ISO 30401:2018

Text of the ISO standard	Required objects and activities
4.4.1 General The organization shall **establish, implement, maintain and continually improve a knowledge management system**, including the processes needed and their interactions, in accordance with the requirements of this document.	Establish a KMS Implement a KMS Maintain a KMS (Continually) Improve a KMS

Text of the ISO standard	Required objects and activities
4.4.2 to 4.4.4 include requirements, each representing **a dimension of the knowledge management system**, which are interdependent. Acknowledging and incorporating these dimensions within the knowledge management system and putting them in place through a managed change process is required for the implementation of an effective and holistic knowledge management system within the organization.	Dimension of the KMS
4.4.2 Knowledge development The organization shall demonstrate that the knowledge management system covers the following activities, for effectively managing knowledge through **its stages of development** through systematic **activities and behaviours**, supporting the **knowledge management system objectives** and covering the **prioritized knowledge domains** defined in 4.3:	Knowledge development Stages of knowledge development Activities and behaviours KMS objectives Prioritized knowledge domains
a) Acquiring new knowledge: means to provide the organization with knowledge that was previously unknown or unavailable within the organization.	New knowledge Acquiring new knowledge Means
b) Applying current knowledge: means to make knowledge effective, integrating the current relevant knowledge of the organization in order to enable improved actions and decision making.	Current knowledge Applying current knowledge Means
c) Retaining current knowledge: means to safeguard the organization from the risks of knowledge loss.	Current knowledge Retaining current knowledge Means
d) Handling outdated or invalid knowledge: means to protect the organization from making mistakes or working inefficiently, as a result of use of knowledge inappropriate within the current organizational context.	Outdated knowledge Invalid knowledge Handling outdated or invalid knowledge Means
4.4.3 Knowledge conveyance and transformation The organizational knowledge management system shall **include activities and behaviours**, supporting all different **types of knowledge flows**, through systematic activities and behaviours, supporting the **knowledge management system objectives** and covering the **prioritized knowledge domains** defined in 4.3:	Knowledge conveyance and transformation Activities and behaviours Types of knowledge flows KMS objectives Prioritized knowledge domains
a) Human interaction: exchange and co-creation of knowledge through conversations and interactions; between individuals, teams and across the organization.	Human interaction
b) Representation: making knowledge available through demonstrating, recording, documenting and/or codifying.	[Knowledge] representation
c) Combination: synthesis, curating, formalizing, structuring or classifying of codified knowledge, making the knowledge accessible and findable.	[Knowledge] combination
d) Internalization and learning: reviewing, assessing and absorbing knowledge; incorporating it into practice.	[Knowledge] internalization and learning

Text of the ISO standard	Required objects and activities
4.4.4 Knowledge management enablers The organizational knowledge management system shall include and integrate elements of all the following enablers to create an effective knowledge management system. This shall support the **knowledge management system objectives** and cover the **prioritized knowledge domains** defined in 4.3:	KM enablers KMS objectives Prioritized knowledge domains
a) Human capital: roles and accountabilities, including all **knowledge management system stakeholders**; making sure that knowledge management is encouraged within the organization (covered in detail in Clause 5).	Human capital Roles and accountabilities KM stakeholders
b) Processes: defined **knowledge activities** applied and embedded within **organizational processes**, including procedures, instructions, methods and measures (covered in Clause 8).	Processes Knowledge activities Organizational processes
c) Technology and infrastructure: digital channels, virtual and physical workspace and other tools.	Technology and infra-structure Digital channels Virtual workspace Physical workspace
d) Governance: Strategy, expectations and means of ensuring the knowledge management system is working in alignment (covered in detail in Clauses 5 to 10).	Governance KM strategy KM expectations KM policy (from clause 5.2)
e) Knowledge management culture: Attitudes and norms regarding sharing, learning from mistakes (covered in detail in 4.5).	KM culture Attitudes [regarding sharing, learning from mistakes …] Norms [regarding sharing, learning from mistakes …]
4.5 Knowledge management culture Embedding a knowledge management culture across the organization is critical for sustained application of knowledge management. A culture where connections and knowledge activities are encouraged, and knowledge is valued and actively used, will support the establishment and application of the knowledge management system within the organization.	KM culture

3   KM-oriented ISO requirements for enterprise modeling language

Based on the analysis of ISO standards, the following requirements for EM language were synthesized:

R1: An EM language for ISO compliant design of KMS should provide concepts for modeling **organizational context for KM and KMS**. Concepts:

1.1. Organizational Processes, which requires knowledge;

1.2. Products and Services, which requires knowledge;

1.3. KMS objectives.

R2: An EM language for ISO complient design of KMS should provide concepts for modeling **Knowledge and its status**. Concepts: Knowledge; Knowledge   domain; Status of knowledge (Necessary knowledge; Current knowledge; New knowledge; Outdated knowledge; Invalid knowledge; Prioritized knowledge domains).

R3: An EM language for ISO complient design of KMS should provide concepts for modeling **Stages of knowledge development**. Concepts: Acquiring new knowlede; Applying current knowledge; Retaining current knowledge; Handling outdated or invalid knowledge.

R4: An EM language for ISO complient design of KMS should provide concepts for modeling **Types of knowledge flows within Knowledge conveyance and transformation**. Concepts: Human interaction;   [Knowledge] Representation; [Knowledge] Combination;   [Knowledge] Internalisation and learning.

R5: An EM language for ISO complient design of KMS should provide concepts for modeling **Activities, behaviours, means for knowledge development and knowledge conveyance and transformation**.

R6: An EM language for ISO complient design of KMS should provide concepts for modeling **KM enablers**. Concepts:

6.1. Human capital (Roles and accountabilities, KM stakeholders);

6.2. Processes (Knowledge activities, Organizational processes);

6.3 Technology and infrastructure (Digital channels, Virtual workspace, Physical workspace);

6.4. Governance (KM strategy, KM expectations, KM policy);

6.5. KM culture (Attitudes, Norms).

Management activities, which "establish, implement, maintain and continually improve" KM system are not reflected in these requirements since they mostly correspond to activities in EAM method, rather then enterprise modeling language (see futher research directions in the conclusion).

4   Study of KM-oriented enterprise modeling approaches

4.1   Overview of approaches at the intersection of KM and EM/EAM

There are many research papers studying a link between KM and EM or EA. In order to select the right approaches for further analysis (see section 4.2), we analyzed and organized existing into the following categories (fig. 1):

A. Enterprise modeling and/or enterprise architecture management are used for designing and implementing KMS;

B. Enterprise model is a codified organizational knowledge describing the way enterprise operations are organized;

C. Knowledge management helps to improve enterprise architecture management practices;

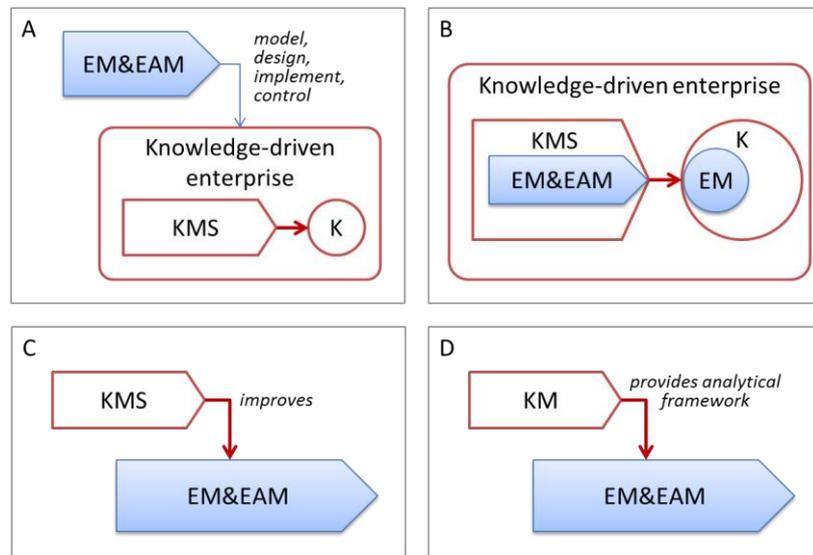D. Knowledge management provides analytical framework for EM&EAM.

Fig. 1. Categories of approaches at the intersection of KM and EM/EAM

A. Enterprise modeling and/or enterprise architecture management are used for designing and implementing KMS

Focus: analysis and design of an effective and efficient KMS

"Modeling is one of the key tasks that helps on the one hand to understand, analyze and improve business processes (business process reengineering), organizational structures in general and structures and processes of KM initiatives in particular. On the other hand, modeling supports the design, implementation and management of information systems, in this case of knowledge management systems." [17]

Modeling approaches in this category can be subdivided into the next groups:

A.1. Design of a KMS as a management system (Focus of our analysis)

A.1.1. Business process-oriented approaches

- KM extensions to ARIS (KM ARIS) [18],
- PROMOTE – a framework for process-oriented KM, which includes modeling language and method. The focus of this approach is on "modelling, identification, accessing, storing, distribution, and evaluation of knowledge in a process-oriented manner." [8],
- B-KIDE: A Framework and a Tool for Business Process-Oriented Knowledge Infrastructure Development (B-KIDE) [19].

A.1.2. Knowledge work-oriented approaches

This group partially intersects with the previous one, but has many special features.

- KIPO (the knowledge-intensive process ontology) [20] & corresponding KIPN (Knowledge Intensive Process Notation) [21],
- Knowledge modelling in weakly-structured business processes (KM-WSB) [22],
- Rapid knowledge work visualization for organizations (Know Flow toolset) [23].

A.1.3. Agent-Oriented KM Modeling

- An agent oriented approach to analyzing knowledge transfer [Strohmaier et al, 2007] (Knowledge Transfer) [24],
- Modelling knowledge transfer: A knowledge dynamics perspective [Mougin et al, 2015] (KDP) [25].

A.1.4. Holistic KM modeling approaches

- Modeling Knowledge Work for the Design of Knowledge Infrastructures [26], where the concept of knowledge stance was discussed to integrate the process oriented and the activity-oriented perspective (Knowledge stance modeling).
- Knowledge-MEMO [27] – multiperspective modeling method for knowledge management.

A.2. Design of a KMS as an information system

Some research papers focus on the specification of IT infrastructure of KMS, e.g. [28].

B. Enterprise model is a codified organizational knowledge, which describes how enterprise operations are organized

Focus: capturing, externalization, formalization, structuring and distribution of knowledge about an enterprise.

Enterprise model development is considered as creating and populating knowledge repository.

Examples of typical publications in this category: [11], [29], [30].

"Process modeling as a tool that allows the capturing, externalization, formalization and structuring of knowledge about enterprise processes" [11]

"Models of an enterprise capture knowledge" [31]

"Enterprise Modeling has been defined as the art of externalizing enterprise knowledge, i.e., representing the core knowledge of the enterprise" [5]

"The Active Knowledge Modeling (AKM) technology is about discovering, externalizing, expressing, representing, sharing, exploring, configuring, activating, growing and managing enterprise knowledge" [30]

"Building knowledge repositories with enterprise modelling and organizational patterns" [29]

Limitations: enterprise models cover only a fragment of enterprise knowledge (tacit knowledge is not covered; knowledge about product, customer, partners external environment etc. is only partially represented in enterprise models), so methodologies from this category are not sufficient for designing and implementing KMS.

C. Knowledge management helps to improve enterprise architecture management practices

Focus: Knowledge management methods and techniques are used to improve EAM practices.

Examples of typical publications in this category: [10], [32].

"EA projects generate a series of artifacts that contain knowledge directly or indirectly which can be reused or transferred from project to project. In this paper, the interest in providing a KM framework for TOGAF-based EA, to capture, store and reuse lessons learned in the first phases of the project." [10]

"KM in general has 3 processes, i.e. create, classify, and retrieve. These three processes can be utilized to support EA Team in formulation of enterprise architecture. This paper suggests the use of knowledge chain, labels (tagging), and taxonomy to develop knowledge base that can helps EA Team in formulation process of enterprise architecture" [32]

In [32] authors present a step-by-step model of knowledge management in an enterprise architecture is proposed with reference to a business strategy. This model suggests the use of knowledge chain, labels (tagging), and taxonomy to develop knowledge base that can helps EA Team in formulation process of enterprise architecture.

Also, in [10] was covered the similar problem, in this paper, the authors propose a KM metamodel for the EA based on TOGAF for the collection, storage and reuse of knowledge. Validation is presented by examining a specific case in a consulting company.

D. Knowledge management provides analytical framework for EM&EAM

Examples of typical publications in this category:

- Business process modeling through the knowledge management perspective [33].
- Future research topics in enterprise architecture management–a knowledge management perspective [9].

4.2 Analysis of the KM-oriented enterprise modeling approaches

Based on the requirements listed in chapter 3, an analysis of the approaches in table 3. The columns describe the main approaches for KM-oriented enterprise modeling (see category A in previous section). The rows list the requirements. The results of the analysis are at the intersection.

Table 3. Analysis of approaches based on required elements in way of modeling

Required elements in way of modeling/Approaches	KM ARIS [18]	PROMOTE [8]	B-KIDE [19]	KIPO&KIPN [20,21]	KM-WSB [22]	Know Flow toolset [23]	Knowledge Transfer [24]	KDP [25]	Knowledge stance modeling [26]	Knowledge-MEMO [27]
R1. Organizational context for knowledge, KM and KMS										
1.1. Organizational processes, which requires knowledge	+	+	+	+	+	+	+	-	+	+
1.2. Products and services, which requires knowledge	-	-	-	-	-	-	-	-	-	-
1.3. KM objectives	-	-	-	+/-	-	-	+	-	+/-	+
R2. Knowledge and its status	+	+	+	-	+	-	-	+	+	+/-
R3. Stages of knowledge development	-	+/-	+	+	+	+	-	+	-	-
R4. Types of knowledge flows	-	+/-	-	-	-	-	+/-	-	+/-	+/-
R5. Activities, behaviours, means [for knowledge development and/or for knowledge conveyance and transformation]	-	+	+	+	+	+	+	-	+	-
R6. KM enablers										
6.1. Human capital (Roles and accountabilities, KM stakeholders)	+	+	+/-	+/-	+/-	+	+	+	+	+
6.2. Processes (knowledge activities applied and embedded within organizational processes)	+	+	+	+	+	+	+	-	+	+
6.3. Technology and infrastructure	-	+	+/-	-	-	+/-	-	-	+	+
6.4. Governance	-	-	-	-	-	-	-	-	+/-	+/-
6.5. KM culture	-	-	-	-	-	-	-	-	-	-

Legend	+	fulfilled	+/-	partly fulfilled	-	not fulfilled

As we see in most approaches, the links between KM and business process management are defined. KM has links to processes, roles, organizational units (KM ARIS, PROMOTE, KM-WSB, KIPO, B-KIDE, Knowledge-MEMO, Know Flow toolset). Only a small part of the approaches models technology and infrastructure, but not fully (e.g. PROMOTE, B-KIDE, Know Flow toolset). There is lack of relationships between knowledge and products/services of an enterprise. Some modeling approaches partially fulfil the requirements (see "+/- " sign), which mostly mean that

a modeling approach suggests similar concepts and/or use them in a limited way. KM Culture is not modeled, but it is questionable whether it is worth modeling or not. Holistic KM modeling approaches [26, 27] better fulfil the requirements, but not completely. As a result, we can conclude that there is no any approach, which satisfy the requirements outlined in chapter 3.

5 Conclusion

ISO has recently included KM-related requirements into its standards, i.e. ISO 9001:2015 Quality Management Systems – Requirements and ISO 30401:2018 Knowledge Management Systems – Requirements. Many organizations started implementing these ISO requirements. EM and EAM may be used to support organizations within this process. The final goal of our research is to suggest ISO compliant KM-oriented extension for existing, proven EM and EAM frameworks. Such extension will not only help to design, implement and support KMS, but also to seamlessly integrate it into overall enterprise architecture of a company.

This paper analyses and summarizes KM-oriented ISO requirements for enterprise management system. This analysis helped to specify KM-oriented ISO requirements for EM language. Existing research papers integrating KM and EM/EA were subsequently studied. Research categorization was suggested. KM-oriented modeling frameworks were studied and compared against KM-related ISO requirements. This comparison demonstrated fragmented support of ISO requirements. Thus, the research highlighted the need for ISO compliant KM-oriented extension for existing, proven EM frameworks.

Further research is needed to achieve the final goal of the research, which is to suggest ISO compliant KM-oriented extension for existing, proven EM and EAM frameworks. Thus, the research needs to:

- Analyse management activities required by ISO, which "establish, implement, maintain and continually improve" KM system, and compare them with existing EAM methods (both generic and KM-oriented). Since the description of these activities for KMS mostly follows the ISO template for other management systems (see ISO/IEC Directives Part 1 and Consolidated ISO Supplement, Annex SL [16]), it seems reasonable to compare this generic ISO template with existing EAM methods;
- Compare methods and techniques for knowledge and knowledge assets mapping [34, 35] with determined requirements. These approaches have a long history and provide many ways for describing organizational knowledge, its sources, application areas (strategic themes, business processes) and development plans, but are less formalized than modeling approaches that we've analyzed in section 4.2.
- Develop, demonstrate and evaluate ISO compliant knowledge-oriented extension for existing, proven EM and EAM frameworks.

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