AQUA - Skills Alliance for Training, Quality and Excellence in Automotive
Project Summary

The complexity of electronic and software functionality in cars is increasing exponentially, and automotive companies have big difficulties to tackle this complexity in terms of product and process quality, functional safety, and reliability. The key characteristic of these topics is that they can only be implemented on an organisational level based on the close cooperation of all specialised expert departments. This is why automotive companies have to assure that a significant part of their employees in design, engineering, manufacturing, servicing, etc. have a basic practical knowledge about all these subjects.

To address this specific need, the principal concrete objectives of AQUA are to

- create a unique sustainable strategic alliance for the implementation and Europe-wide deployment of modern certified VET curricula for Integrated Product and Process Quality, Functional Safety, and Reliability on an organisational level;

- create and sustainably maintain an ISO 17024 compliant Skills Set for “Best and Next Practices in implementing ISO15504 Quality, ISO26262 Functional Safety, and Reliability in Automotive”; Europe-wide Certification will be offered under the roof of the European Certification and Qualification Association (ECQA);

- create a complete certified VET on-line and classroom training program on “Best and Next Practices in implementing ISO15504 Quality, ISO26262 Functional Safety and Reliability in Automotive”, and perform trial trainings for 130+ participants during the project. Such a training programme is what key automotive players such as DAIMLER, KTM Motorsport AG, ZF Friedrichshafen AG, Continental, Magna, BOSCH, MTU, Hella, and others ask for today, and will want to deploy on a large scale tomorrow;

- create significant impact during the project, which will be the basis for successful broad exploitation, by a very clear and targeted dissemination strategy mainly facilitated by the partnering Automotive Associations (which influence and decide about Automotive VET Training and Education curricula all over their countries) and all associated networks.

The AQUA consortium can address a vast array of automotive companies. EMIRAcle manages a network of Europe-wide manufacturing and innovation research and training organisations. The Automotive Clusters AC Upper Austria and AC Slovenia represent regional associations of many automotive companies who are also very influential in the definition of VET qualification and certification requirements. TU Graz has strong research ties to automotive industry and addresses students in Technical Informatics and Telematics, many of whom working in the automotive industry after their studies. ISCN represents the network EuroSPI where many European automotive companies have been contributing significantly over years. ISCN is one of only seven training partners of VDA QMC (the Quality Management Center of the VDA, which represents the German Automotive Association and many automotive suppliers), and they moderate a working group of 24 suppliers exchanging best practices in automotive (SOQRATES). Symbol represents the LSSA (Lean Six Sigma Academy) in Europe and manages a network of companies committed to high quality and reliable manufacturing. Our certification partner ECQA hosts 30+ certified job roles and their community networks.

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AQUA - Skills Alliance for Training, Quality and Excellence in Automotive Project Progress Report

Project Title: **Skills Alliance for Training Quality and Excellence in Automotive (AQUA)**	
Coordinating organisation: Graz University of Technology, AT	
Project coordinator: Graz University of Technology, AT	
Period covered by the report	From: .01/01/2013 To: 31/01/ 2014

Project on the Leonardo da Vinci Project Portal:
http://www.adam-europe.eu/adam/project/view.htm?prj=10446

Project website:
http://automotive-knowledge-alliance.eu/

A. OVERVIEW

Please summarise in this section the past/future activities of your project, in order to provide a correct assessment on current progress.

A.1 PAST ACTIVITIES

Please describe the past activities undertaken.

Adhering to the project plan described in the AQUA project proposal, Project Management (WP1), Quality Management (WP2), Configuration Management (WP3, including collaboration platform NQA2) have been set up and are active.

A Skills Needs Analysis (WP4) has been conducted with experts from Automotive industry companies and international subject matter experts. Dedicated, exclusive AQUA workshops for companies in Austria, Slovenia, Germany, Czech Republic. The AQUA approach was discussed with international expert workshop communities at EuroSPI 2013 conference (Automotive SPICE, Functional Safety, Six Sigma).

Based on the Skills Needs analysis, the AQUA Skills Set was agreed, documented and integrated to the ECQA skills browsing and self-assessment portal (WP5). ECQA is the examination and certification body for AQUA skills.

A first release of AQUA training material was designed (WP6) in accordance with the Skills Set. This release is intended to be used for the trial trainings to come. Feedback will lead to refinements and further releases.

Dissemination (WP7) has been planned and numerous events targeted at Automotive stakeholders and organisations, as well as in expert communities and higher education took place. To mention only the most prominent events, AQUA was presented at dedicated workshops organised by Automotive Clusters in Slovenia and Austria, the EuroSPI 2013 conference and workshops (Automotive SPICE, Functional Safety, and Six Sigma communities), ECQA days 2013 (convention of ECQA job roles), Automotive Forum Lille, and many more.

What is the estimated percentage (%) of work completed?

50% (estimated)

A.2 FUTURE ACTIVITIES

Please describe the future activities.

WP6 – development of AQUA training material will continue based on AQUA trial trainings. Online course versions and exam questions will be developed. Translation of course slides to more languages besides English will be done with the final release.

Dissemination (WP7) will continue, in particular accompanying the trial trainings and our primarily targeted conferences.

The AQUA exploitation strategy and agreement will be developed towards the end of the project (WP8).

Indicate changes to planned activities which you expect in the future and briefly explain the reasons:

Currently no changes planned

B. RESULTS

Describe those results that you have achieved/completed in the period covered by this report. Where applicable include also login and password details.

Result title	**Skills Needs Analysis**
Result description	Several targeted expert's workshops and reviews have been conducted with expert groups in (Automotive) SPICE, (ISO26262) Functional Safety, and Six Sigma (for more details see section D). The following concepts/topics key to AQUA have been discussed, iterated, and confirmed with the experts: • Need for interdisciplinary, integrated syllabus linking Automotive SPICE, ISO26262 Functional Safety, and Six Sigma specialist knowledge. • "Essential" content of an AQUA Body of Knowledge. • Strictly modular course architecture: each cross-section course element consist of compact Automotive SPICE, Functional Safety, and Six Sigma sub-elements, plus an integration module. • The integration strategy for course modules. Associated Deliverables No.6: • AQUA Skills Analysis Document • AQUA white paper (EuroSPI 2013 conference, published in Springer CCIS book, available from: http://automotive-knowledge-alliance.eu/images/AQUA-media/AQUA-whitepaper-Springer2013.pdf)
How does the Result contribute to achieve the project objective/s	The skills needs analysis led to the definition of the AQUA Skills Set (see below), a roadmap for VET training needs in automotive.
Findings, conclusions and lessons of evaluation and testing.	Several feedback events with experts from Automotive industry and specialist subject areas were conducted. This led to the following lessons learned and iterations of recorded skills needs: • Confirmed need for integrated syllabus linking Automotive SPICE, ISO26262 Functional Safety, and Six Sigma specialist knowledge in an interdisciplinary way at workshops with Automotive and experts. • Input from AQUA white paper review by VW people: follow strictly modular course architecture.

	• Rework and restructuring of Skill card proposal with Functional Safety, SPICE and Six Sigma workshop communities at EuroSPI 2013 towards the "essential" topics for Automotive. • A concrete prototype AQUA training element (U2.E2 Requirements) was given a workshop with Automotive experts. Feedback confirmed the chosen integration strategy.
Was the result/product/process modified respectively adapted after evaluation and testing?	The needs analysis was conducted in several learning iterations of more and more detailed AQUA concepts proposals and feedback from qualified Automotive experts. The current status is the basis of the AQUA Skills Set Release 1.

Result title	**Skills Set Design**
Result description	Based on the skills needs analysis, a documented and agreed AQUA Skills Set, the course syllabus for the aforementioned first AQUA training, and a pool of interest in Europe. The skills set follows ISO 17024 compliant skills definition standards with skills units, skills elements, performance criteria. Release 1 of AQUA skills set has 11 skills elements grouped in 4 elements. In total there are 44 performance criteria, and combines ISO15504/Automotive SPICE, ISO 26262 Functional Safety, and Six Sigma topics in an interconnected, modular way. Associated Deliverables No.7: • Detailed AQUA Skills Set Document (http://automotive-knowledge-alliance.eu/images/AQUA-media/07-01-AQUA-skillcard-release1-integrated.pdf) • AQUA Skills Set import file for ECQA database (restricted access) • AQUA skills set is integrated in the online skills browsing and self-assessment portal of ECQA as new job role (http://www.ecqa.org/index.php?id=386) Overview job role: "Automotive Quality Manager with AQUA Skills":

Unit ID	Unit Name	Element ID	Element Name
AQUA.U1	Introduction	AQUA.U1.E1	Integration view and general part
		AQUA.U1.E2	Organisational readiness

	AQUA.U2	Product Development	AQUA.U2.E1	Lifecycle
			AQUA.U2.E2	Requirements
			AQUA.U2.E3	Design
			AQUA.U2.E4	Integration and Testing
	AQUA.U3	Quality and Safety management	AQUA.U3.E1	Capability
			AQUA.U3.E2	Hazard & Risk management
			AQUA.U3.E3	Assessment and audit
	AQUA.U4	Measure	AQUA.U4.E1	Measurements
			AQUA.U4.E2	Reliability
How does the Result contribute to achieve the project objective/s	The documented and agreed AQUA Skills Set is the course syllabus for AQUA trainings and certification. In that it defines the AQUA body of knowledge, it also intended to provide the anchor for the integration forces of the AQUA Knowledge alliance in the long term.			
Findings, conclusions and lessons of evaluation and testing.	The AQUA Skills Set development was started in parallel to the needs analysis phase. Please see above for development findings.			
Was the result/product/process modified respectively adapted after evaluation and testing?	Feedback and learning on the AQUA Skill Set Release1 will come up during the next project phase of AQUA trial trainings (we expect only minor changes).			

Result title	**AQUA Training material (first release, ongoing)**
Result description	Based on the AQUA Skills Set, a very first release of AQUA training material has been configured. It follows the architectural requirements elicitated and agreed during needs analysis: • Thematic structuring into Units and Elements as described in the AQUA Skills Set. • Strictly modular course architecture: each course Element consists of the following sub-elements: compact Automotive SPICE, Functional Safety, and Six Sigma sub-elements, plus an integration module. • The interdisciplinary linking of Automotive SPICE, Functional Safety, and Six Sigma follows a deliberately chosen "essence" strategy for the topic. This integration is a significant innovation for knowledge and training in Automotive. Each integration sub-module explains the interdisciplinary linking following a deliberately chosen "essence" strategy for the particular topic to give a deep insight to the complexity of automotive engineering and production. Release 1 has a volume of 575 slides and is considerably larger than originally planned. Release 1 is intended for the trial trainings to come. We expect to develop 1-2 further releases based on the feedback from trial trainings during the next months. Associated Deliverable No.8: AQUA Training material based on AQUA Skills Set (restricted access)
How does the Result contribute to achieve the project objective/s	AQUA training material is a core product of AQUA and directly adresses one of to the project's top-level goals, providing the AQUA VET course.
Findings, conclusions and lessons of evaluation and testing.	First release of training material - evaluation still to come.
Was the result/product/process modified respectively adapted after evaluation and testing?	Ongoing work/see above.

Result title	**Dissemination**
Result description	Ongoing series of dissemination activities, following AQUA dissemination plan, **see section D** of this report

C. WORK PACKAGES

Note: For completed results you do not need to fill in work package boxes, only the result boxes above.
Please describe the work in progress and related results.

Work package title	**Project Management**
Work package progress description	Status: Ongoing (WP running for entire project duration)

Work package title	**Quality Management**
Work package progress description	Status: Ongoing (WP running for entire project duration) Associated deliverables No. 03-Quality_Management_Plan

Work package title	**Configuration Management**
Work package progress description	Status: Ongoing (WP running for entire project duration) The Configuration Management plan defines AQUA folder structure, version management of work products, and a way of distributed working with the NQA platform used in AQUA. A dedicated project space on the NQA Teamwork Server is operated by partner P2. Associated deliverables and subdeliverables: • Deliverables No. 04-Configuration_Management_Plan (document and appendix) • Deliverables No. 05-NQA_Web_Collaboration_Platform (http://nqa2.iscn.com/index.php?option=com_nqa2&view=project&id=66).
Result to which this work package will contribute	Configuration management plan and platform (NQA2) for all work products and evidences (http://nqa2.iscn.com/index.php?option=com_nqa2&view=project&id=66)

Work package title	**Training Materials, Trainings, Examination and Certification**
Work package progress description	Status: Ongoing (WP planned month 12-22) Release 1 of the AQUA training material has been configured according the AQUA skills set and requirements derived during the Skills Needs Analysis. This set of training material will be used in the trial trainings and examinations to be organised by the project partners during the next phase of the work-package. Based on the feedback from the trainings with target group experts in AT, DE, FR, NL, SI, (and very probable also CZ), we expect to develop 1-2 further releases of the material. Associated deliverables No. 08-Training Material (non-final release 1 available)
Results to which this work package will contribute	Training material; training and examination web platforms: Training material is a main deliverable of the WP and a core product in AQUA Trainings and certification: A total number of 130 AQUA course attendants is targeted during the AQUA project.

Work package title	**Dissemination**
Work package progress description	Status: Ongoing (WP running for entire project duration). **See section D** for details.

Work package title	**Exploitation Concept / Sustainability**
Work package progress description	Not started (WP planned: month 18-24)

D. DISSEMINATION & EXPLOITATION OF RESULTS

Describe clearly and briefly the activities for the dissemination and exploitation of results.
Dissemination activities have been grouped by their characteristics and target group. A detailed list of activities, key data, and web links can be found in the appendix to this document.

Activity description	Exclusive AQUA workshops and future trainings for primary AQUA target group in member companies of partner Automotive Clusters, SoQrates and Automotive companies developing complex mechatronic systems in general. Quality managers, developers, project manager etc. from the Automotive suppliers are the main target group of the project.
City	Dedicated AQUA workshops in Ljubljana, SI; Wels, AT; SoQrates meetings in Nuremberg/Erlangen, DE, Friedrichshafen DE, Graz AT
Which institutions/organisations were targeted?	Member companies of Automotive clusters in Slovenia and Austria, Automotive companies developing complex mechatronic systems in general.
Why have these institutions been chosen, and what is their relevance towards the project objectives?	The results of the project (training) should be applied to the members of the partner organisations (Automotive Cluster Slovenia and Automotive Cluster Austria). Automotive sector policy makers can be reached via the automotive clusters. The members of the Soqrates Initiative are well known experts in the field of Automotive SPICE and Functional Safety, will be invited to trainings and kept informed about the project progess. Goals: Raising the Awareness, Understanding needs, apply knowledge
Number of participants	Directed communication: ~4800 Participants: ~70

Activity description	Conferences and conference presentations for/with experts • Automotive companies developing complex mechatronic systems, (Automotive SYS, Automotive Forum Lille, …) • expert communities for Automotive SPICE, Functional Safety, Six Sigma (EuroSPI 2013). • ECQA community and network (ECQA days 2013)
City	Automotive and EuroSPI: Dundalk IE, Berlin DE, Lille FR, Ljubljana SI ECQA: Dundalk IE, Cannes FR, Virrat FI, Krems AT, Timisoara RO, (Tokio JP, Shanghai CN)
Which institutions/organisations were targeted?	Automotive companies developing complex mechatronic systems. EuroSPI expert communities for Automotive SPICE, Functional Safety, Six Sigma. ECQA members, ECQA trainers and training organizations, ECQA JRC
Why have these institutions been chosen, and what is their relevance towards the project objectives?	Quality managers, developers, project manager etc. from the Automotive suppliers are the main target group of the project. The EuroSPI is an annual conference series with the topics System, Services and Software Process Improvement and Innovation. The participants fall clearly in the target group of the project. All ECQA members will be informed about the AQUA project and will be invited to participate in the training. Goals: Raising the Awareness, Understanding needs, apply knowledge
Number of participants	Events .participants: 1120 ; Printed publications; est. 3000

Activity description	Activities to hook up other Automotive Clusters and cluster-like organisations
City	Nuremberg/Erlangen, DE, Friedrichshafen DE, Graz AT; Ljubljana, SI;
Which institutions/organisations were targeted?	Czech Automotive cluster (Ostrava community invited to AQUA from September 2013 project meeting on), and SoQrates workgroup companies (SoQrates, working group of many German Automotive suppliers in VDA) are kept up to date regularly on AQUA and invited to trainings.

Why have these institutions been chosen, and what is their relevance towards the project objectives?	It is important to attract and involve also other Automotive Clusters and their members. Automotive sector policy makers can be reached indirectly via the automotive clusters. The members of the Soqrates Initiative are well known experts in the field of Automotive SPICE and Functional Safety, will be invited to trainings and kept informed about the project progess. Goals: Raising the Awareness, Search for Commitment, Understanding needs, apply knowledge
Number of participants	~35

Activity description	Conference presentations, publications, and web sites
City	Brussels BE, Vienna AT, Salzburg AT
Which institutions/organisations were targeted?	EU Commission, LLP national agencies, and other beneficiaries in the Lifelong Learning Programme
Why have these institutions been chosen, and what is their relevance towards the project objectives?	EU and national agency networks. The dual AQUA approach of VET and University course Goals: Raising the Awareness, AQUA as Sector Skills Alliances “testimonial” for ERASMUS+ calls
Number of participants	Events: ~1150 Printed Publication: est. 2000

Describe the results and feedback received from stakeholders (target group or sector) of implemented dissemination activities.

Feedback from stakeholders led to:

- Confirmed need for integrated syllabus linking Automotive SPICE, ISO26262 Functional Safety, and Six Sigma specialist knowledge in an interdisciplinary way at workshops with Automotive and experts.
- Course architecture should follow a strictly modular course architecture “Baukasten”.
- Iterations on AQUA Skills set towards the “essential” topics for Automotive.
- Confirmation of chosen integration strategy for sub-elements Automotive SPICE, ISO26262 Functional Safety, and Six Sigma.

E. TARGET GROUPS

E.1 INVOLVEMENT

Please describe the involvement of target groups/end user(s), educational structures, sector representatives, VET policy and decision makers in your project

Currently the labour market in Automotive has a large demand on engineers with electronics and software background. Especially engineers with a background in integrated (multi-disciplinary) and globally collaborative engineering, as well as functional safety standards are needed. Already more than 70% of the car functionality is controlled by electronics and software, and since the ISO 26262 norm for Functional Safety in passenger cars came out recently, many systems (especially in the driving dynamics area) have been classified as safety critical. Functional Safety, just as Quality and Reliability largely addresses the architecture of systems and significantly impacts the hardware, the sensors and the software. All these are subjects that can only be implemented effectively on an organisational level, impacting many different stakeholders from different expert departments, as well as different management levels.

Thus the principal target group for AQUA, and the proposed initial training program, are experienced engineers from different disciplines, software architects, system architects, project managers, quality managers, and safety managers in the Automotive area. As the proposed initial training addresses the interaction of the three topics quality, safety, and reliability, it is very well suited to support employees and unemployed in re-qualification. We are also reaching Higher education students by training AQUA Elements in university courses.

Organisations addressed

AQUA addresses Automotive manufacturers and suppliers, Automotive Associations, and VET Bodies. With the training, we address all Automotive suppliers who develop components which include electronics and software. They are directly addressed by the previously mentioned networks, Automotive clusters and working groups. Higher education Bodies are made aware of the dual VET-University nature of the AQUA approach via conferences.

Involvement

We do and will involve our primary target group by

- inviting them to review and direct the AQUA Skills Set and Course material QUAlity. This has and will be accomplished with workshops, trial trainigs (to come)
- publications and workshops in subject matter expert groups (Automotive SPICE, Functional Safety, Six Sigma)

E.2 TARGET GROUP STATISTICS

Indicate on which target groups the project had impact and quantify. Indicate to which educational field and educational level the respective target group belonged.
*For the educational level please use ISCED codes and descriptions.

Target group	Automotive industry quality managers, developers, project managers, safety managers etc. from Automotive suppliers are the main target group of the project.
Educational field	*Engineering and Engineering Trades (Field of education: ISECD-52)* *Automotive Engineering*
*Educational level	*ISCED 4VOC - Post-secondary non-tertiary education - level 4 - vocational programmes*
Number of people directly addressed to date	~5950

Target group	Students and stakeholders in higher education with interest in Automotive engineering
Educational field	*Engineering and Engineering Trades (Field of education: ISECD-52)* *(To some extent also: Science/Computing (Field of education: ISECD-48))*
*Educational level	*ISECD 5-8*
Number of people directly addressed to date	1150

F. LESSONS LEARNED

Describe any difficulties encountered during the implementation of the project, and what solutions you found to overcome those difficulties.

A project like AQUA needs to consolidate feedback from different directions:

- Integrating three complementary methods (where no other work is published in the area of integrating the three methods so far)
- Integrating the ideas from different Automotive clusters and regions
- And basing on real practice and real demands from industry.

Just distributing a questionnaire and collect feedback to define a skill card would have been much too simple. Thus different expert workshops took place to review and refine the strategy:

- The white paper was reviewed by experts from VW who came up with the idea of a Baukasten of modules
- The Baukasten was reviewed at an international workshop at EuroSPI 2013
- The proposed solution was piloted and discussed with core members of the Automotive Clusters

Another issue is that the project includes industry partners beside universities and national bodies, and some effort is needed to arrange that a typical industry / consulting company aligns with the administrative burden of an LPP project. To make initiatives like AQUA a success a direct collaboration with industry partners who actively work in Automotive is a valuable contribution to get practical results for Automotive industry.