Consulting System to Support The Implementation of Complex Requirements for Quality, Sustainability, Occupational Safety and Digital Transformation in Food Chains – Benchmark, Processes And Qualification

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Abstract

The demands placed on companies in terms of up-to-date quality and sustainability management as well as health and safety measures are high and are becoming increasingly complex. Increased legal requirements, additional industry standards and derived customer requirements constantly present companies and value chains with new challenges. The integrated approach to the implementation of these different requirements has already taken place in companies in recent years. However, small businesses still find it difficult to face the complexity of requirements on their own without an accompanying consultation. Qualint is a support tool, which is currently available in the 3rd version. The tool supports companies in setting up and continuously developing their integrated management system with coordinated hybrid service bundles. The focus is on combining the fields of action of quality, environmental and sustainability management as well as occupational safety and health.The article illustrates how quality management can be used as a basis for building up digital and organizational structures in companies and value chains. The focus is on sustainability aspects and ethical requirements that are closely related to people, such as occupational health and safety. Compliance with human rights is required in ISO 26000 and is also part of occupational safety and health. Furthermore, compliance with human rights and corresponding working conditions is also regulated by the new Supply Chain Duty Act (LkSG). It shows how demands on companies have grown and how the consulting tool Qualint has developed accordingly.

Keywords: digitized process representations, life cycle assessment, health protection, sustainability report

1 Quality management - from island solution to digital integrated system

1.1 Quality management

Today, our society is characterized by rapidity, internationality and a comprehensive range of knowledge. Companies operating in the European internal market and beyond are obliged to meet standards that allow a statement to be made on the quality of their products and processes as well as on ecological and economic aspects. Examples of this are the worldwide requirements for quality and environmental management. There are also international standards for plant and occupational safety. The structure of the standard requirements is comparable. The implementation of these standards is particularly

challenging for small and medium-sized enterprises. With the constant revision of international norms and standards or legal regulations, they find it difficult to keep up to date due to a lack of human resources.

Therefore, they rely on tailor-made advice to help them align processes with holistic and expandable management systems. Here, the generic structural elements of a management system are elaborated in order to make the best possible use of the synergies in an integrated management system [1]. The approach of an integrated management system with a correspondingly comprehensive corporate philosophy [2] has been in place for almost 20 years. In today's complex, variable and uncertain business environment, not all events can be anticipated and planned in advance. Two decades ago, however, criticism [3] was also voiced because it was feared that management in small and medium-sized enterprises would be overburdened due to the high complexity and increasing number of ISO and industry standards. Individual company management systems were proposed.

At the same time, international efforts by the agaric and food industry to promote mutual recognition and harmonization of industry standards were also countered. Different approaches were taken:

1. a simple 'equivalence principle' based on mutual recognition: two guides are matched and small differences in requirements are either aligned or an additional checklist is developed.

2. Formation of a task force with representatives of quality system organisations to compare quality standards (e. g. European Meat Alliance)

3. Development of key criteria for benchmarking food safety management programmes (e. g. Global Food Safety Initiative Guidance Document) [4]

4. Benchmarking against a system (such as the benchmark implementation of the EurepGAP system) using an existing standard as a basis and comparing the content with CAP directives [5].

 5. A bilateral negotiation in which the parties seek to improve or coordinate audit activities, including external audit, internal audit, planning, auditor status, audit report formulation and liaison with other audits, and perform controls in combination [6]

6. The development of a new standard is also an approach to harmonisation, based on benchmarking of requirements. Examples of this development include the development of ISO 22000, which aims to achieve harmonisation of HACCP standards, and the International Feed Ingredients Standard for the harmonisation of feed standards [7].

1.2 From prototype to Qualint 01 version

The identification of relevant quality standards and the continuous benchmarking are a complex problem, due to the particular complexity, different structure, depth of requirements and dynamics for company decisions. To help solve this problem, a decision support system was designed, prototyped and evaluated by case studies. This prototype, which was developed to market maturity, is hereinafter referred to as "Qualint 01". The tool helps companies find the right management system for them. Qualint presents integrated lists of requirements for operations management, for example. This is the most important area of functionality analysis of quality standards. In addition, companies can have a cost-benefit analysis carried out in the context of structured advice. In this way, they learn what costs you will incur, for example, in the implementation of a further standard.

The main functions and the process of consulting with "Qualint 01" are the following. The key stages in determining costs and benefits are shown in bold in the table. In addition, the steps that have to be carried out by the user are shown in italics. The prototype and the process of decision support show a great variety of variants both in the input and in the possibility of indicating the results.

Process of the decision support process Content in QualintSys Operationalization
1. Language choice German, English, given by entering and translating the standards
2. Input of already implemented quality systems Selection of international quality standards with checklist and input possibility Determination of the current status of the enterprise in the area of quality standard implementation
3. Input of the newly selected quality systems Selection of international quality standards with checklist and input option Checklist and input option of quality standards
4. Choice of operation:
a) Audit checklist sorting by benchmarking chapters Benchmarking of requirements

b) Division Sorting by Division Benchmarking of requirements

(c) ISO Chapter sorting by ISO chapters Benchmarking of requirements

d) Cost categories Sorting by indirect costs Benchmarking of requirements

e) Benefit categories Sorting by indirect benefit Benchmarking of requirements

5. Indication of results

a) Audit checklist Sorting by audit checklists Checklist representation (alphabetically sorted by benchmarking category)

b) Department Sorting by Department Checklist presentation (sorted by department) and graphical representation

c) ISO chapters Sorting by ISO chapters Checklist display (sorted by ISO 9000 chapters) and graphical display

d) Cost categories Sorting by cost categories Checklist display with summing up of additional audit checklist items and graphical display with percentage distribution of requirements

e) Benefit categories Sorting by benefit categories Checklist display with listing of additional audit checklist items and graphical representation with percentage distribution of the requirements

5. Elimination of legal requirements Identification of legal requirements in result view Checklist display

6. Review of the result checklist and comparison with already implemented requirements by other measures Result view Checklist presentation of the reduced requirement.7. Presentation of the results checklist Final results Summary of the requirements to be finally implemented in the respective cost and benefit categories and the possibility of graphical supportThis provided the companies with a basis and a direct overview of the new requirements they had to meet when introducing further quality standards.

2 Consulting system for digitized, integrated design of cross-company processes and implementation of standards

2.1 Establishment of a hybrid advisory system for an integrated management system in companies

The next step was the development of integrated management systems in companies between 2008 and 2015. Qualint 01 was supplemented with requirements from the field of environmental management and occupational safety, so that the Qualint 02 version was created. With the help of the system, companies were able to clearly and comprehensively present the requirements of the different standards. Since 2015, there has been continuous development. The requirements for standard-compliant quality management have remained unchanged with the latest revision of ISO 9001 in 2018. However, quality management systems in companies in the agri-food industry are developing rapidly, mainly due to the integration of the requirements of a growing number of industry standards. Since 2020, the IFS standard requires, among other things, the implementation of a food safety culture in companies. Furthermore, the legal side increasingly imposes requirements on companies that concern sustainability, but also demands on the entire supply chain by the Supply Chain Act. The 17 SDGs (UN Sustainable Development Goals) formulated in 2015 call on business, science and politics to do everything possible by 2030 to combat hunger and poverty worldwide and to achieve this through high-quality education. The EU General Food Law thus shapes quality management systems based on the prevention principle and the obligation to ensure traceability and comprehensible documentation of processes. For companies in the agricultural and food industry, this means having to keep an eye on processes along the value chain or value-added networks in addition to their internal processes. Another voluntary obligation is the disclosure of sustainability data and the publication of an annual sustainability report. These new fields of action require a continuous further qualification of the employees, so that the corresponding requirements can also be implemented in companies [8].

2.2 Visualization of internal and cross-company processes

Digitalization tools such as Signavio, viflow, adonis and cumando can be used to visualize processes [9]. The aim is to improve the efficiency of their processes in this way. One of the measures to increase efficiency is supply chain management [10]. Supply Chain Management is an integrative approach to planning, controlling and monitoring product flows from supplier to end user with the aim of improving customer service at reduced total costs [11,12]. One of the main tasks is the coordination of cross-company communication and information management. Many authors see no possibility of predicting and controlling quality factors without appropriate information systems and creating transparency in value

chains [13, 14, 15, 16]. Supply chain processes require an appropriate exchange of information and a coordinated enterprise architecture.

In most companies, IT processes are still not sufficiently structured to deliver the expected added value for the company effectively. In order to change this state of affairs, several best practices have been developed to serve as a roadmap and as a reference for structuring business processes. It shows how the documentation not only supports the efficient execution of processes, but also helps to record cross-company measures to reduce food losses within the supply chain. In addition, it is easier to prepare a sustainability report and to use an appropriate document management system. The extension of Qualint 02 with reference process representations and thus the link to a document management system have taken up the point of traceability within the network.

The link to further education materials in the form of presentations, teaching videos and podcasts is to be made available via Qualint 03 in the future.

This further development to Qualint 03 is currently being tested in companies as a pilot. Qualint 03 integrates three dimensions 1. Process representations; 2. Documentation and 3. Continuing training. A benchmark of the current requirements for integrated management systems and the greater consideration of legal requirements form the basis of the expanded tool. This gives companies an overview of where action is needed in the further development of their own system. Process representations are part of the 1. Dimension process representations and serve as support for the creation of the individual process landscape and processes [9], integrated documentation and form a basis for a document management system. A link to an LCA tool provides support for the development of the sustainability report. The 3rd dimension Employee training is used to determine the qualification needs and to support competency building in teams through videos, podcasts and web-based information. The result is a tool that not only supports the consulting of companies, but as a guide to achieve a continuous improvement of integrated management systems in companies.
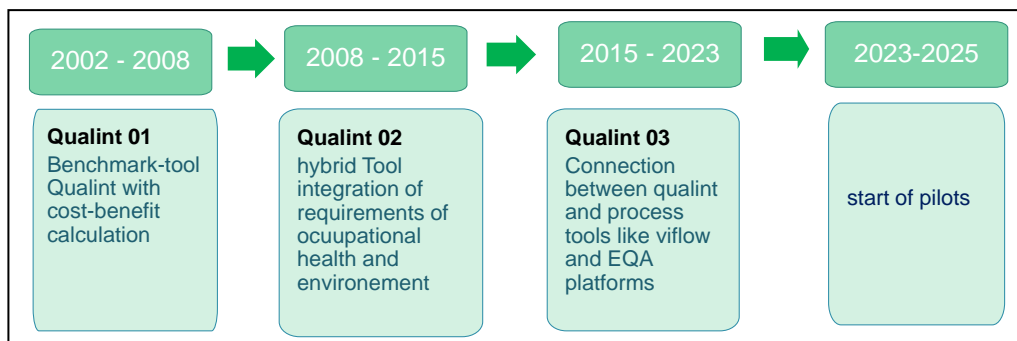

2002 - 2008	2008 - 2015	2015 - 2023	2023-2025
Qualint 01 Benchmark-tool Qualint with cost-benefit calculation	**Qualint 02** hybrid Tool integration of requirements of ocuupational health and environement	**Qualint 03** Connection between qualint and process tools like viflow and EQA platforms	start of pilots

Figure 1: Development of Qualint

3 Strengthening the role of farms in the digital transformation of sustainable food chains

The food market is in constant flux: on one hand, issues such as digitisation, sustainability, environmental protection, market prices and international competition are increasingly coming to the fore for future developments of the stakeholders involved. On the other hand, the related discussions on animal welfare, farming methods and methods, water consumption, CO_2 emissions, etc. enter the public debate. In the situation between meeting modern standards on the one hand and cost-effectiveness, many companies along the food value chains lose their orientation. They also often lack the motivation to adapt to constantly changing conditions and new norms. In the meantime, there are a large number of fields from different socio-political perspectives from which companies in the agri-food sector derive demands on their own farms.

3.1 Dimensions of digital transformation

Digital transformation can be divided into two dimensions:

One is the digitization of business processes in each of the participating companies in the value chain. This is primarily about increasing efficiency and reducing time and costs in the increasingly complex quality and crisis management in each individual company.

The digitization of business processes leads to "incremental innovation", i. e. to a clear improvement of defined processes such as self-assessment, traceability or document management. The second dimension is the digitisation of new business models, such as the establishment of a joint platform cooperative [18]). Here one speaks of a "disruptive innovation" as a radical renewal [19]. The form of radical innovation requires the willingness and courage to implement a vision. The members of the European Cooperative EQA had the courage, together with practical farmers, to create the organisational and technical conditions for the first platform cooperative centred on agricultural and forestry holdings [18]). The three service packages Q-Farm-HUB, Q-Guide and Q-CERT-Wallet are being continuously developed in European Innovation Partnership Projects. A link is seen to Qualint (figure 2) (EIP. Agri) [20].
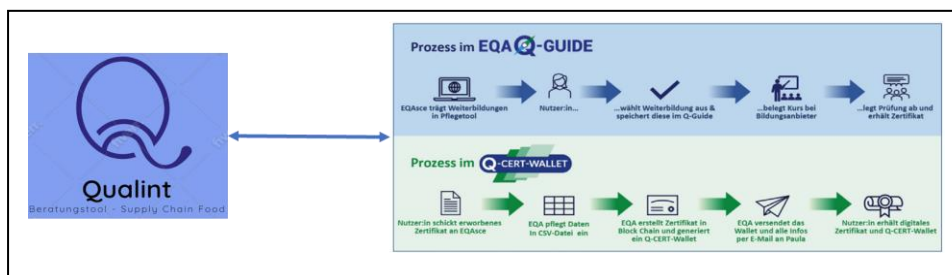

Figure 2: Link between EQA-Platform and Qualint [18]

An important step towards enabling the three public-private partnership tasks of crisis management, public services and achieving climate targets will be the creation of web-based communication solutions between farms and the local authorities responsible for them, such as veterinary, environmental and health offices. The digital transformation in these fields of action is not a process with a clear endpoint. On contrary, the first goal is to be able to position ourselves together in such a powerful and flexible way that all parties involved can adapt to new technologies and be able to react to the constantly changing framework conditions as quickly as possible. This also applies to the current Qualint 03 version. The new role of farms as suppliers of products of plant and animal origin as well as intangible products such as data, information and services has to be taken into acount. The provision of new digital infrastructure organised within a cooperative enterprise can be realised in ten steps [18]

1.Connecting experiential knowledge from practice and science(combining top-down with bottom-up approach)

2. Defining target groups for a platform cooperative

3. Questioning old processes and structures

4. Visualization of roles and processes

5. Involving all stakeholders

6. Dynamic management of responsibilities and communication in the value chain

7. Tailor-made support for users of digital tools in the "Moment of Need"

8. Accompanying the changeover of processes with training offers

9. Use of key users as ambassadors for the platform cooperative

10. Continuous improvement of the system to meet the needs of the target group

3.2 Dimensions of digital transformation

The Supply Chain Due Diligence Act (LkSG) entered into force on 1 January 2023 and more and more enterprises are involved. The law requires companies to carry out an appropriate risk analysis at least annually in order to identify the human rights and environmental risks in their own business and those of their direct suppliers [21]. In addition, the Act requires that the preventive measures taken as a result of the risk analysis [22] be reviewed in the company's own business by means of risk-based control measures or that such measures be agreed with direct suppliers and implemented on a risk-based basis [23]. The explanatory memorandum [24] explicitly mentions that third parties must be taken into account both in the risk analysis and in the implementation of the control measures. This is a future field of application of the knowledge-intensive consulting system Qualint. In particular, third parties must be involved in the context of the LkSG if the company does not have the corresponding competence or does not yet have the corresponding competence and therefore the integration of external knowledge is necessary and sensible. In addition, the commissioning of smart service facilities such as EQAsce may be recommended in order to strengthen the credibility of audit results and certificates [8]

4 Conclusions

The development of different standards, norms and also legal requirements has accelerated in recent years. This leads to a high need for advice, especially in small and medium sized enterprises.

The trend to make compliance with climate targets a quality feature for value chains and regions will only succeed if this is seen as the performance of the entire value chains. The EU Green Deal, the Farm to Fork approach with the aim of becoming the first continent to be climate neutral by 2050. Innovative farms in the agricultural sector in particular have become trendsetters in this field. The further development of digitalization and the implementation of artificial intelligence will increasingly require skilled workers who can successfully implement this development. Future developments will mean an increase in the qualifications of the employees and a continuous professional development. The developed consulting system Qualint supports companies to establish a future-oriented management system in companies [25,26].

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