ORGANIZATIONAL KNOWLEDGE

DIN EN ISO 9001:2015 interpreted and explained for practical use
CONTENTS

MANAGEMENT SUMMARY .................................................. 3

1. KNOWLEDGE CREATES QUALITY.
   DIN EN ISO 9001 IS RAISING THE BAR .................................... 7

2. FROM THE OLD TO THE NEW STANDARD.
   WHAT HAS ACTUALLY CHANGED? .......................................... 8
   a. Changes in the entire standard
   b. New resource (organizational knowledge)

3. PROPER INTERPRETATION OF THE RESOURCE “KNOWLEDGE” ........ 11
   a. What does the standard mean by “knowledge”? 
   b. How have quality management systems organized knowledge in accordance with ISO 9001:2008?
   c. How is the term knowledge management being used?
   d. Where are synergies being created between organizational knowledge and the risk-based approach?

4. ADAPTATION OF THE QUALITY MANAGEMENT TO THE NEW STANDARD .................................................. 16
   a. What are the minimum requirements?
   b. How is organizational knowledge being managed in a practicable manner?
   c. What does optimum knowledge management look like?
   d. How high are the investments?

5. FROM AUDIT TO CERTIFICATION. SIX EXPERT INTERVIEWS ................. 21
   a. Wipf AG, Karl Mosimann
   b. TE Connectivity, Heiko Mayer
   c. Fischer Rista AG, Tobias Silabetzschky
   d. GRG Services Group, Oliver Knappa
   e. Bremer Institut für Produktion und Logistik GmbH, Stefan Wellsandt
   f. DQS GmbH, Thomas Hermsdorf

6. HOW TO ESTABLISH KNOWLEDGE MANAGEMENT ....................... 31
   a. Use of existing tools and processes
   b. The knowledge manager’s tool kit

7. EXAMPLES OF IMPLEMENTATIONS AND BEST PRACTICES .................. 35
   a. Knowledge transfer moderator training at I-SEC Deutsche Luftsicherheit GmbH – Quality assurance through structured knowledge transfer
   b. Prevention of recurring errors along the development and production process at TE Connectivity
   c. Compilation and implementation of an office Wiki for documentation purposes at Steuerwerk

8. TIPS, TRICKS & FAQs .......................................................... 38
   a. Self-assessment on knowledge management
   b. FAQs – Frequently asked questions

9. CONCLUSION ........................................................................ 41

10. LITERATURE ....................................................................... 42
With the revision of the ISO 9001 standard, the focus of quality management is increasingly shifting towards the resource “knowledge” as an important production factor. The standard takes the fact into account, that knowledge management should not be considered a stand-alone discipline, but an essential component aimed at helping to maintain and improve the quality of products and services. In order to implement the standard, the report “Organizational Knowledge – DIN EN ISO 9001:2015 Interpreted and Explained for the Practice” reflects the new requirements and supplies pragmatic answers that are already offered by knowledge management today. In addition to expert interviews with users and an auditor, the report contains helpful checklists and FAQs along with a self-assessment questionnaire with regard to the current handling of knowledge in the company.

BASIS FOR A SUCCESSFUL CERTIFICATION

The purpose of the revision is to illustrate the changes in the quality management practice and technology use since the last major new edition in the year 2000. By now, ISO 9001 is in effect in organizations of all sizes and in all industrial sectors in more than 170 countries. The revision of ISO 9001 in September 2015 provides companies with a three-year transition period for the standard-compliant implementation. In other words, no certificates according to 9001:2008 will be issued anymore after September 2018. The transition to the current certificate will only be possible with an audit.

General changes relate to stronger involvement of the top management regarding responsibilities and guidance. The process-oriented approach is maintained, but the new ISO 9001 puts greater emphasis on customers and “interested circles”. Topics such as risk management, change management and also knowledge management play a vital role. Specific requirements likewise exist for “risk-based thinking”. Furthermore, the so-called high level structure will be revised in order to promote the uniformity in the various management systems.

The report “Organizational Knowledge – DIN EN ISO 9001:2015 Interpreted and Explained for the Practice” describes how an organization can fulfill the minimum requirements of ISO 9001 in regards to the resource “knowledge”, but also which hands-on procedures have proven effective for a viable knowledge organization.

HOW “KNOWLEDGE” CAN BE ORGANIZED

Based on experience, it is not conducive to approach the entirety of all new requirements of the standard at once, but to create smaller work packages instead. In the case of standard-related requirements pertaining to the organizational

The numbers in brackets refer to the chapters in DIN ISO 9001:2015

7.1.6. KNOWLEDGE

Gathering | Storage | Development | Evaluation | Sharing | Usage

The diagram of the standard’s structure and knowledge in the organization in the PDCA cycle

CP. DIN 2015

PUMACY KNOWLEDGE MANAGEMENT MODEL

Knowledge Development

Knowledge Gathering

Knowledge Assessment

Knowledge Utilization

Knowledge Storage

People & Skills

Proc. Docs & Organization

Technology & Systems
knowledge, the compilation of an overview is useful, e.g. with the help of a knowledge map; irrespective of how extensive and comprehensive the future knowledge organization will be. This step at the latest will provide insight into what “knowledge” actually means within one's own organization. The standard, but also the discipline of knowledge management will provide hints to this end, enabling us to refer to a number of best practices.

The set of methods and tools is elaborate, but a smart combination of a few practices already helps with the identification of an optimal cost-benefit ratio.

**Optimum Amount to Be Invested for Knowledge Management**

- **Knowledge Loss**
- **Knowledge Conservation**

**Costs**

- No KM (High loss of knowledge)
- Plenty of KM (Low knowledge loss)
- Optimum cost-benefit ratio

**Scope of activities in knowledge management**

**Knowledge Management**

This report claims to reflect the practice and to serve as a guide through the topics developing, capturing, sharing, saving, using and assessing knowledge. As a first step, the report contains a self-assessment. The 16 questions help with a preliminary assessment and especially with self-reflection in terms of weaknesses and potentials. Moreover, answers are given to frequently asked questions (FAQ’s) to help clear first hurdles and also reduce concerns within the organization.

**Proven and Practical Solutions for the First Steps and Beyond**

Special emphasis was placed on users: In six interviews, experts were queried about the revision and the associated requirements related to organizational knowledge; three best practices are used to describe specific applications. This helps the readers of the report to evaluate their own organization in terms of the efficient use of the resource “knowledge” and to undertake the resulting adaptations for a successful recertification.

```
The organization needs to determine the knowledge required to perform its processes and to achieve the conformity of products and services. (DIN EN ISO 9001:2015)
```
Knowledge is a valuable commodity. Since 2015, this is also reflected in the revised ISO 9001 standard. With the inclusion of knowledge as a new resource, the standard clarifies that every company must make explicit efforts aimed at maintaining and sharing the necessary knowledge, in order to conserve and improve the quality of products and services.

Knowledge has become a vital production factor. To that extent, it is logical and not surprising that it is included as a resource for quality management systems.

This report reflects the new requirements for the resource “knowledge” in quality management systems and provides pragmatic answers that have already been established in the field of knowledge management, in order to implement the standard. In the past, knowledge was a hidden part of the standard, not explicitly mentioned at any time. Still, knowledge transmission was also directly concluded from the documented continuous learning from errors or from the determination of the required workforce expertise. In a large survey conducted by the Technical Committee Quality Management and Quality Assurance of ISO, knowledge management was ranked the fourth most important concept to be integrated into ISO 9001, with 72% of 6299 answers (where multiple answers were possible). Nearly 1.2 million companies around the world are already ISO 9001-certified. Consequently, it is one of the best-known and most popular management systems.

In the revised 2015 version, “organizational knowledge” is listed as a separate resource. Nowadays, every organization working with a quality management system is explicitly required to organize its knowledge. This affords the opportunity to establish a meaningful link between two basic management systems: quality and knowledge management.

As outlined by the users and the auditor in the interview (chapter 5), the fulfillment of the ISO 9001:2015 requirements is not a trivial task. But every organization can determine the minimum requirements by answering a few simple questions (chapters 4 and 8a). There are no blanket answers to the question as to how these requirements can be implemented: Small, efficient variants and comprehensive, sustainable knowledge management strategies exist. The majority of those aligning themselves with the standard now, will likely find a middle ground to protect knowledge for the long term and to provide it on short notice. A comprehensive tool kit (chapter 6) is available for this purpose, whose proven methods and long-standing utensils are expected to elicit the well-known eureka effect in everyone.

Yet, quality and knowledge management are not only going hand in hand since the ISO 9001 revision. Expertise, information and data are already emphasized in the old version (chapter 3). But the description of the specific way as to how knowledge should be organized is missing. For instance, these may be solutions already in place within the company or new methods that can also be found in related fields such as competence management, human resources development or business intelligence.

Organizing knowledge is obviously not a new idea. Many best practices related to quality management are already established. Several examples as to how quality management handbooks, processes or networks have been realized by knowledge management are described in chapter 7. Checklists and frequently asked questions are other self-help resources and an organization will realize that it has already practically implemented many aspects of knowledge management (chapter 8).

The standard has changed in several points. However, this report exclusively focuses on the changes in regards to the resource “knowledge”. The DIN EN ISO 9001:2015 version serves as a basis for this document.

### a. CHANGES IN THE ENTIRE STANDARD

The standard is amended approximately every seven to nine years on average, with the changes focusing on the needs of the certified companies. Multiple revisions have been made since the standard was created in 1987. British standard BS 9000 was the starting point. A major revision was undertaken in 1994, pertaining to topics such as preventive procedures and total quality management. In 2000, process orientation was the dominant aspect. The latest revision in 2008 was among other things aimed at the consistency with different management systems (for example with ISO 14000). In 2015, the focus was on risk and knowledge. But the goal is also to ease the harmonization with other management systems and the compatibility with other standards.

Below is a brief presentation of all essential changes, detailing how the resource “knowledge” fits into the overall context.

#### STRUCTURE AND HARMONIZATION WITH OTHER STANDARDS

- The order of the sections was revised to make it consistent with the basic structure for management system standards (“High Level Structure”) defined in the ISO directives.
- Since the ISO 9001:2008 and ISO 14001:2004 standards are supposed to follow the same structure in the future, the appendix pertaining to the analogies was removed as well.
- Relevant terms and definitions from ISO 9000 were taken over.
- The basic text, terms as well as basic definitions for use in management system standards described in the ISO directives were taken over.

#### APPROACHES AND SECTIONS

- Knowledge in the organization is explicitly included as a resource (cp. 7.1.6).
- The process-oriented approach is strengthened. The extensive documentation of process management is explicitly requested (cp. 4.4).
- The risk-based approach is strengthened (cp. 6.1). The emphasis of the risk-based approach becomes the central element of prevention; in the future, there will not be a separate section for “preventive procedures”, but they will instead be integrated into this approach.
- The definition of the organizational context includes the definition of the interested parties and their requirements that are relevant for the quality management system (cp. 4).
- In connection with roles, responsibilities and authorizations within the organization, the “representative of the top-level management” for the quality management system is no longer explicitly required.
- The planning and execution of changes to the quality management system are specified (cp. 6.3).
- The activities after the delivery of the product or fulfillment of the service are specified (cp. 8.5-5).
- Thanks to the formulation of requirements, the previous option to exclude certain requirements as “not applicable” has become obsolete (cp. 4.3).
- The demand for a quality management handbook is no longer present (cp. 7.3).
- A modified diagram provides a visualization of everything.

#### TERMINOLOGY

- The significance of the standard for the service industry is emphasized: In the past, “products” likewise included “services”. Now, express mention is made of “products and services”.

---

1 ISO/TC176/SC, with standardization organizations from 95 countries
Knowledge is a supporting resource for the organizational processes and is incorporated into the products and services. The goal is to maintain and improve the quality of the products and services. Different sub-tasks are named in the quality management system as a requirement for organizing this knowledge: The aim is to determine, maintain, share and make knowledge accessible as well as to acquire additional knowledge.

For the most part, these requirements are focused on the traditional definition of knowledge management. To that extent, the holism when dealing with the resource "knowledge" is already being used in the standard as a basis for this first approach.
“Knowledge” is allocated to the resources in the standard. Thus, knowledge is on an equal footing with the general resources personnel, infrastructure, environment for the conduct of processes and resources for monitoring and measuring.

Corresponding planning and management processes are often incorporated in the company for a range of commonly used resources, such as e.g. workforce and infrastructure. The resource “knowledge” is not new, but it has yet to become a fixed component of planning and management processes in every company. Activities for organizing knowledge are still at the beginning, but it should be possible to integrate them into the existing overall structure and into other management systems. Companies always draw from resources as means to develop their products. Removing one of them compromises or prevents the rendering of services.

Solutions and insights gained from knowledge management help to integrate the understanding in the standard and to provide even more vivid hints as to what companies should undertake in the future, in order to improve their quality management system (section 3c).

a. WHAT DOES THE STANDARD MEAN BY “KNOWLEDGE”?

The new version of the ISO standard explicitly requests organizations to “organize knowledge”. What understanding of knowledge is used for this purpose?

In the standard, “knowledge” is described in distinction to data, information and expertise. The standard defines these terms in accordance with the following overview:

In the definition of the terms, it is remarkable that they are linked in the standard by means of logic in such a way that information cannot exist without data, knowledge not without information and expertise not without knowledge. This suggests that companies are compelled to also include data and information in the operations, in order to organize knowledge.

Knowledge goes beyond information of any kind, in that it comprises an evaluation and a claim to be true. Individuals collect and evaluate information with regard to a task or a problem they are facing. And they subject the information to a test to find out whether and what information is true. Based on the limits of human judgement, we develop a “belief” that is not arbitrary, but “justified” and “true with a high degree of certainty”, because the available information is verified and evaluated.

Knowledge alone does not have a factual influence on the quality of the products, services and processes, because people and organizations may not necessarily be able to act competently using this knowledge. According to the definition, they need to be able to use the knowledge for this purpose (e.g. make a sound decision) as well as possess the skills (including physical) required for the practical implementation. Competence is always tied to people who change the reality in their work. Ideally, they do this on the basis of their existing knowledge.

Hence, knowledge is a necessary, albeit not a sufficient prerequisite to improve the quality of products, services and processes.

b. WHERE HAVE QUALITY MANAGEMENT SYSTEMS IN ACCORDANCE WITH ISO 9001:2008 ORGANIZED KNOWLEDGE?

The previous ISO 9001 version 2008 already contained an implied description of requirements pertaining to the organization of knowledge. Consequently, quality management systems based on ISO 9001 are already organizing knowledge now, with the use of the following system elements.

### DEFINITION IN ACCORDANCE WITH ISO 9000:2015

<table>
<thead>
<tr>
<th>CHAPTER IN THE STANDARD</th>
<th>TERMS USED IN THE STANDARD</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Def.: 3.8.1 (chapters: 8.5, 9.1)</td>
<td>Data</td>
<td>Facts about an object (3.6.1)</td>
</tr>
<tr>
<td>Def.: 3.8.2 (chapters: 4.1, 4.2, 4.3, 4.4, 5.2, 6.2, 7.1, 7.2, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 9.1, 9.2, 9.3, 10.2)</td>
<td>Information</td>
<td>Meaningful data</td>
</tr>
<tr>
<td>Def: 3.10.4 (chapters: 7.2, 7.5, 8.4)</td>
<td>Expertise</td>
<td>Ability to apply knowledge and skills to achieve intended results. Note 1 regarding the term: Demonstrated competence is sometimes referred to as qualification.</td>
</tr>
</tbody>
</table>

### QM SYSTEM ELEMENT

**Deming cycle / PDCA cycle**

The PDCA cycle is the basic principle for the continuous improvement of products, services and processes. The improvement is based on gained experience. Learning from experience can be considered a higher development of knowledge. Organizations with intact PDCA cycles systematically boost their knowledge by measuring and evaluating quality, surveying customer expectations, etc. This enables them to incorporate better knowledge into their process of rendering services.

**Documentation maintenance, update and management**

Documentation is a pathway to securing knowledge, e.g. in the form of process descriptions. Companies often turn their best knowledge into standards and distribute them by means of documents. As a result, document management always also includes the targeted supply of knowledge.

**Development and provision of competence and creation of awareness**

Employee competences are unthinkable without knowledge and bring to bear knowledge. Similarly, the mentioned pathways for developing competence (e.g. training) are processes of knowledge transformation and transmission. In most cases, proof of competence and certificates (qualifications) also serve as proof of acquired and certified knowledge.

**Identification of problems (development assessment) and reciprocal effects of processes (process-oriented approach)**

Insight processes comprise the development of knowledge through perception, combination of information and deduction of conclusions (evaluation). They serve as basis e.g. of procedures for solving problems.

### ORGANIZATION OF KNOWLEDGE

- The role of knowledge is not only to manage and control processes, but also to provide means for improving processes. The PDCA cycle is the basic principle for the continuous improvement of products, services and processes. The improvement is based on gained experience. Learning from experience can be considered a higher development of knowledge. Organizations with intact PDCA cycles systematically boost their knowledge by measuring and evaluating quality, surveying customer expectations, etc. This enables them to incorporate better knowledge into their process of rendering services.

- The role of knowledge is not only to manage and control processes, but also to provide means for improving processes. The PDCA cycle is the basic principle for the continuous improvement of products, services and processes. The improvement is based on gained experience. Learning from experience can be considered a higher development of knowledge. Organizations with intact PDCA cycles systematically boost their knowledge by measuring and evaluating quality, surveying customer expectations, etc. This enables them to incorporate better knowledge into their process of rendering services.
In any case, a first impulse for people in charge of quality management systems will be to review the existing practices, processes and methods to determine whether or not they fulfill the requirements of the new standard. More details than those listed in the table can be found under the headline “Organizing knowledge”. The task will subsequently be to evaluate whether the existing activities suffice to improve the quality in the future.

In the day-to-day business, the quality management system and entities used to organize knowledge are necessarily intertwined. No company works without organizing its knowledge. The only difference is that they do this with varying degrees of intention, methodicalness and success. Knowledge management provides people in charge of quality with helpful hints as to what they should in fact be organizing. For this purpose, it pays off to take a look at the world of knowledge managers and how they determine their subject matter.

A major difference compared to the already known resources such as personnel and infrastructure is in the character of the resource “knowledge”. Therefore, knowledge managers further distinguish explicit and tacit knowledge (Nonaka & Takeuchi, 1997). Explicit knowledge is already documented and is available in an organization for example in manuals, knowledge databases, Wikis, operating procedures, role descriptions, lessons learned documents, or in business intelligence or big data applications. However, tacit knowledge makes up the considerably greater part of organizational knowledge. It exists in the heads and skills of the workforce, gained through experience, many years of practice, interpersonal exchanges, team work, training or also continuing education. Furthermore, tacit knowledge is distinguished into externalizable and non-externalizable knowledge. Notes 1 and 2 in section “7.1.6. Organizational Knowledge” (Deutsches Institut für Normung, 2015) refer expressly to tacit knowledge such as experience, learning from errors and undocumented knowledge. This understanding of knowledge can be visualized with the iceberg model.

**Knowledge Ladder**

- **Knowledge-based corporate management**
  - Competitive-ness
  - + Uniqueness
  - Expertise
  - + Correct action
  - Action
  - + Volition
  - Ability
  - + Relevance to practical application
  - Knowledge
  - + Integration
  - Information
  - + Meaning
  - Data
  - + Syntax
  - Sign
  - IT solutions
  - Special stand-alone solutions
  - Operational knowledge management
  - Professional knowledge organization
  - Strategic knowledge management

**Iceberg Model**

- **Explicit Knowledge**
  - Information
  - Documents
  - Minutes
  - Data
- **Tacit Knowledge**
  - Experience
  - Competence
  - Commitment
  - Actions
  - Thoughts

**Definition KNOWLEDGE**

(according to CEN CWA 2004)

A set of data and information (when seen from an Information Technology point of view), and a combination of, for example know-how, experience, emotion, believes, values, ideas, intuition, curiosity, motivation, learning styles, attitude, ability to trust, ability to deal with complexity, ability to synthesize, openness, networking skills, communication skills, attitude to risk and entrepreneurial spirit to result in a valuable asset which can be used to improve the capacity to act and support decision making. Knowledge may be explicit and/or tacit, individual and/or collective.
Both forms of knowledge, explicit and tacit, are important for quality assurance. As it is difficult to gauge tacit knowledge, the focus is on sharing this knowledge directly among subject matter experts and, to the extent conducive, to externalize it.

Externalizing knowledge is attractive because it can be saved in documented form and distributed independently of people. However, the documentation is time-consuming and thus expensive. For this reason, it is usually spared in connection with strong dynamics or a low probability of re-use. Moreover, it is impossible to make inquiries.

D. WHERE ARE SYNERGIES BEING CREATED BETWEEN ORGANIZATIONAL KNOWLEDGE AND THE RISK-BASED APPROACH?

Corporate knowledge management further scales knowledge based on its relevance and urgency for the organization. This results in two extremes: highly critical knowledge, which is strategically valuable as well as negligible knowledge, which will not be relevant anymore in the future. The production factor “knowledge” is tightly linked to the employees in the company. It is not the human who is viewed as a bearer of knowledge, but instead the transfer of his knowledge potential promised to the employer (Bodrow & Bergmann, 2003). Yet, this knowledge potential is vulnerable and exposed to numerous risks caused by forgetting, unlearning, non-use, technical advances and economic overhaul. Thus, the knowledge of the workforce is a commodity rather than an expendable good.

As mentioned earlier, the new standard also puts a greater emphasis on risk management. In the new version of the standard, risk is regarded as the “effect of uncertainty on an expected outcome”. Based on Note 2, “uncertainty is the state, even partial, of deficiency of information (3.8.2) related to, understanding or knowledge of, an event, its consequence, or likelihood.” Uncertainty can be reduced with knowledge management, and is thus contributing to the calculable risk.

The exact definition of risk in the standard is as follows (Deutsches Institut für Normung, 2015):

**3.7.9 RISK EFFECT OF UNCERTAINTY**

**NOTE 1 TO ENTRY:** An effect is a deviation from the expected - positive or negative.

**NOTE 2 TO ENTRY:** Uncertainty is the state, even partial, of deficiency of information (3.8.2) related to, understanding or knowledge of, an event, its consequence, or likelihood.

**NOTE 3 TO ENTRY:** Risk is often characterized by reference to potential events (as defined in ISO Guide 73:2009, 3.5.1.3) and consequences (as defined in ISO Guide 73:2009, 3.6.1.3), or a combination of these.

**NOTE 4 TO ENTRY:** Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood (as defined in ISO Guide 73:2009, 3.6.1.3) of occurrence.

**NOTE 5 TO ENTRY:** The word “risk” is sometimes used when there is the possibility of only negative consequences.

**NOTE 6 TO ENTRY:** This constitutes one of the common terms and core definitions for ISO management system standards given in Annex SL of the Consolidated ISO Supplement to the ISO/IEC Directives, Part 1. The original definition has been modified by adding Note 5 to entry.

Strategic risk management always also includes knowledge management. That is because practices from the knowledge manager’s tool kit are used to prevent and overcome damages (cp. chapter 6). Knowledge as a resource needs to be organized. To do so, the first order is to identify the critical knowledge.

The conformity of products and services is the main goal of quality management. To achieve this goal for the current and future production, a glance at securing and transmitting knowledge for the long term is recommended. But short-term measures, e.g. to achieve the minimum requirements set forth in the standard, are equally meaningful and can be incorporated into a long-term strategy.

a. WHAT ARE THE MINIMUM REQUIREMENTS?

The minimum requirements set forth in the standard are the identification and provision of the relevant knowledge. This has to be demonstrated in a credible fashion. It must be apparent that knowledge is actively being classified: Only the knowledge required to achieve the conformity of products and services needs to be determined. This must be documented, maintained and communicated.

A knowledge map might be sufficient for this purpose, containing a one-time depiction of all knowledge sources and critical knowledge blocks. This is supplemented with a document management system that grants the employees access with a logical structure and a simple role/permission system. Both methods are explained in item 6b of this report.

The purpose of the minimum requirements is the simple and efficient achievement of the certification, but not to support the entire organization and its processes within the meaning of quality management. A one-time location determination does not reflect the character of the resource “knowledge”, which is very dynamic and changes quickly. A file archiving system does not mean that people learn from experience or that it is possible to identify experts. Still, it is worthwhile to start with small steps of the minimum requirements, and use them to model the resource “knowledge” for the entire organization.

b. HOW IS ORGANIZATIONAL KNOWLEDGE BEING MANAGED IN A PRACTICABLE MANNER?

The sustainable management of the resource “knowledge” is divided into strategic and operational knowledge management. The strategic part includes the analysis of the knowledge in the organization and the definition of goals and procedures, in order to initiate the necessary changes. The operational part includes the implementation, control and adaptation of the procedures.

In the first part, the existing knowledge is structured for example in a knowledge map. It can subsequently be evaluated with regard to the relevance for the fulfillment of the requirements of the standard, the reacquisition costs, strategic goals of the company and other criteria that can be determined individually. The goals are further distinguished into short-, medium- and long-term goals. The analysis also takes into account which tools and methods already available in the company are utilized for knowledge management and can optionally be employed in a modified form or also just in a more consistent fashion.

Defined procedures are realized in the operational part, by means of new and proven methods. They need to be continuously supported, reviewed and adapted as necessary. An accompanying communication provides regular information about the changes and helps to quickly answer any questions that may arise.

Organizations are required to organize data, information as well as knowledge and to introduce skills in order to work competently. With the definition of knowledge given in the standard, it is possible that the organization has more knowledge than it uses to create quality. Hence, the knowledge of the organization also represents a potential that should be nurtured. Similarly, it is possible that there is a lack of knowledge supply, which represents a risk for the quality of the products, services and processes. An organization needs a small surplus of verified information in order to develop convictions and alternative options to act from it.

c. WHAT DOES OPTIMUM KNOWLEDGE MANAGEMENT LOOK LIKE?

Knowledge is an individual and context-related, ever-changing resource. However, it is impossible to manage knowledge as such. Therefore, knowledge management must focus on humans as bearers of knowledge and on the organization of the conditions surrounding them and utilize information technology as a supporting tool. The task is to
initiate, arrange and design processes. This creates the framework conditions for developing, capturing, sharing, saving, using and evaluating knowledge (Bredehorst, Gross, & Frost, 2013). The three dimensions of action that determine the basic strategic focus of knowledge management are illustrated in the well-known TOM (Technology – Organization – Human) model (Bullinger, Wörner, & Prieto, 1998). With reference to these dimensions of action (cp. figure below, Pumacy knowledge management model), success factors are listed below, which are aimed at implementing knowledge management optimally and as defined in the standard.

**Human factor – the employee as the main actor**

Aside from financial resources, it is primarily the workforce that is vital for acting successfully in the market. Taking into account the respective human resources strategy of a company, the following points should be considered, in order to create an optimal knowledge management from the employees’ point of view and for their colleagues:

- Establishment of an organizational culture that continuously supports the flow of knowledge, in accordance e.g. with a defined overall concept and the formulated objectives to be achieved with the knowledge management
- Conduct of training sessions and development of expertise, in order to be able to utilize the knowledge management tools efficiently
- Promotion of the motivation to utilize knowledge management consciously, by highlighting the individual and general benefit for the achievement of objectives
- Documenting and use of best practices and their expansion to specific case examples
- Creation of incentives and/or agreement on individual objectives
- Development and incorporation of multipliers for the dissemination and implementation of knowledge management and promoting activities
- Public appreciation, recognition or commendation for implemented knowledge management

**Success factors for the optimal implementation on the organizational level are:**

- Identification and analysis of knowledge-intensive processes, products and methods
- Inclusion of decision-makers, interested parties and sponsors to legitimate any action
- Integration of procedures and courses of action into existing processes and initiatives with overlapping content-related objectives
- Promotion of knowledge exchange between employees on and between different organizational levels
- Agreement of possibilities to communicate and of regular communication for the direct flow of knowledge between bearers of knowledge
- Establishment of roles and designation of individuals in charge of communication within the company
- Provision of resources (time, personnel, financial means and tools)
- Safeguarding the verifiability and evaluation of concepts and procedures by means of criteria that can be defined in advance, but also during the conduct

**Information technology factor – technology as an indispensable tool of efficient knowledge management**

Knowledge management is controlled by humans. Aside from the direct exchange among employees, a broad range of information technology exists in order to enable an efficient and effective use of explicit knowledge. Success factors for the optimal use of information technology in knowledge management are:

- Coordination with corporate IT in regards to the tool strategy, use, adaptation and specification of requirements with respect to knowledge management software
- Use of information and communication technologies for collaboration and for the interdivisional internal and external exchange
- Definition of documentation standard formats and documentation software, taking the specific requirements into account
- Design or optimization of interfaces between humans and device, device and software, or software and software
It is difficult to express the cost-benefit ratio in knowledge management in monetary figures. The optimum level of investment in knowledge can be determined by contrasting the costs of knowledge loss with the costs of knowledge management. The failure to capture, share and use knowledge means a high risk of knowledge loss. This risk can be taken by organizations that discard their knowledge very quickly or are able to reacquire their knowledge at an affordable price. The complete conservation of knowledge is impossible; some degree of decrease in knowledge is acceptable. Therefore, the compilation of the critical and the knowledge to be conserved is always recommended. If the costs of knowledge loss are in line with the investments in knowledge management, the ideal cost-benefit effect is achieved from an economic standpoint.

d. HOW HIGH ARE THE INVESTMENTS?

As mentioned earlier, it is difficult to quantify both tangible costs as well as gains achieved with knowledge management procedures. In contrast, it is relatively easy to document external expenditures, although the amortization period is strongly dependent on the mode of action. However, it is always advisable to define a specific goal and to furnish it with indicators. Even if the range of the effect is ultimately not covered completely, the achievement of a milestone is vital to the success and justification of the project.

Time, personnel expenditures and external costs are obviously dependent on the scope of the measures. In most projects, they are also dependent on the size of the company and the number of involved employees, the type of knowledge (explicit, tacit, expert knowledge, managerial knowledge, critical knowledge, etc.) and the phase. The point is always to gather indicators and parameters that reflect the defined goals in the best possible qualitative and quantitative fashion, in order to achieve an optimum cost-benefit ratio. To obtain an idea of the required investments, it makes sense to compile a brief summary of the goals to be achieved and of the measures that appear to be suitable for this purpose.

---

### OPTIMUM AMOUNT TO BE INVESTED FOR KNOWLEDGE MANAGEMENT

- **Knowledge Loss**: Costs up to No KM (High loss of knowledge)
- **Knowledge Conservation**: Costs up to Plenty of KM (Low knowledge loss)
- **Knowledge Management Strategy**: Optimum cost-benefit ratio

#### KNOWLEDGE MANAGEMENT PRactices AND RESULTS IN THE Pdca CYCLE

<table>
<thead>
<tr>
<th>PHASES</th>
<th>APPROACH</th>
<th>RESULTS</th>
<th>Sample results/ Lessons learned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLAN</strong> Analysis &amp; Strategy</td>
<td>• Clarification of the current situation (knowledge analysis) • Development of goals and strategies • Development of procedures</td>
<td>• Organizational knowledge (internal and external) is transparent • KM goals and strategy • KM map and action plan</td>
<td>• Knowledge map • LL templates</td>
</tr>
<tr>
<td><strong>DO</strong> Activation</td>
<td>• Pilot project(s) and campaigns pertaining to strategic key aspects • Development of organization and roles • Tie-in with existing processes • Use of methods (e.g. knowledge transfer, lessons learned, project debriefing, knowledge structuring, communities of practice, networks, training sessions, etc.) • Enterprise search, Wiki, knowledge database, blogs, etc.</td>
<td>• Realized pilot projects • Intra-organizational KM competence • Accepted KM organisation and process integration • Motivation</td>
<td>• LL forum • Error prevention • Motivated experience exchange</td>
</tr>
</tbody>
</table>
| **CHECK** Validation | • Develop and gather indicators and KPIs • Communication: Spread best practice and utilize empirical values • Coordinate the continuous improvement process | • Indicators and key figures • Evaluation of activities and experience • Derived improvement measures | • 3 LL workshops, 45 completed LL cards • Knowledge map • LL templates • Knowledge map

---

Example of knowledge transfer:

“Wally would have known” had become a standard quotation in the knowledge management department of a large industrial corporation: Wally had reached his well-deserved retirement age, was no longer available to answer questions from his former colleagues and his absence left a grievous void.
Questions and discussions serve as a basis to determine the employee dossier, training matrix and qualification points. Every employee is listed. The training matrix is an integral component of the QHB. The combination of employee dossier, training matrix and qualification discussion serves as a basis to determine the required training or knowledge. In our industry, where the core competency consists in joining (laminating) and several different layers of foil to create a composite that meets the customer's specifications. It is definitely disconcerting that no profession exists and has ever existed to teach laminating as a main skill. It is all based on "learning by doing" and requires in-house management.

In your function as quality manager, what are the opportunities and risks you see in connection with this new resource?

Knowledge is success and knowledge enables me to create consistent quality. Making the knowledge of our employees transparent and then using this knowledge correctly as well as promoting and challenging the employee. This means, assembling the teams depending on the customer requirements/ type of problem. Overseeing this knowledge management in a structure that is as lean as possible is the greatest challenge, but also a major opportunity.

Have you already been dealing with the management of the resource "knowledge" before the change of the standard? In what form?

Yes, with the introduction of the training matrix and the new organization of the entire education and knowledge management.
b. TE CONNECTIVITY, HEIKO MAYER

Company size: 5,000 employees (Germany)
Industry: Automotive / automotive component supplier
Department: Advanced Quality Engineering, AQE

Heiko Mayer has been a member of Advanced Quality Engineering at TE Connectivity for five years. His responsibilities include among other things the quality pre-planning within different development projects. TE Connectivity is a leading supplier of state-of-the-art connection technologies for vehicles. TE employs more than 90,000 people all over the globe.

To what extent are quality management and knowledge management intertwined at TE Connectivity?

Knowledge management is a central aspect of TE’s in-house quality and project management. With regard to new product development, we have made efforts early on to transfer knowledge from previous developments and products to the new development. Knowledge management is particularly important in our manufacturing sites that are exposed to high cost pressure, in order to prevent the repetition of errors during the manufacturing process and hence to reduce the internal and external quality-related costs.

What tipped the scales in favor of a stronger connection? What are your experiences in this regard?

The development and manufacture of products across countries and continents was crucial at TE for a stronger connection between quality management and knowledge management. On the basis of this infrastructure, it is compulsory for TE to share the necessary information quickly and in a targeted manner with the appropriate departments. KMMaster is a tool that covers this scope and as a result, this tool is available throughout TE and used by a variety of departments.

Is the quality management at TE Connectivity undertaking any special preparations for the change of the DIN EN ISO 9001:2015 standard with regard to the new resource “organizational knowledge”?

Our top management has already pursued knowledge within the organization years before the change of the DIN EN ISO 9001:2015 standard and incorporated it in the annual achievement targets of each employee.

In your function as quality manager, what are the opportunities and risks you see in connection with this new resource?

Opportunities: quick access to existing knowledge and important insights.
Risks: Correct allocation of knowledge in the organization to the respective departments, in order to prevent overstimulation.

Fischer Rista AG is DIN EN ISO 9001:2008 certified. When is the next scheduled recertification after 2015?

The DIN ISO 9001:2008 recertification was carried out in November 2014. Within the context of the regular interval, the next recertification is scheduled to take place in 2017.

How is the quality management at Fischer Rista preparing for the change of the standard with regard to the new resource “organizational knowledge”?

I was taught the basic idea and methods of knowledge management among other things within the context of continuing education. In a first step, we subsequently transferred all processes and documents of our quality management system into a simple, yet smart tool (an interface created in MS Excel). The tool was essentially introduced to simplify the employees’ daily mode of operation at a glance, by means of links. All required documents and tools (programs used by the departments for day-to-day operations as well as manuals compiled by the departments) are archived and named in this shared memory in such a way that they are quickly retrievable and can easily be used to train new hires.

In your function as quality manager, what are the opportunities and risks you see in connection with this new resource?

I see opportunities in quality improvement and avoidance of duplications that can be achieved with better experience transfer. In addition, time can be saved if information and knowledge are more easily and faster accessible. Interfaces and control steps can be reduced with expanded decision-making competency, thereby promoting innovation. The risks include the fact that knowledge identified as strategically important and critical is not taken into consideration because of the insistence on the previous organization. If the structure is wrong, the use of the knowledge database can miss the corporate and knowledge targets. Finally, the potential user should be convinced of the benefit of the structure.
GRG Services Berlin GmbH & Co. KG is DIN EN ISO 9001:2008 certified. When is the next scheduled recertification after 2015?

The last re-audit was carried out this summer. Recertification is expected to start at the beginning of the third quarter in 2016. Since the new version will start to take effect for us next year, we are already in the midst of the conversion and preparation.

How is the quality management at GRG preparing for the change of the standard with regard to the new resource “organizational knowledge”?

The level of maturity of our systems and certifications is generally very high. Particularly with regard to the context-based approach, we don’t have a clear strategy. On the one hand, we have thoroughly analyzed and documented our prospective partners and their requirements as well as our own requirements within a compliance document, creating a solid foundation. The derived measures are multifaceted: ranging from qualification to workforce development, regular training units, systematic communication to neat documentation.

The next step involves carving out the risk-based approach on the basis of this context, i.e., the definition and assessment of risks within our processes and within the operational business, using the value chain so to speak. Analogously, when it comes to knowledge, we strive to pursue a Wiki-focused approach. Particularly for a decentralized corporate structure with several locations, it is worthwhile to consider structuring and exchanging knowledge e.g. by way of a Wiki rather than by way of historically acquired process organization know-how. Experience shows that employees are not necessarily familiar with documented knowledge in the form of process descriptions, especially in decentralized structures. Therefore, we aim to actively engage the employees and to structure the knowledge exchange to an even greater extent. This is our challenge and the correct approach.

In your function as quality manager, what are the opportunities and risks you see in connection with this new resource?

One of the opportunities is to focus the resource(s) in an even more targeted fashion on the company, in line with the characteristics of the organization. On the one hand, the variance of the documentation can be broadened. On the other hand, care obviously needs to be taken that the conversion – from a strict standard procedure to a targeted, less constrained documentation – is approached correctly, in order to prevent the loss of knowledge on this basis.

I believe that the focus on the risk-based approach represents a further opportunity. In the past, we have already taken steps in this direction with the setting of priorities and the alignment of projects, but the backing up through ISO is certainly welcome. Procedures will have greater conformity and the in-house focus on strategy, goals and the realization of concepts will be boosted.

There are no problems with regard to the managerial commitment. GRG Services Group defines itself by the brand essence of quality, using it among other things to generate its market edge, such that the management is pursuing the advancement of procedures in uniform collaboration.

Have you already been dealing with the management of the resource “knowledge” before the change of the standard? If so, in what form?

The topic of knowledge management is discussed regularly. As a result, the standard was not an impulse for us, but it has brought the topic even more to the fore. It is always worthwhile to examine the current state-of-the-art of standards and to evaluate one’s own approaches against this backdrop.

We have already discussed and partly implemented solutions relating to knowledge-based risk management last year.

As for knowledge management, we have also already created a concept for managers. The goal is to “take managers along” and provide them with relevant competence. This is essentially a knowledge map of management systems on the basis of training sessions, communication and continuing education.
e. Bremer Institut für Produktion und Logistik GmbH, Stefan Wellsandt
Industry: Research
Company size: 51-200 employees

BIBA - Bremer Institut für Produktion und Logistik GmbH

BIBA – Bremer Institut für Produktion und Logistik GmbH is a scientific engineering research institute. It consists of two research areas, "Intelligent Production and Logistics Systems" (IP), and "Application of Information and Communication Technologies in Production" (IKAP). With the LogDynamics Lab, BIBA has a special service center for developing and testing innovative mobile technologies for logistics processes and systems.

Stefan Wellsandt is a research associate at the institute and has been working in the institute’s quality management since 2011. He was the quality management officer of the institute between 2012 and 2014. During his tenure, the institute’s quality management manual was transformed into a modern Wiki and a variant of the Aachen quality management model was developed and put into effect by the executive board. In 2014, he worked on dividing the company’s quality management into the two operational areas "process development" and "knowledge management". Aside from conducting research, he has been coordinating corporate projects in knowledge management in his capacity as assistant quality management officer.

BIBA – Bremer Institut für Produktion und Logistik GmbH is a scientific engineering research institute certified in accordance with DIN EN ISO 9001:2008. When is the next scheduled recertification after 2015?

The recertification is scheduled for 2016. We have already taken a preliminary look at the DIN EN ISO 9001:2015 revision in November 2014.

How is your quality management preparing to the change of the standard with regard to the new resource “organizational knowledge”?

In 2014, the quality management has been divided into the two operational areas "process development" and "knowledge management". Process development coordinates among other things the work involving the continuous improvement process (CI) and the internal and external audits, while knowledge management is more concerned with the upgrade of the quality management handbook (QMH) toward an effective knowledge base. In our company, the QMH is represented with a Wiki and realized with DokuWiki.

The Wiki is currently undergoing a structural redesign. The handbook should fulfill the claim of being focused on the employees. Functions such as tags and overview flowcharts should be used more, to make it easier to find relevant information. Contents should be added by the appropriate persons in charge of the process, in order to boost the focus on quality at the institute.

In your function as quality manager, what are the opportunities and risks you see in connection with this new resource?

The resource “knowledge” is not new as such, but the new revision places greater emphasis on it. As a research-intensive operation, the adaptation of the standard enables us to design our quality management handbook in a more flexible fashion. Because it is difficult to deal and argue with “knowledge”, I am acting under the assumption that:

- a) there will be misconceptions associated with the use of the QMH, and
- b) the demonstration of conformity in accordance with the standard will become more difficult.

CI is an area that might benefit strongly from the new orientation. In this area, the handling of knowledge has played less of a role in the past, at least in our company.

Has the BIBA already been dealing with the management of the resource “knowledge” before the change of the standard? In what form?

The BIBA is a knowledge-intensive operation (research institute). Our QMH supplies employees with process information and controlled documents. Otherwise, the field of "knowledge management" belongs the BIBA’s research topics.
Thomas Hermsdorf is a graduate engineer and freelance consultant; he is also working as auditor for DQS GmbH, German Society for the Certification of Management Systems. During the consultations, the focus is on benefits, risks and goals of the organization as well as on strengthening an integrated management system. He provides advice regarding the set-up and development of quality management systems, the preparation of documents and the fulfillment of requirements set forth in the standard. For existing QM systems, Thomas Hermsdorf provides assistance with the conduct of internal system and process audits and also as an external quality management officer. Quality management is rounded out with the topics of information safety management in accordance with ISO 27001 and data protection in accordance with the BDSG [Federal Data Protection Act].

Are the improvements of DIN EN ISO 9001:2015 really associated with such major changes?

I don’t think that the revision is associated with overly major changes; the new requirements are generally also set forth in ISO 9001:2008. What’s interesting is the cutback of formal requirements, which will definitely also contribute to a relief of the systems. My personal highlight is the clear focus on “expected results” and risks that might hamper them. All of this is allocated to the top management, truly enabling it to customize itself a “tailored” management suit that is focused on results rather than formalities.

You have already assessed many companies and their quality management in your function as auditor. Are the companies required to make major changes in order to fulfill the new requirements with regard to the resource “knowledge”?

In addition, it should be clarified which processes the management deems relevant. Only then will the requirements set forth in the standard take effect for the description of processes. The basic idea of ISO 9001 to prevent errors and to incorporate regular improvements into the performances is indeed emphasized in the new standard, but this is not new either.

What is a company required to demonstrate to you in an audit, in order to fulfill the minimum requirements with regard to the new resource “knowledge”?

It is a major challenge to make “knowledge” available; ultimately, it is a combination of technical, organizational and communicative activities. In the audit, it depends on what the company has defined in its own processes – that is, what kind of knowledge or information is supposed to flow in which form from where to where? It will definitely be based on the discussion of the risk, what loss of knowledge will “hurt” the company and which knowledge will be particularly suitable for exploiting market opportunities. This knowledge should subsequently be available.

What are your recommendations for a company to prepare itself for DIN EN ISO 9001:2015?

Read, compare and check for breaches. A table illustrating old and new requirements and their implementation is a useful tool. It reveals what already exists and what may be missing. The SOA (Statement of Applicability) comes alive in information safety management systems, in order to document the use and implementation of requirements.

The revision is also a major opportunity, like spring cleaning. Nobody likes quality management systems that become “fatter” over the years, potentially making it impossible to find vital information. Here, technical systems reveal their advantages, as keywords can simply be attached to information (tagging), thereby making it easy to find. Companies with a risk assessment can assign each document to a risk. Is there no risk? - Do I still need this document?

What kinds of literature and online addresses do you recommend for this topic?

I am keeping myself updated e.g. with training provided by the DGQ (German Society for Quality). My most recent continuing education was the auditor training on the new standard and a webinar on the topic of risk management from DQS. The biography of Steve Jobs was very inspiring to me personally, as an example of a company that continuously scrutinizes itself in order to create the best possible products.
Every company conducts knowledge management: Some do it consciously and systematically, others more spontaneously and selectively. All approaches are legitimate. The question is how to do it efficiently rather than should it be done at all. In a world where work is shared, responsibilities, structures and processes are closely linked. The goal is to provide all the resources, data and information (for example, parts list, drawing, assembly or work plans) that are relevant to resolving a task to the process and colleagues at the right time.

a. USE OF EXISTING TOOLS AND PROCESSES

Elements that can be allocated to knowledge management already exist in every company. This handling of the resource “knowledge” generally takes place unknowingly. Practices that have proven useful in the past should be used, and existing processes incorporated. If a human resources planning process exists, knowledge transfer can be integrated into it. If a final report is stipulated the knowledge management process and colleagues at the right time.

The simplest form is the direct knowledge exchange between employees. It can be nurtured during project meetings, staff meetings and informal events. Time and perhaps a few targeted questions are needed to achieve this.

The induction training of new hires as well as the transfer of workplaces or human resources management responsibilities are designed to help employees to familiarize themselves faster with the new environment. Induction training and transfer plans can cover large parts of the requirements set forth in the standard. Job or responsibility descriptions can reinforce these efforts. When used in recruiting, they enable the creation of a more accurate profile of prospective employees’ qualifications.

A shared file storage can fulfill many standard-related requirements. Properly structured and transparent, it is a practical solution to gather, file and provide access to information. A nomenclature helps with the search for the appropriate document.

The content of corrective and preventive measures, for example in a continuous improvement process (CIP), is related to lessons learned, whose typical elements consist of the description of facts, applied procedures and recommendations. The difference is in their origin. For example, corrective measures should be understood as a direct response to detected deviations or errors. In contrast, preventive measures reduce identified risks. Lessons learned are typically generated within the scope of a look-back, e.g. at the end of a project phase. Commonalities exist in the life cycle: ideally, they both result in a revision of the affected processes and are optionally integrated into the new version of a process description. A further difference generally is that introduced corrective and preventive measures have a binding character; their use is compulsory, whereas lessons learned tend to be of a more informal nature, depending on the integration into the quality management documentation, i.e. the allocated binding character. Lessons learned that are not incorporated directly into the workflow in particular also include the resource “knowledge”. There are many examples of possible hidden knowledge management.

The knowledge present in the heads of individual people is associated with the human psyche and depends on their motivation, social environment or needs. “New knowledge always begins with the individual” according to Nonaka and Takeuchi (Nonaka & Takeuchi, 1997, p. 97), and they show that knowledge is subject to a process and cycle, ranging from the individual to the organization and back (cp. the Munich Model (Reimmann-Rothmeier, 2000)). This cycle often proceeds as follows: Knowledge is developed and used. Thereafter, it is recognized and an attempt is made at capturing, storing, safekeeping and documenting it. In this step, knowledge can be evaluated by assigning keywords to a ranking or reporting in detail about it. However, what’s essential in knowledge management is not the documentation or archiving, but the multiplication, dissemination and reuse of the knowledge. If this happens, it is developed further and starts a new cycle.

Every knowledge manager’s tool kit contains a method of analysis. Using a knowledge analysis (cp. Fig. below “Procedures in a knowledge analysis”), they obtain an overview of the required and used internal and external knowledge. As a general rule, this should always be the first step. The goal is to influence the handling of knowledge and information as well as the exchange of experiences within the company. A knowledge analysis can shine a light on different detailed levels (department, unit, entire company), identify critical knowledge areas as well as risks and new opportunities and develop specific improvement

<table>
<thead>
<tr>
<th>TOOLS AND METHODS TO FULFILL THE REQUIREMENTS SET FORTH IN DIN EN ISO 9001:2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFINITION IN THE STANDARD</td>
</tr>
<tr>
<td>SET OF METHODS FROM KNOWLEDGE MANAGEMENT AND RELATED DISCIPLINES</td>
</tr>
<tr>
<td>• Best Practice / FAQs</td>
</tr>
<tr>
<td>• Debriefing / Lessons learned</td>
</tr>
<tr>
<td>• Knowledge map</td>
</tr>
<tr>
<td>• WIKI</td>
</tr>
<tr>
<td>• World café</td>
</tr>
<tr>
<td>• Knowledge modeling</td>
</tr>
<tr>
<td>• Knowledge audit</td>
</tr>
<tr>
<td>• Knowledge transfer</td>
</tr>
<tr>
<td>• Self-explanatory folder structure</td>
</tr>
<tr>
<td>• KM Cloud application</td>
</tr>
<tr>
<td>• Open Space</td>
</tr>
<tr>
<td>• Job rotation</td>
</tr>
<tr>
<td>• Site inspection</td>
</tr>
<tr>
<td>• Blog/whiteboard</td>
</tr>
<tr>
<td>• Knowledge marketplace</td>
</tr>
<tr>
<td>• Newgroups/feeds/ RSS</td>
</tr>
<tr>
<td>• Knowledge management app</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Conformity of products and services</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Definitions of knowledge management (methods) “Knowledge management trends, 2014-2023: What users are using and visionsaries expect”</td>
</tr>
<tr>
<td>32</td>
</tr>
</tbody>
</table>

B. THE KNOWLEDGE MANAGER’S TOOL KIT

As distinctive as every organization is, as characteristic are the tools, methods and instruments. Software too should be configurable to meet the respective needs. The following list of knowledge management practices has been compiled and fine-tuned based on many years of practical experience in different companies and contexts. For definitions and descriptions, please refer to the Pumacy study “Knowledge management trends, 2014-2023”. Appendix A7 of the standard highlights that it is up to every individual organization to identify suitable measures and to combine people-oriented and IT-supported solutions. The standard is not only focused on externalized, documented knowledge, but leaves it up to the organization to find an individual solution.
measures. They can be related to both current targets and product development strategies as well as the market position and outlined in a roadmap or action list.

*Most of those confronting the standard now will find a middle-ground to secure knowledge and make it available on short notice.*

<table>
<thead>
<tr>
<th>PROCEDURES IN A KNOWLEDGE ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. SCOPING</strong></td>
</tr>
<tr>
<td>Determine the department within the company you wish to analyze Reflect the company environment: How will our environment change in the future? What knowledge will be affected? Identify higher-level knowledge areas</td>
</tr>
<tr>
<td><strong>2. KNOWLEDGE AREAS</strong></td>
</tr>
<tr>
<td>Survey and itemize knowledge areas of the organization (products, service, processes, customers, tools, etc.) Categorize and evaluate knowledge areas (e.g. priority, risk, internal, external)</td>
</tr>
<tr>
<td><strong>3. TARGETS AND POSSIBLE ACTIONS</strong></td>
</tr>
<tr>
<td>Deduct knowledge goals Develop possible actions (current status – target – how)</td>
</tr>
<tr>
<td><strong>4. ACTIONS AND ROADMAP</strong></td>
</tr>
<tr>
<td>Reflect the feasibility and benefits, evaluate procedures select actions (content-related) Develop a (chronological) implementation roadmap</td>
</tr>
</tbody>
</table>
The best way to learn is from experience. Pumacy Technologies AG has been mentoring its clients on knowledge and processes since 2000. The following three sample implementations show how knowledge and quality management can go hand in hand.

### a. KNOWLEDGE TRANSFER MODERATOR TRAINING AT I-SEC DEUTSCHE LUFTSICHERHEIT GMBH – QUALITY ASSURANCE THROUGH STRUCTURED KNOWLEDGE TRANSFER

I-SEC specializes in the rendering of progressive aviation safety services all over the world. I-SEC Deutsche Luftsicherheit GmbH offers aviation safety services and products and acts as guarantor for passenger, carry-on luggage and air cargo safety.

**DESCRIPTION AND TARGETS OF THE MODERATOR TRAINING**

Organizations realize that they can and must systematically support their workforce with learning processes with their peers, in order to safeguard the quality of services. This knowledge transfer between employees is especially important for impending job changes and induction training, e.g. in connection with new hires, retirement, termination of the employment, maternity leaves or the reorganization of responsibilities.

The training was geared toward anyone tasked with the independent moderation of knowledge transfers.

**Learning targets:**
- Ability to identify knowledge transfer needs and clarify situations
- Take notice of the knowledge transfer process and ability to carry out all the steps
- Ability to lead discussions related to the analysis of knowledge areas and experiences
- Ability to prioritize knowledge areas and compose an action plan
- Ability to select appropriate transfer methods
- Take notice of prerequisites for successful knowledge transfers and ability to provide advice relating to them

**OUTCOMES**

At the end of the course, the participants were able to moderate and supervise knowledge transfer processes. They practiced each process step using own sample cases and are familiar with the required tools:
- Analysis interviews for gathering of knowledge areas and learning topics
- Development of action plans for the induction training of new hires
- Formulation and practice of transfer processes
- Analysis and evaluation of specific application scenarios
- Safeguarding of the quality through smooth induction training

### b. PREVENTION OF RECURRING ERRORS ALONG THE DEVELOPMENT AND PRODUCTION PROCESS AT TE CONNECTIVITY

The company TE, a former division of Tyco International Ltd. known under the name Tyco Electronics, has been one of the global leaders in power supply and data connectivity for more than 50 years. The TE Automotive business unit represents one segment in the company group, focusing on automotive customers.

**PROJECT DESCRIPTION AND GOALS**

The TE Automotive unit launched a quality management initiative in 2010. The goal was to prevent recurring errors along the development and production process. It was about maximizing improvement processes and reducing unnecessarily expensive corrective measures. To ensure that the practical realization of the individual experiences was not left to chance, a company-wide lessons learned system was set up for all parties involved in the process, in order to systematically reflect and communicate their experiences and to learn from them for ongoing or future projects. The task was to introduce a knowledge management software and to oversee the company-wide establishment and maintenance of the system over several years.

**OUTCOMES AND SUCCESS FACTORS**

Experience-related knowledge was gathered and exchanged within TE, but only within individual departments and not across the countries and in a systematic fashion. With the launch of the in-house TE quality management initiative, a consulting and software company was involved early on. This resulted in the implementation of the knowledge database KMmaster, including the training of all involved parties. The knowledge management software was already innately able to fulfill a range of TE-defined requirements. The modifiable parts of KMmaster were additionally expanded with TE proprietary aspects, such as the adaptation of workflows, roles and access permissions. As a result, the knowledge database was tailored very precisely to the future and new knowledge processes in a company of this size.

*Quote:* “With the migration [of the lessons learned] into KMmaster, these contents were communicated to a large circle of users, thereby very quickly delivering best practices and examples of success.” Alex Borrmuth, TE Connectivity

### c. COMPILATION AND INTRODUCTION OF AN OFFICE WIKI FOR DOCUMENTATION PURPOSES AT STEUERWERK

The law firm Steuerwerk was established by Roger Wilms in 1995. The team of 20 employees provides consulting services among other things for financial accounting, tax law and commercial law. In recent years, the law firm recorded strong growth rates; it is regularly recommended by banks and has suffered almost no client losses. In the summer of 2013, the law firm changed its name to steuerwerk KG, in order to strengthen the support of its clients through its workforce and partners. Steuerwerk refers to itself as a modern and “paperless” office. It focuses on the continuous upgrade of processes using new EDP programs to help simplify the work processes within the firm as well as the cooperation with clients.

**PROJECT DESCRIPTION AND GOALS**

An office Wiki was created and introduced for the firm, in order to considerably improve the structure and information content of the previous documentation in one large Word document and to pass the pending ISO 9001 certification. To this end, the existing contents were used, restructured and all users and authors subsequently received personal training following a comprehensive stock-taking and conduct of workshops with everyone involved in the project. As for the technical support, a close collaboration was established with the existing IT service provider of the Steuerwerk law firm. Since the Wiki has an import function, it was easy to import the procedure rules and quality management handbook. Pumacy was initially tasked with the formatting and creation of links; Steuerwerk later assumed these responsibilities on its own.

**OUTCOMES AND SUCCESS FACTORS**

A comprehensive and clearly structured corporate Wiki was compiled, which was positively received by all employees and is used regularly. The quality of the processes was ensured with the proper documentation and rated very positively by the ISO 9001 auditor.

The office Wiki was set up as a separate area; however, it is possible to expand it with other auditing areas or an additional law firm. The advantage of keeping the areas separate is in the simple control of search queries and the simple administration of access permissions.
In retrospect, I can say that the expenditure was manageable. [...] The new tool is embodied by the workforce! Thanks to the similarities with social networks, especially the young employees can relate well to the Wiki. The simple operation and handling lets them quickly learn how to deal with this new and straight-forward knowledge management. And best of all, everything is trackable and protected by the revision safety and other features. Mr. Hoffmann wrote in his instructions: “Don’t worry, you won’t be able to break anything!” And that’s very true.”

Christian Weiss, Steuerwerk KG

---

Every organization is unique. Consequently, there is no patented recipe for dealing with knowledge. This self-assessment will provide you with key questions based on which you can assess your organization and your organizational handling of knowledge for yourself and review it internally.

To what extent are the following statements applicable to your organization?

---

**SELF-ASSESSMENT ON KNOWLEDGE MANAGEMENT**

<table>
<thead>
<tr>
<th>TO WHAT EXTENT ARE THE FOLLOWING STATEMENTS APPLICABLE TO YOUR ORGANIZATION?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOT AT ALL APPLICABLE</strong></td>
</tr>
<tr>
<td>We know what kinds of knowledge and skills are required to make our products/services successful.</td>
</tr>
<tr>
<td>We are aware of the knowledge we are missing and of the skills we need to develop in the future.</td>
</tr>
<tr>
<td>We are systematically collecting customer requirements and feedback and incorporate them into the product/service development.</td>
</tr>
<tr>
<td>The subject matter experts in the organization are known and trackable.</td>
</tr>
<tr>
<td>The organization has an overview of all internally available data and information inventories and makes them accessible to the workforce.</td>
</tr>
<tr>
<td>The data and information relating to products and processes are archived in a trackable and accessible manner for the employees.</td>
</tr>
<tr>
<td>The organization specifically offers employees the opportunities to exchange experience with products and processes.</td>
</tr>
<tr>
<td>The employees have a shared understanding of internal processes.</td>
</tr>
<tr>
<td>Product and process innovations are communicated efficiently and comprehensively.</td>
</tr>
<tr>
<td>The organization offers the workforce several tools for sharing knowledge (meetings, internal training, experience exchange, collaboration software, document storages, visualization options, etc.).</td>
</tr>
<tr>
<td>Experience with particularly successful/unsuccessful projects is processed and shared within the organization.</td>
</tr>
<tr>
<td>Good practices are used to define and disseminate standards.</td>
</tr>
<tr>
<td>Unchangeable or knowledge that will be in effect for the long term is documented and available to all employees (e.g., product history).</td>
</tr>
<tr>
<td>We monitor external developments (market, competitors, technology, law, etc.) and actively gather information about innovations.</td>
</tr>
<tr>
<td>We cooperate specifically with other organizations in order to boost our skills.</td>
</tr>
<tr>
<td>We “look over the rim of our tea cup” during conferences, external training sessions, in publications, etc.</td>
</tr>
</tbody>
</table>

---

The product, service or process were lost?
if this knowledge or these experiences related to
sometimes be answered with: what would it mean
sions. the question about the pay-off or value can
projects and gradually advance to larger dimen-
oped individually as well. however, it is definitely
is always specific, the strategy needs to be devel-
with the situation and the goal. as the situation
characterized in equal measure by both a wealth of
effective and successful knowledge management is
b. FAQ s – frequently asked questions
Effective and successful knowledge management is
categorized in equal measure by both a wealth of
practice the new approach to dealing with knowl-
not only managers, but peers
knowledge are recognized and valued will not hide
the fulfillment of the requirements set forth in DIN
ense and experience. not only managers, but peers
practice the new approach to dealing with knowl-
knowledge management project and can generally
arise particularly often especially at the start of a
knowledge management project only
or is it more about exchanging and reflecting tacit
knowledge and experiences verbally, in order to
learn from them? Especially tacit knowledge cannot
be filed in a binder. A knowledge manager's tool
kit is voluminous and a variety of methods, soft-
ware solutions and communication channels can
be used, depending on the type of knowledge and
goal.
How can I motivate my co-workers to participate in
knowledge management activities?
Experience is often looked at as everybody's own
capital rather than corporate property. This type of
knowledge is only shared voluntarily. As a result,
it is important to emphasize the benefit associ-
ated with the efforts undertaken for the disclosure
or documentation. For instance, the documenta-
tion of lessons learned at the end of a project only
makes sense if the reuse at a later date is planned
or integrated in the processes. If it is apparent how
best practices can be used in future projects, the
willfulness to invest time rises. For this reason,
success stories and facts about their effect are mo-
tivating. The second greatest hurdle in connection
with the sharing of knowledge is usually time: Time
needs to be set aside for documenting experience,
reflecting on projects or joining in networks. This
also demonstrates the executive board's appreci-
ation of the employees. People whose work and
knowledge are recognized and valued will not hide
but rather share them. It is particularly motivating
if there are role models who "lead by example" and
practice the new approach to dealing with knowl-
edge and experience. Not only managers, but peers
act as multipliers to embody knowledge manage-
ment and to demonstrate the real benefit.

What options are available for selection in
knowledge management?
Every organization is practicing knowledge man-
agement, e.g. using a shared drive, the intranet,
writing e-mails, meeting regularly for discussions
or informally in the cafeteria. At first, it is always
advisable to take into account what is already avail-
able and being utilized. What methods and tools
are established, accepted or even "banned"? Prior
to selecting tools, the type of knowledge and its
traits should be defined and made aware of. Does
it concern easy-to-document, explicit knowledge
that can be recorded in databases and documents?
Or is it more about exchanging and reflecting tacit
knowledge and experiences verbally, in order to
learn from them? Especially tacit knowledge cannot
be filed in a binder. A knowledge manager's tool
kit is voluminous and a variety of methods, soft-
ware solutions and communication channels can
be used, depending on the type of knowledge and
goal.

Score:
If your score is less than 10, you should urgently
and intensively look into your knowledge culture.
If your score is greater than 30, you have already
reached a strong position. Think about specific
fields of action to also in the future secure an inno-

ative and knowledge edge. With a score between
10 and 30, there is a need for action, particularly
in the categories with the lowest scores. A detailed
analysis should provide the necessary insight.

An overview of the knowledge management practic-
es can be found in the study “Knowledge manage-
ment trends, 2014-2023: what users are using and
visionsaries expect”.

Every block contains statements that also indicate
the fulfillment of the requirements set forth in DIN
EN ISO 9001:2015. Review your processes and
judge whether your company organizes its knowl-
edge in conformity with the standard. Reflect the
results with the individuals in charge of quality at
your company.

To what extent is knowledge management
conducive for my company or my department?
Knowledge management is always useful, although
the scope of the measure should be commensurate
with the situation and the goal. As the situation
is always specific, the strategy needs to be devel-
oped individually as well. However, it is definitely
recommended to start small, i.e., to start with pilot
projects and gradually advance to larger dimen-
sions. The question about the pay-off or value can
sometimes be answered with: What would it mean
if this knowledge or these experiences related to
the product, service or process were lost?

What are the first steps for introducing a knowledge
management project?
Even if you decide in favor of introducing a piece of
software, you should remember: It’s always a tool,
not a method. For IT to work, its users need to be
won over. Start by identifying the main drivers and
multipliers for the project (key users, managers,
only staff committee). The time invested dur-
ing this phase for finding a consensus will be made
up later on, should problems and disagreements
arise. Define your starting point, the challenge and
your goals. Remain pragmatic, but leave room for
visions and future developments. Communicate
your course of action and celebrate achieved mile-
stones. For example, a kick-off is a good opportu-
nity for a bold conversion of the plans to reality.

How do I implement knowledge management for
the long term?
The success of knowledge management is mea-
sured by the initially established goals. Depending
on the selected measure, the desired success can
be demonstrated in the short, medium or perhaps
also the longer term. Depending on the company,
the change in dealing with knowledge is a project
to be set up for the medium to long term, because
the corporate structure affects the speed at which
changes can be implemented in the mode of opera-
tion.

Aside from numerous methods and tools, knowl-
edge management is in particular also common
sense. Many minor stumbling blocks can be
circumnavigated and duplications can easily be
avoided with some support. External oversight can
furnish the necessary other aspect and reveal dif-
ferent pathways for reaching the goals if you have
discovered knowledge as an influenceable resource
in your organization.

• Align your knowledge management goals
  with the corporate strategy
• Incorporate knowledge management into the
  work processes
• Link your standards with quality management
• Communicate the advantages and report
  successful outcomes
Quality management cannot exist without knowledge management. Especially the handling of explicit knowledge is the foundation of any quality component. To that extent, the new standard formally establishes what was taken for granted in the past. In particular also in consideration of tacit knowledge, knowledge management is stipulated as a key component in the standard.

Knowledge as such cannot be certified. Since 2015 however, a DIN EN ISO 9002:2015 certifies organizations that an organization is putting its focus squarely on dealing with knowledge. In section 7.1.6., the standard captures the handling of the resource “knowledge”. Thus, knowledge management attains formal legitimacy in the context of quality management systems. Companies are given an opportunity to reflect their handling of the resource “knowledge” and organize it more efficiently – always with the goal to maintain and improve the quality.

Systematically does not mean that this approach must be realized identically in every company or that it is dogmatically tied to certain procedures and rules. On the contrary, the selection of the “proper” methods and the adaptation to typical events that are relevant to the company, leads to an actually measurable and profitable benefit, while a purely formal implementation often results in resistance and opposition to knowledge management.

Knowledge and knowledge management are always beneficial in cases where changes need to be implemented, when new hires, new tasks or technologies require new modes of operation or when potential malfunctions require unscheduled modifications. As a result, some knowledge management solutions are utilized in the daily business while others are only utilized temporally. Knowledge management methods and tools evolve rapidly. As “knowledge” is included as a separate resource in ISO 9002 for the first time in 2015 and contrasted with data and information, the previously often unpopular documentation of project experiences (project debriefing) or (software) development status attains a new quality. Being able to see that and how this information actually generates a benefit is often more motivating than a corresponding work instruction.