

# QUARISMA – Joint model for academic quality management qualification in food chains

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## Keywords

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## 1. Problem statement

European meat industry is facing an aging problem, not only of its management staff but also of its innovative business. To put this into the right perspective, one has to stress that in the next 20 years a dramatic increase in global trade of human food and animal feedstuffs is to be expected. This presents the agriculture and food industries the wholesale and retail food trade and the public sector with the challenge of creating relevant, cross-border food/fodder safety systems which are economical, reliable and compatible on an international level. Therefore the need is growing for specific skills and innovation to improve the general standard of quality and crisis communication in the field of consumer health protection.

Nowadays, the agri-food production is characterized by complex production chains with a huge variety of converging and diverging production processes. They are acting in complex networks with great numbers of suppliers and customers (Luning and Marcelis, 2009; Ruben et al., 2006; Popov and Brebbia, 2011; Raab et al., 2011).

During the last decade food safety research and governance came to realize that a new strategy of collaboration between public health sector and animal health sector is needed. Conceptual frameworks for the economic assessment of the effectiveness of preventive measures as part of food safety improvement were developed (Wilke, 2012; Käferstein, 2004).

In chain oriented agribusiness a lot of network actors can be identified: scientific actors, business actors, public authorities. To organize management support in inter-organisational innovation processes the role of an “innovation broker” was identified (Bruns, 2011). He centrally acts as service provider within the network and mostly belongs to an organization which is in charge of coordination or management of the innovation network.

Especially in pork-producing value chains the small and medium-sized companies specialized on separated production steps so that the achievement of common

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quality targets along the chain presents a major challenge (Ellebrecht, 2012). Service providers need new and efficient quality management methods, especially for the use in inter-organisational health and quality management.

For the planning of inter-enterprise services activities for health management in the meat sector, service organization have different alternatives to organize their support (Schütz

The organisation can become a Full-Service-Provider or some organisations can be merged into a joint operating company. As a last alternative, all services for the health management can be sourced out ( Schütz, 2009)

New fields and more complex tasks in the field of agriculture and the food sector require qualified training instruments of young professionals. Human capital has become a key resource for agribusiness. To distinguish that in comprehensive decision making processes descriptive, comparative, predictive and prescriptive information have to be performed and communicated belongs to diverse professional skills of junior staff members in chain oriented quality management. However, the problem related to communication gaps in food chains remains unsolved up to now (Petersen, 2002).

Today, team skills and a willingness for collaboration, are two of the outstanding skills that characterize trainees for tomorrow's top management (Weltring, 2011). In addition to professional knowledge, special skills and competences are necessary to meet the requirements of quality management, communication and crisis management (Brinkmann et. al, 2011). Global markets and international food chains require even with the expansion of career opportunities team-oriented quality methods with a strategic focus on European and international standards. Those who do not already learn to think and work in an interdisciplinary way during the academic life, for them it will be difficult to acquire these skills during their professional life. Therefore, quality management programmes have to be imbedded in the European network of the European Organization for Quality (EOQ).

It is the aim of an initiative of the meat industry and the Universities of Bonn and Wageningen to train young professionals to the basic know-how of inter-company quality management systems in theory and practice (Lehnert, 2011). So they are able to introduce, maintain and internally audit such quality management systems. Especially for the different structures in the agricultural sector special certification models can be applied (Lehnert, 1998).

Additionally they will also learn to use properly the most important quality tools and to decide on how inter-company business processes can be actively and successfully designed for a total quality management approach (Gawron 2011).

## **2. Objectives**

Aim of the Industry- Academia Partnerships and Pathways project QUARISMA is to support the needs of the European Agrofood scientific community in terms of training, mobility and career development of junior staff in European meat industry. This means on one site exchanging of personnel between public research institutions and private enterprises and on the other site knowledge exchange. Mutual understanding of the different settings and skill requirements in science and industry should be the

basis of the staff development. Fostering the integration of the so called "knowledge triangle" education, research and business the mission of QUARISMA is to create the conditions and the framework that will allow a fresh food chain quality management culture flourish both as a mindset and as an action.

Its strategy is therefore based on a two-pronged approach:

- 1.) by way of education to create a cultural shift in the perception of quality food chain, crisis and risk management;
- 2.) by encouraging and supporting entrepreneurship through concrete cross-border activities to bring together individuals from both universities Bonn and Wageningen and businesses and public organisations in the public private partnership platform GIQS where all QUARISMA partners work together face-to-face.

Main goal is to develop a joint higher education programme of Master and PhD level and a Train - the Trainer - Concept with the QUARISMA partners. The involved Universities and GIQS are aiming to create a "Quality Food Chain Management" brand of excellence across European higher education institutions which will mark out EOQ-DGQ Courses as cutting edge in delivering high quality and innovation results.

The courses and target group concepts will integrate entrepreneurship, innovation and risk management content and include mobility and practical business experience aspects.

Together with international partners, the QUARISMA activities aim at the

- Definition
- Testing
- Validation in pilot sectors and
- Adaptation to other food chains such as milk, beef

of a joint education model for quality management qualification in the meat chain. This model comprises of the following components: Branch specific organization scheme for quality management qualification in the agricultural and food area; specific levels of responsibilities.

A gap analysis concerning the curricula of the actual quality management qualification programme at University of Bonn and Wageningen is performed to ensure the requirements of EOQ qualification criteria. Both universities have research foci which complement each other in a perfect way: the research and education activities of the University of Bonn are mainly focused on primary production whereas the University of Wageningen concentrates especially on the processing steps within the food chain.

Guidelines are formulated to guarantee a European wide application.

In workshops, seminars and information tasks the different qualification elements are disseminated. Expert panels ensure the integration of branch and practical know-how.

Essential for knowledge acquisition in this area were several EU projects and cross-border projects: Q-Pork-Chains, SAFEGUARD and FIN-Q.NRW. Additionally, the activities of three strategic alliances in the sector were integrated :

- AMOR – Alliance Mutual Organization of Risk oriented testing strategies
- AIDA – Alliance Information and service agencies for coordination of quality, health and crisis management tasks in agricultural primary production
- Alfons - Alliance Education and Training for international promotion of junior staff in business and science

Prerequisite for this integration is a multi-layer collaboration between the project partners and alliance participants since many years:

Table 1: Research and training collaborations between the QUARISMA partners as a condition of model development.

<b>Partners</b>	<b>Common activities</b>	<b>Duration</b>
DGQ BLH + University Bonn	Quality Management education of academic personnel: "QSM Junior"	Since 1999
GIQS-Platform + alliances	Public-private-partnership cooperation in inter-organisational quality management areas	Since 2001
University Bonn + University Wageningen	"FRECO Food and Resource Economics" - common study programme	Since 2006
University Bonn + University Wageningen + GIQS + partners	QUARISMA Quality Management and Risk Management in Meat Chains – EU funded project	Since 2009

### 3. Procedures

To develop the joint education model, the QUARISMA project is the financial basis. The exchange of researchers and staff between enterprises and academic organizations is unique, thus supporting the interdisciplinary, intersectoral, and international approach of the model approach at the same time.

Currently, QUARISMA is the largest project in the segment of personnel exchange, funded with 2.5 million € from the European Union. The element IAPP (Industry-Academia Partnerships and Pathways), which is one element of the Marie Curie actions of the 7th Research Framework Programme of the EU, aims to support the needs of the European scientific community in terms of training, mobility and career development of junior staff. It aims at creating dynamic solutions for the exchange of

personnel between public research institutions and private enterprises, especially SMEs, including traditional manufacturing industries. Knowledge exchange and mutual understanding of the different settings and skill requirements in science and industry are the basis for staff development.

Working procedures within the project are:

1. A gap analysis concerning the curricula of the actual quality management qualification programme at University of Bonn and identification of gaps according to the EOQ framework:
  - experts interviews in agrifood industry concerning the demand of skills needed in quality management working field
  - 2 science to business workshops (SWOT analysis)
  - alumni survey concerning working fields in which the acquired skills and knowledge could be applied
2. The development of a reference model
3. Pilot testing of the model in the framework of the GIQS activities of knowledge transfer via e-learning tools
4. Submission of proposals for the international dissemination of the joint EOQ education model
5. Adaptation of the joint EOQ education model to other chains of the agricultural and food sector

## **4. Results**

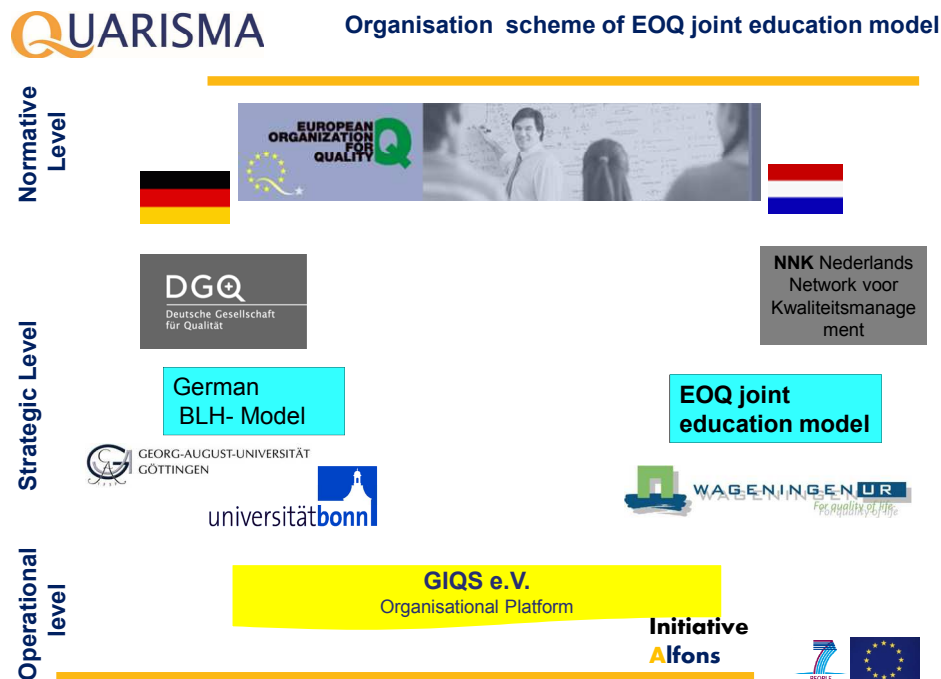
The cross-border collaboration and the exchange of methodological and theoretical knowledge between University of Bonn and University of Wageningen as well as specific business knowledge provided three main results:

- Organization scheme of the EOQ joint education model
- EOQ joint education model
- Components and target groups

### **4.1 Organization scheme of the EOQ joint education model**

Within the project a multi-layer approach is performed: different actors along the meat chain such as education partners, industry and branch organizations cooperate, two EU founded projects like QUARISMA and Q-Porkchains are combined and finally - for the first time in the meat chain - cross-border activities between Germany and the Netherlands are launched to get access to the European network of quality management driven by EOQ (Figure 1).

Figure 1: Organization scheme of the EOQ joint education model



On the normative level EOQ as an umbrella organization of selected national quality societies, sets the framework for harmonized quality training and certification concepts for quality management and technical staff.

The EOQ connects more than 70,000 experts and organizations in the field of quality management all over Europe. With the “Competence Specification – Requirements for Quality Management Personnel” (EOQ CoS 9000), the EOQ defines the subjects and related qualification criteria relevant for standardized training and education of persons in the field of quality management. This scheme has been approved by the EOQ General Assembly in Dubrovnik/Croatia in May 2009 ([www.eoq.org](http://www.eoq.org)).

The 14 subjects are related to three specific levels of qualification (Figure 2).

Figure 2: Specific education levels of the EOQ Competence Specification for Quality Management Personnel (EOQ CoS 9000)

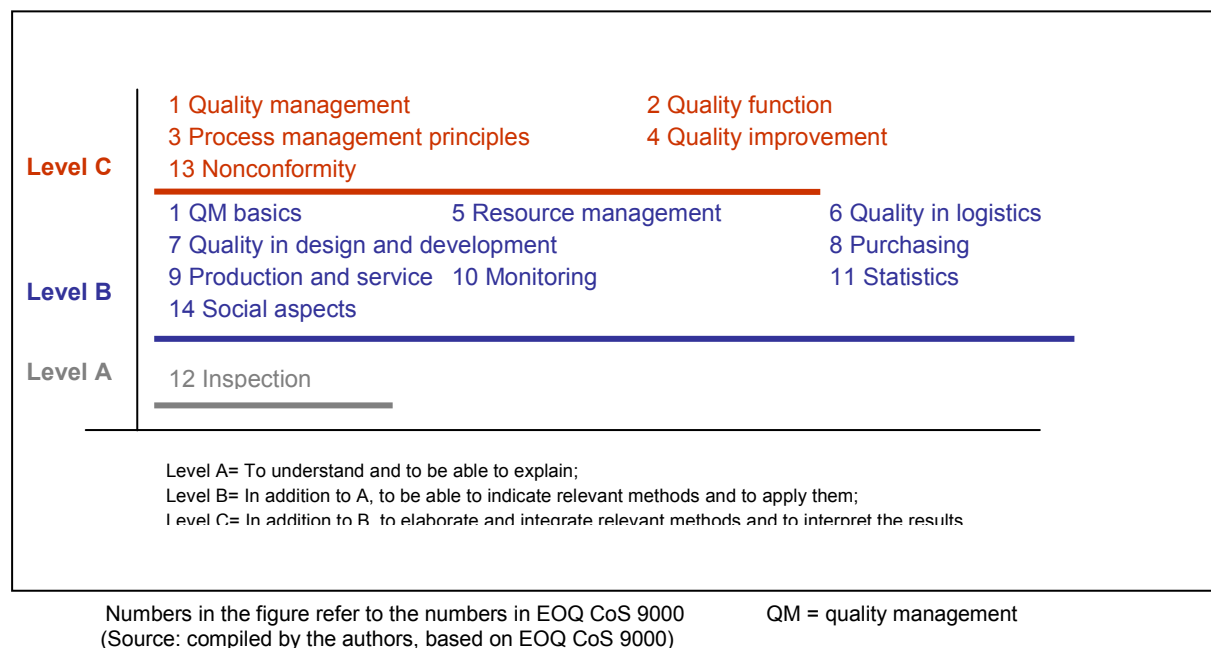


Table 2 shows an excerpt of the EOQ CoS 9000, where the related subjects and qualification criteria for the topic quality management are listed. Additionally, branch specific topics for the education in the meat sector are listed.

Table 2: Excerpt of the EOQ CoS 9000 (Source: EOQ)

Topic	Subjects	Qualification criteria	Additional branch (meat sector) specific topics according to the criteria
Quality management			
	Basic management principles	Decision making, Planning, Organizing, Human resources, Reviewing	
	Basic management principles	Decision making, Planning, Organizing, Human resources, Reviewing	
	Standards	ISO 9000, ISO 9001 and 9004	ISO 22000, ISO 26000
	Quality management principles	Importance of systematic quality approach for society, interest of producer, consumer and government and for the environment; Use of QM principles	
	Concepts	Quality of all production/enterprise areas, TQM, QMS and auditing	
	Quality policy	Quality as a profession and as a management task, management by objectives,	

Topic	Subjects	Qualification criteria	Additional branch (meat sector) specific topics according to the criteria
		quality reporting/accounting and policy formulation	
	Organizational concepts	Organisational principles, organisational structures of responsibilities, tasks and competences	Private-public-partnerships, Netchain coordinators
	Policy Making	Vision and mission, strategy and policy, objectives and operational objectives	Chain orientation, crisis and riskmanagement
	System-approach of managing organisations	Models of management, effectiveness and efficiency, project management	
	Standards and guidelines	ISO and EN standards and guidelines, esp. ISO 9000 (vocabulary), ISO9001 (requirements), ISO 19011 (auditing) and ISO 17000 series	QS; GMP; IKB, IFS, BRC

On the strategic level national organizations such as the DGQ (Deutsche Gesellschaft für Qualität) in Germany or the NNK (Nederlands Network voor Kwaliteitsmanagement) in the Netherlands are responsible for branch-oriented adaptation and basic qualification criteria. At some German universities, e.g. Göttingen and Bonn, qualification programmes in the area of quality management are already established and accredited by the DGQ. For example, the additional qualification DGQ Quality Systems Manager Junior at the University of Bonn exists since 2002 and till December 2012, 230 students have graduated in it. During their studies in agricultural, food or nutrition science and related study programmes, the students have to pass defined courses for the additional qualification.

In the context of the Bologna process of restructuring and modernization of European universities (Bachelor and Master System), the University of Bonn has revised its course programme and also based it on the EOQ CoS 9000. The new programme was accredited by the DGQ in February 2010 and is shown in Table 3. An accreditation from the EOQ is the next step in the QUARISMA project. At the University of Wageningen comparable contents are integrated into the master study programmes.



Tab. 3: Modules and exams in the new accredited QMJ scheme of the University of Bonn

Bloc I: Lectures and exercises			
Required course		Optional courses	
Quality management in agricultural and food economy (MA-L-07)	3 CP 90 h WL E	Cold Chain Management (MA-T-23)	2 CP 60 h WL E
		Product and Process Quality (MA-P-02)	4,5 CP 135 h WL E
		Specific aspects of the quality of animal products (MA-T-14)	Min. 10 h (as a part of the seminar, introduction in the topic)
Bloc I	90 h 1 Exam		10 - 135 h Up to 1 Exam
Bloc II: Seminars and group work			
Required course		Optional courses	
Quality management in agricultural and food economy (MA-L-07) <i>Seminar*</i> (Use of quality management tools)	3 CP 90 h WL Term paper	Cold Chain Management <i>Seminar*</i> (temperature mapping and innovative tools) and <i>Practical course*</i> (Issues of cold chain management for plants and foods of animal origin)	Sem: 2 CP 60 h WL Graded term paper Pract.: 2 CP 60 h WL
		Product and Process Quality (MA-P-02) <i>Seminar*</i> (Product Quality Management)	1,5 CP 45 h WL Graded term paper
		Specific aspects of the quality of animal products (MA-T-14) <i>Seminar*</i>	6 CP 180 h WL Graded term paper
Bloc II	90 h		45-180 h
Bloc III: Practical activity			
Master thesis (Prof. Petersen as First or second examiner)r)			30 CP 900 h WL

\* related to the mentioned courses in bloc I, Exam including all parts of the module (Lecture + seminar)  
CP: Credits points, WL: Workload, E: Exam

At the University of Wageningen comparable contents are integrated into the master study programme "Food Quality Management". An overview of this Master programme is shown in Figure 3.

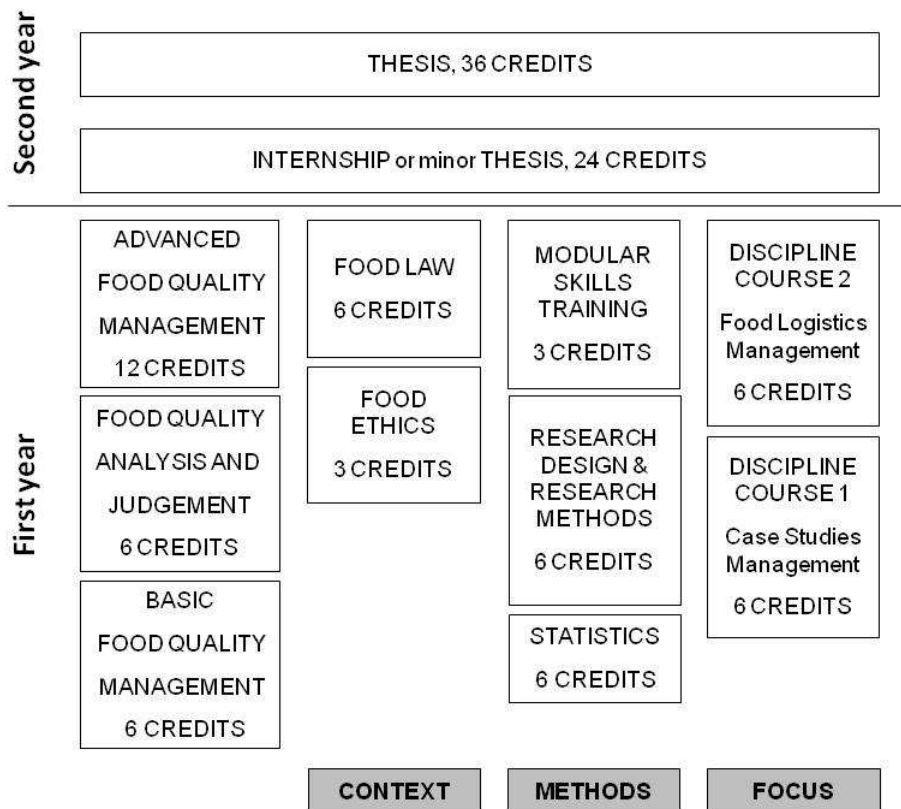


Figure 3: Overview of the Master programme “Food Quality Management” at the University of Wageningen (Source: compiled by the authors).

On the operational level cross-company organizations such as GIQS are offering qualification courses, services for maintaining e-learning tools or hotline services. Coordinated qualification content and components within the alliance ALFONS are applied. Within ALFONS the four universities of Bonn (D), Wageningen (NL), Göttingen (D) and Bayreuth (D) match their study programmes with new profession areas of agricultural and food industry.

#### 4.2 EOQ joint education model

Education partners in academia and the private sector as well as companies and organizations of the meat chain have recognized competent professionals and managers as a key resource. Future nutritionists, food technologists, agricultural scientists and professionals require education and training modules in quality management which are based on European-oriented standards. For this purpose the cross-departmental and interdisciplinary collaboration of many network partners is required. This joint education model consists of four elements (Figure 2):

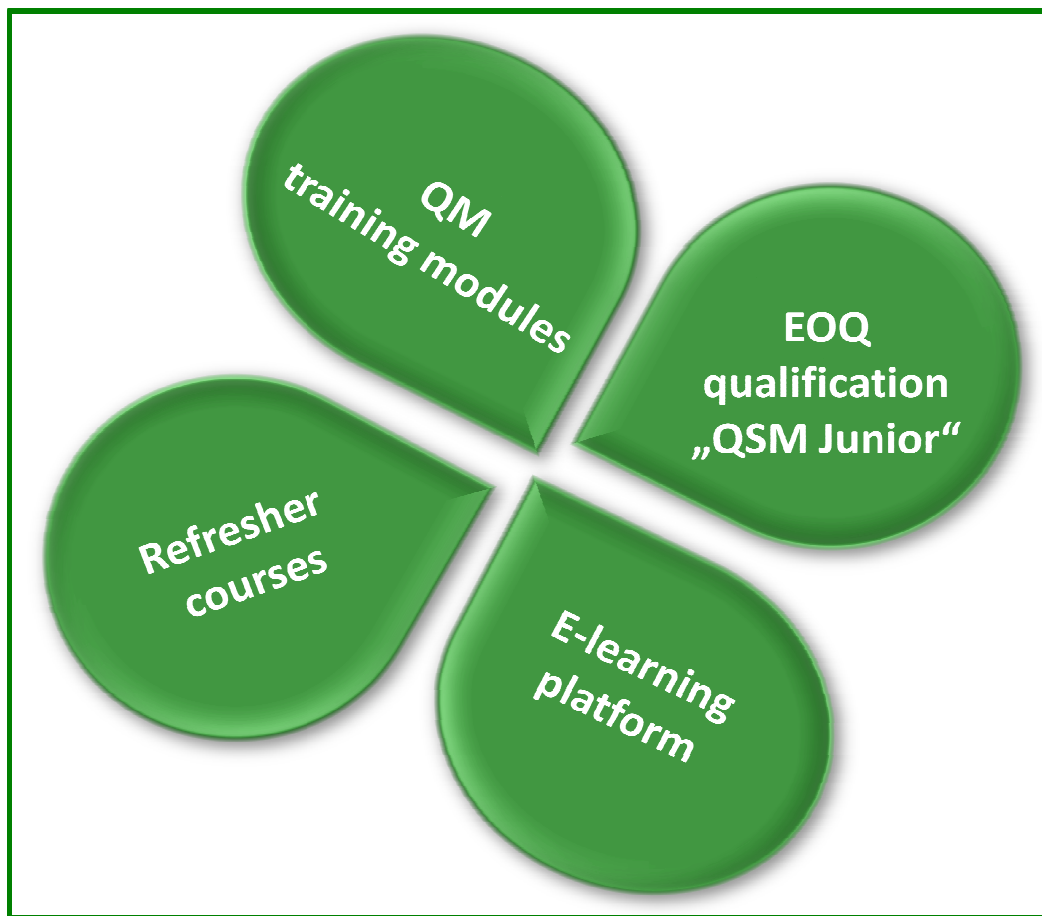
- **EOQ recognized international QM qualification.** The German qualification programme “Quality Systems Manager Junior (QSM Junior)” of the University of Bonn (D) and the study programme “Food Safety Management” of Wageningen University (NL) form the basis for an EOQ recognized course-related quality management training

- **Target-oriented quality management training modules.** Special training modules which allow the companies to maintain their personnel's quality management competence are offered. These training courses and seminars are open to graduates from business. Here, the business partners will ensure that training priorities are precisely aligned to the content requirements of the industry.
- **Refresher courses for quality managers and auditors.** Especially training courses for the operating personal in the quality management field are developed. Experiences of the Quality Systems Manager Junior programme established at universities will be integrated and used to develop several course modules covering internal and external audit management, technical tools and methods for use in quality control and risk management, customer-supplier relationships and strategic alliances in meat products chains, preventive quality management tools (HACCP, FMEA and forecasting models), management of safety and quality improvement processes e.g.
- **Platform for e-learning tools.** To support the developed training modules an e-learning platform is used that was firstly developed in the project Q-Pork Chains (2005-2011) which is supported by the 6. Framework Programme of the EU. Several instruments for a wide range knowledge transfer can be adopted: e-learning resources, a web-based industry platform training as well as demonstration events

#### **4.3. Components and target groups**

Training content of the four components of the EOQ joint education model (figure 4) will be oriented at different target groups in the agricultural and food area.

Figure 4: Components of the EOQ joint education model



The EOQ QMJ program will presumably take into account the following methodological areas:

- Supplier evaluation
- Seven basic quality techniques (Q7)
- Seven Management techniques (M7)
- Quality Function Deployment (QFD)
- Failure Mode and Effect Analysis (FMEA)
- Hazard Analysis and Critical Control Points (HACCP)
- Six Sigma ( $6\sigma$ )
- Statistical Process Planning (SPP)
- Statistical process control (SPC)
- Quality standards and standards

Training modules and refresher courses will be designed for graduates and quality management staff of business. The business project will provide support to the precise content focus to align industry requirements. The following topics are suitable to be integrated and used for the development of course units covering :

- Internal and External Audit Management
- Technical tools and methods for use in quality control and risk management
- Customer-supplier relationships and strategic alliances in the meat producing chains
- Preventive quality management tools (HACCP, FMEA and predictive modeling)

- Management of safety and quality improvement processes

The mediated content of the developed course modules should be deepened with e-learning elements .

The different target groups for the developed joint education scheme not only belong to business and science of the agricultural and food sector (see Table 4). Students at universities but also graduates and job starters who work in the field of quality management at industry, science, administration or service organizations may be participants in the training modules.

Table 4: Target groups and QM-Qualifications

Target groups	QM qualification + skills	Performance of certification	Responsible for certificates
Master + PHD students	EOQ QSM Junior	University Bonn	DGQ*
College + university graduates in agrofood industry	EOQ Systems Manager /Technician/Auditor	AGRIZERT	DGQ*
Advisors + consultants in agrofood industry	Food Chain QM and Crisis Manager	AgriQ GIQS	GIQS**
College + university graduates in public and private organisations	Train-the-Trainer Qualification in QM and Crisis Management skills	DRV AgriQ	GIQS** *EOQ-conform ** EOQ-oriented
AgriQ GmbH Service organisation in agrifood sector AGRIZERT GmbH Certification body in agrifood sector DGQ German Association for Quality e.V.		DRV Deutscher Raiffeisenverband e.V. GIQS e.V. Joint R&D Platform of the Universities Bonn and Wageningen	

## 5. Conclusions

In an environment of permanent economic, social and cultural changes, innovative approaches are needed on the path to excellence in competition. To meet future challenges of global markets in the agricultural and food area, the chain approach is indispensable. Education and qualification programmes in the area of quality management have to be recognized European and international wide.

Education models which are internationally oriented can only be successful if all the three levels of responsibilities such as normative, strategic and operational are willing to cooperate. Within the QUARISMA this was realized for the first time. So the EOQ recognized programme “EOQ Quality Systems Manager Junior” may hopefully be the starting point for further development of academic quality management qualification

at university level. It can be a key influencer in the field quality management education in its broadest sense.

Through the different educational approaches within QUARISMA and Q-Pork Chains etc a chain-wide view on quality management especially on risk-oriented chain management is possible. Covering several steps of the supply as well as focusing on a wide range of targets groups (academia, students, industry) a holistically view is feasible. Thus, a crossroad of ideas, knowledge, research and information for the mutual benefit of all partners in the area of quality management in food chains is achieved.

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