HoWARP

Action-Oriented Continuing Education at the Workplace

Intellecutal Output 2

Action-oriented and agile learning in continuing education and training at the workplace

Case studies and best practices

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1. Introduction and Overview

IO2 seeks to provide further insight into the topic of agile learning by introducing good practice examples – selected by each of the country experts to represent different forms of agile learning found within the country – which follow the criteria for agile learning, as defined in IO1, in differing ways. For the HoWARP project, we have defined agile learning as follows:

- short-term learning opportunities
- with short but recurring learning episodes
- including reflection cycles as part of the learning process
- learning in day-to-day work situations
- self-organised learning in a team
- for continuous improvement of skills

Agile learning as we understand it is therefore mainly found in:

- concrete professional training
- in modern, complex, innovative and rapidly changing work environments
- in fields where different professions work on a larger common goal - energy-efficient buildings are therefore certainly a good example of this.

Starting from these definitions, for each country, based on expert interviews as well as desk research, two very interesting examples for agile concepts in the country are described in-depth as case studies. Other relevant practices identified during company interviews or desk research, are presented in a shorter format. The examples all follow the same structure, offering a short description, a reference to the approach on agile learning (systemic or methodological), target groups and stakeholders, a brief description of the set-up, possible shortcomings, and a reference on a possible transferability of the initiative. However, due to individual nuances in the interpretation of the above-mentioned criteria, the selection of examples may have slight national biases.

The description thus reflects the indicators described above – and in more detail in the final part of this report – and aims to compare them to the definitions established in IO1. The methods used are also summarized in the final part of this report, in order to serve as a basis for IO3.

The examples described are summarized below:

Austria (Chapter 2):

Case Study 1: Short-term Training Consortia (AT1)

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Good Practice 1: Onboarding process of the Austrian Postal Service (AT3)

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Germany (Chapter 3):

Case Study 1: Bayer Pharma in Berlin - A learning project on project management (DE1)

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Good Practice 2: Andreas Stihl AG und Co. KG, Waiblingen (DE4)

The Netherlands (Chapter 4):

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Case Study 2: Aldowa (NL2)

Good Practice 1: Brewery App (NL3)

Good Practice 2: Knowledge sandwich / 'colleague college' (NL4)

2. Austria

The Austrian case studies and examples of good practice mainly refer to agile approaches at the systemic level, i.e. the setup or 'design' of an initiative, rather than necessarily the learning exercise itself.

2.1. Case Study 1 – Short-term Training Consortia

Country:	Austria (AT1)
Case Study:	Short-term Training Consortia (IQV – Impulsqualifizierungsverbund)
Carried out by:	For Vienna, Carinthia and Upper Austria: ÖSB Consulting (contracted by the Austrian PES; periodical tenders)
Short description:	Publicly funded support for identifying and setting up appropriate short-term further training measures for SMEs.
Reference to agile learning	The systemic approach to training is agile, in the way that the training needed can be responded to quickly. Through joining forces with similar companies, training needs can be met more easily and quickly.
Level of implementation:	System-level
Level of roll-out:	Regional: currently carried out by 4 companies in all 9 federal provinces (Bundesländer); International: the setting up of IQVs has been facilitated in Bulgaria, Romania and Bavaria (Germany)
Main aim:	Facilitation of further training in SMEs
Background and rationale	IQVs were set up for the first time in 2002, in order to facilitate continuous education and training for SMEs.
Main beneficiaries:	SMEs of various sectors (e.g. construction-related, research); generally open for all, specific groups of employees can be chosen by the companies, additional funding may be available for specific age-groups or based on educational background.
Stakeholders involved:	▪ Austrian PES (financing, prior consulting) ▪ external consulting firms (regional variations) ▪ SMEs (person responsible for training within the company ▪ staff to be trained) ▪ training companies (external)
Set-up / Main processes:	The IQVs were initiated by the Austrian PES (AMS). Different consulting companies are in charge of facilitating the consortia. Currently 2 companies oversee IQVs in 5 Federal Provinces.

	The main processes of an IQV from the point of view of an interested company include: 1. Interest of the company – either directly shown to the consulting company or to the PES 2. General consulting about IQV by consulting company 3. Signing of contract / agreement between SME and consulting company 4. Site visit by consulting company to set up training development plan 5. Access to online platform for overview of available trainings 6. Consulting company does specific research on training offers needed by the SME 7. Consulting company organises sector-specific networking events 8. Company may sign up for offered trainings 9. Consulting company helps to identify additional funding opportunities for employees' training. The main processes of an IQV from the point of view of the consulting company include: ▪ Analysis of training needs ▪ Development of individual staff development concepts ▪ Desk research on training opportunities ▪ Staying in touch with consortium members ▪ Organising networking events for relevant groups
Methods used:	▪ Analysis of training needs ▪ Staff development concepts ▪ Sector-specific networking events ▪ Individual consulting ▪ Establishment of individual training plans The trainings offered may include numerous methods of training, which may or may not be action-oriented or agile. Due to the Covid-19 crisis, more online formats have been established (webinars and training formats) which are now included in the IQVs.
Evaluation and Quality Assurance	The initiative was evaluated in 2015. Details are not available publicly, but the general outcome of the evaluation was very positive.
Possible shortcomings:	The training methods used in the trainings do not necessarily always follow an agile approach. The initiative is rather cost-intensive, and relies on the willingness of a public body or sector representation to (at least partially) finance it.

Financed by:	Austrian PES (AMS) – finances consulting and support structure offered by private consulting firms; as well as individual support for persons eligible for funding of their training (e.g. employees over the age of 45, ...). SMEs finance the training measures for all employees not eligible for funding by the PES.
Transferability:	The initiative is suitable for use in areas and sectors with a high share of SMEs. The actual transferability relies heavily on the willingness or ability to finance the surrounding support system of consultants in order to make it a low-threshold offer for SMEs.
Sources:	Site-visit, interviews, participation in information session Online sources: https://www.oesb.at/projekte/management-consulting-gleichstellung/impuls-qualifizierungsverbuende.html https://www.ams.at/unternehmen/personal--und-organisationsentwicklung/impuls-qualifizierungs-verbund-iqv https://www.impuls-qv.at/oberoesterreich

2.2.Case Study 2 - BIM

Country:	Austria (AT2)
Case Study:	BIM (Building Information Modeling) qualification projects
Carried out by:	Green building cluster of Lower Austria, part of ecoplus, Lower Austrian Business Agency (www.bauenergieumwelt.at)
Short description:	Multi-stakeholder workshops to get a hands-on training on the use of BIM in their daily work.
Reference to agile learning:	Agile concept: the cluster's reaction to the needs of its members is agile as such; the content of the workshops is multidisciplinary and defined by the participants, according to the needs of their companies and their processes in every day work. The methods used are partially agile (making them even more agile will be part of the next phase of the HoWARP project).
Level of implementation:	(regional) system-level
Level of roll-out:	Regional
Main aim:	further training
Background and rationale:	BIM = Building Information Modelling is the most important digitalization step in the construction industry when planning buildings. BIM is a coordinated working method of different disciplines (architect, building services engineer, building physicist, structural engineer, etc. but also building material industry, who have to provide BIM-data of their products). They access a 3D building model (= digital twin of the building) and increasingly enrich it with information during the planning process. BIM represents a disruption in the construction industry - the path is moving away from sectoral planning towards integral planning - and is set to become the national and international standard. Large projects in Europe are already being carried out using BIM (in some cases it is already mandatory), and pilot projects for the implementation of BIM in medium-sized construction projects are currently being run in Austria by various tendering bodies. In order to learn BIM, there are various national training programs for employees, most of which have the character of seminars. The cluster initiative "BIM@KMU" (BIM@SME) was launched in 2016, as it became clear in cluster member meetings, that there was a lack of practical knowledge regarding the implementation of BIM in daily work processes. The cluster developed a qualification format similar to coaching or learning by doing in order to bring the knowledge into the companies in a more efficient way.

Main beneficiaries:	All members of the green building cluster, Lower Austrian companies
Stakeholders involved:	Project responsible of the cluster Lower Austrian companies, above all member companies of the cluster, and their respective staff (e.g. planners, fire protection responsible, master builder, structural engineers, ...) External trainers, most of whom are themselves planners and self-taught BIM experts from the very beginning.
Set-up / Main processes:	Describing the set-up of the initiative, including individual steps of the case in detail. • Cooperative format: minimum 3, maximum 12 companies participate in the training. • The companies send 1-3 relevant employees who (should) work with BIM in the company. • Each round (BIM project) is individually adapted to the needs of the participating companies. This framework is the same for all BIM projects: • Step 1: 1-2 Workshop before the BIM project (by cluster and external trainers/BIM experts: Presentation of the setting, collection of the companies' needs and their commitment to participate in the BIM project. • Step 2: Submission of the BIM project to the regional funding agency. Companies from Lower Austria receive 50% of the external service costs as funding. • Step 3: Implementation of the BIM project in at least 5, usually 7-8 qualification days (interactive workshops), plus homework. Within a BIM project, company partners can also book individual company days with BIM experts - who then come to the company and coach it individually. • Step 4: Project completion, collecting feedback and other requirements, accounting for subsidies. • Step 5: Public relations work: the cluster organizes BIM events or articles in specialist media, where the company partners report on their experiences in the BIM project.
Methods used:	• The content is created based on the needs of the participants. • interactive workshops/Qualification days: frontal lectures (to impart necessary know-how) alternate with direct application of what has been learned in practice: companies work with their laptops + their software products (enriched by additional BIM tools) on 3D building models (digital twins). • The 3D building models are adapted to the needs of the company partners: e.g. steel constructions for the steel construction company and similar.

	• In the workshops there are divisions into small groups: group with the same software, group planner, group building materials industry and similar • Within a small group the participants learn from the experiences of others (from practice, from homework, etc.); • the trainer leads via beamer, the participants implement this in the plenum or in the small groups. • There are feedback loops directly in the workshop. • During the BIM project (usually 6-12 months), the trainers are available by phone, online or remotely to answer individual questions from the participants. • In individual coaching sessions, the trainer comes to the company and provides individual support and guidance in converting internal processes to BIM.
Evaluation and Quality Assurance:	On each qualification day, the cluster (= organizer and coordinator of the BIM project) asks for feedback from the participants and trainers and, if possible, immediately adjusts the qualification accordingly. At the end of the BIM project, comprehensive feedback is requested to further develop this qualification format. The cluster team is thus responsible for quality assurance. There is no evaluation beyond this.
Possible shortcomings:	parts of the initiative might not follow the most agile approach
Financed by:	The coordination of the qualification format (as well as provision of premises) is done by the cluster in kind. The green building cluster is mainly financed by ecoplus, which in turn is financed by the regional government. All member companies also pay a certain amount of membership fee, based on the number of employees. The costs of the external trainers (BIM experts) are borne 50% by the participants, 50% in the "Cooperation" funding program by the regional funding agency (department of economics of the regional government of Lower Austria).
Transferability:	The process can be transferred to other sectors, wherever there is the need to collaborate intensively with other sectors to achieve a common goal by using a new digital tool. The increased effort of tailoring the qualification to the participants and the effort of the ongoing coordination (before and during the qualification) is essentially carried out by the cluster team. For a transfer, these processes would have to be more standardized.
Sources:	On-site interviews with workshop leaders and participants (Julia Fellinger); cluster manager Michaela Smertnig

2.3.Good Practice example 1 – Austrian Postal Service

Country / Company:	Austria – Austrian Postal Service (AT3)
Good Practice:	Onboarding process though playful training
Carried out by:	Design: ovos media; implementation: Austrian Postal Service
Short description	The Austrian Postal Service has implemented an 'onboarding' process using the agile method 'playful training'
Reference to agile learning:	The training method is agile (micro-learning; 'playful training')
Level of implementation:	company level A pilot was started for the department of letter delivery, the project was then extended to most departments of the company
Level of roll-out:	national
Main aim:	Improved on-boarding: higher employee-retention through playful e-learning in the onboarding process
Main beneficiaries:	New employees
Stakeholders involved:	New staff (beneficiaries) Heads of Department Digital agency for the development of online platforms and playful knowledge transfer (Ovos media)
Main processes:	The concept was developed taking in to account different learning types (auditive, visual, communicative and 'motorical'). An e-learning platform was developed to supplement the different departments' on-the-job-training with additional tailored information, tailored to the individual learner and their working environment. Superiors can allocate locations, manage team groups with different chapters or tasks, and individually assign retrainings. The platform includes modules with subchapters containing 'playful tasks'. At the end of each chapter, results are summarised, including a personal statistic on progress, points, successes and high scores.
Methods used:	Microlearning; individualised playful training; feedback-orientation
Possible shortcomings:	The initiative is an example for the implementation of an agile method rather than a 'systemic' agile learning project.
Financed by:	Austrian Postal Service (the company)
Transferability:	While the content is individual, the process itself can easily be transferred to other companies with similar tasks.
Sources	https://ovos.at/en/projekte/a-simple-formula-better-training-less-fluctuation/

2.4.Good Practice example 2 – 'Construction academy'

Country / Company:	Austria – Bauakademie Niederösterreich (AT4)
Good Practice:	Advanced training as building construction foreman - 'certified foreman building construction' – final exam as interdisciplinary practical work
Carried out by:	Bauakademie Niederösterreich
Short description	Part of the publicly funded „advanced training for construction foremen“
Reference to agile learning:	The systemic approach to training is agile, in the way that the competences needed to work out the practical exam are acquired in practical lessons, provided by all the trainers
Level of implementation:	System level
Level of roll-out:	Regional: currently implemented in 1 federal province – Niederösterreich (Lower Austria)
Main aim:	Implementation of acquired competences in a field based, practical work
Main beneficiaries:	Construction workers (foremen)
Stakeholders involved:	Trainer, training institute, training coordinator
Main processes:	The concept was developed taking into account, that the learners are not used to learn and study in a school- or university “environment”, as they are practitioners from construction companies. Applying and combining the different skills in a work-based example
Methods used:	Work – based case studies; group works with practical examples
Possible shortcomings:	There is no documentation existing about the methods used, it is based on the personal experience of the coordinator
Financed by:	Austrian PES (AMS)
Transferability:	The process itself could easily be transferred to other Training institutes with the same curriculum.
Sources	Ronald Setznagel

2.5.Good Practice example 3 – Vocational schools for construction

Country / Company:	Austria – Vocational schools for construction (AT5)
Good Practice:	Digitalization of education of construction trainees (apprentices)

Carried out by:	Vocational schools in cooperation with construction enterprises and construction academies
Short description	e-baulehre.at is an unlimited accessible, free and digital learning platform with the aim to complement and support the construction teaching. Through multimedia and a high practical relevance, the motivation of the learners and thus the learning success is increased. The learning platform contains a comprehensive program: Online trainings (knowledge) Teaching videos (skills) Knowledge checks (knowledge reviews) By means of additional media such as pictures, films and graphics, the learning contents are implemented more quickly and remain longer in the memory.
Reference to agile learning:	The systemic approach to training is agile, in the way that the competences needed to work out the practical exam are acquired in practical lessons, provided by all the trainers
Level of implementation:	System level
Level of roll-out:	Regional: currently implemented in all vocational schools and construction academies
Main aim:	“to react on the digital challenges” and make the profession more attractive
Main beneficiaries:	Construction trainees
Stakeholders involved:	Trainers, teachers, training institutes, vocational schools, construction enerprizes
Main processes:	Creation of a comprehensive and application-oriented e-learning for building construction (structural engineering, concrete construction and civil engineering) E-learning is not intended to replace, but rather to support the current training courses in the BAUAcademies, vocational schools and training companies in the form of pre-learning, as preparation and consolidation of classroom instruction. The digital transfer of knowledge supports the apprentices in their training. It will not and cannot represent the entire building knowledge. The focus is on selected fields/fields, especially construction technology.

	The application is easy to use and free of charge for all apprentices. E-learning is not a temporary project, but a permanently growing, changeable and adaptable knowledge platform that is used intensively throughout Austria.
Methods used:	Work – based case studies; group works with practical examples
Possible shortcomings:	There is no guideline available for the teaches and trainers, how to use the materials
Financed by:	Construction enterprises
Transferability:	Methods and materials could easily be transferred to other branches of the construction industry
Sources	www.e-baulehre.at

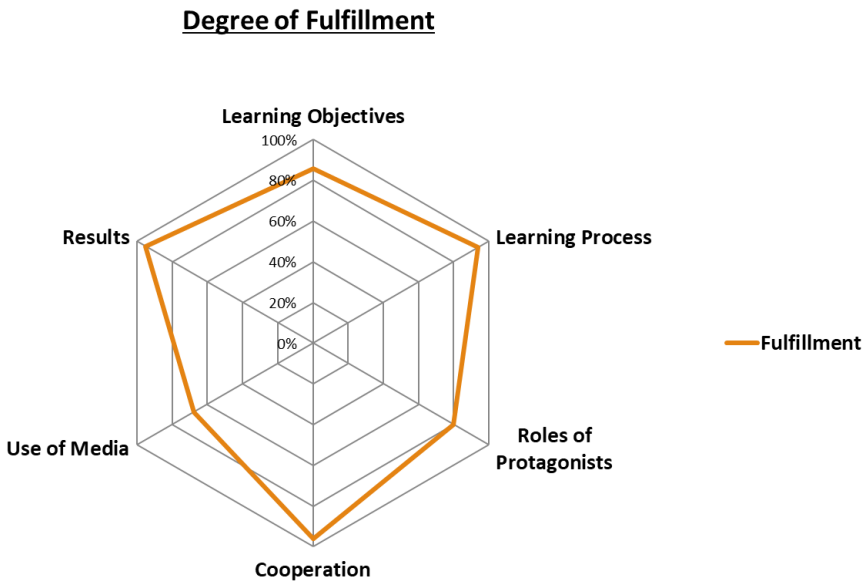
3. Germany

The German case studies and examples of good practice mainly describe agile learning projects within companies, all of them fulfilling the criteria laid out in Chapter 1 using the agile approach both at systemic and methodological level and regarding the type of learning, timing and use of methods.

3.1. Case Study 1 – Bayer Pharma

Country:	Germany (DE1)
Case Study:	Bayer Pharma in Berlin A learning project on project management with a team component and an individual component – using actual projects within the company as learning topic
Carried out by:	Sustainum – Institute for a Sustainable Economy Berlin
Short description:	At Bayer Pharma AG Berlin, for a target group of technicians and master craftsmen the most important field for competence development was project management. In May 2016 a pilot process was launched to address this topic. In a first phase team members worked on a project task from a general company background in order to familiarize with each other, the web based learning platform and the basic concepts of project management. In a second phase, team members chose a specific real life project from their working environment. The level of the input provided as well as the expected level of results met academic standards
Reference to agile learning	This project was developed as a pilot to introduce the principles of “Agile Methods of Project Management” / Scrum into a learning environment.
Level of implementation:	Within the department of technics
Level of roll-out:	It was intended to make this type of competence development a standard procedure within the company, but the internal structures did not fit with the approach.
Main aim:	Competence development of technical experts with a vocational background toward the level of chartered engineers
Background and rationale	Within the department of technics at Bayer Pharma Berlin there was an urgent need for technical experts at engineering level. However, the top management had ordered that no new staff should be hired. Therefor the only option was competence development of the staff already employed. So qualified workers with a vocational training background were to be qualified to work at engineering level.
Main beneficiaries:	The participants of the competence development
Stakeholders involved:	▪ Head of department ▪ Junior management

	▪ Human resources department ▪ Internal training academy ▪ Researchers
Set-up / Main processes:	At Bayer Pharma in Berlin, the subject area “project management” was determined as the most important learning topic within the department of technics. The members of the learning team were to acquire practice-relevant competencies based on current projects in their field, including the handling of interfaces and cooperating with general departments in the company (controlling, quality assurance, purchasing, regulatory approvals, supplier support, etc.). Therefore, it was decided that there should be a two-part learning project. In the first phase, the team members worked on a study that was equally relevant to all of them and their areas of work. With this study, they learned about and used basic elements of project management (including project structure plans, work packages, set-up and scheduling, time and cost control). In the second phase, each member worked on a separate project from his area. They worked in stages of two weeks. The individual work was synchronized and tested in a review meeting and a retrospective at the end of each stage. There the team presented the work status, discussed personal challenges and gave peer feedback. Accompanying this, the coaches gave on-demand technical and didactic input to support the processing of the learning objectives. Finally, in a joint presentation, the team presented the results of the individual projects - which all clearly exceeded what they had already done before – to the management. Their results were acknowledged with respect, because the team had not only learned considerably about project management, but also understood a lot more of the internal processes of their company.
Methods used:	Using agile principles: • Giving input adjusted to what was needed at the state of the learning projects, not in a bulk beforehand • Working in short stages / “sprints” with Review and Retrospective at the end; • Sprint planning with a sprint backlog before the next sprint started; Introducing a “learning diary” to reflect individual insights and learning achievements.
Evaluation and Quality Assurance	Quality assurance started with a formative evaluation, scrutinizing whether the project was on track toward, using a multi-level approach. In the final evaluation, the level of target achievement was stated. Graphically, this looked as shown:

	
Possible shortcomings:	The project was rather over-staffed, given that it was a small team of 4 persons. For a roll-out, the ratio of coaches and team member would have had to be changed and the concept to be changed accordingly.
Financed by:	Mainly by the German Ministry of Science and Education as part of a research project, partly by the company itself.
Transferability:	This learning concept allows a very individual and target specific competence development (and along the Ho-WARP principles). However, it requires involvement of senior staff and organisational changes. Therefore, a transfer would only succeed if the company is willing to accept this.
Sources:	https://www.researchgate.net/publication/317549528_Agile_learning_Bridging_the_gap_between_industry_and_university_A_model_approach_to_embedded_learning_and_competence_development_for_the_future_workforce Höhne & Longmuss (2017): Agile Learning for Vocationally Trained Expert Workers. Expanding Workplace-based Learning One Sprint at a Time, DOI: 10.1016/j.promfg.2017.04.003

3.2.Case Study 2 –MAN

Country:	Germany /MAN in Augsburg (DE2)
Case Study:	Learning agile methods the agile way
Carried out by:	Sustainum – Institute for a Sustainable Economy Berlin
Short description:	A two stage process where a team learned first about agile principles and methods in a learning project and then began applying this approach to their daily work
Reference to agile learning	Agile learning was the method as well as agile methods were the content
Level of implementation:	Within a department that is developing, building and installing high level components of power stations
Level of roll-out:	This particular way of learning was not extended beyond the participating department because all promotors had left the company even before the project was finished.
Main aim:	To learn about agile methods and test their usability in the daily (project) work
Background and rationale	The department was newly founded and had to cope with highly expensive, complex projects with strong time constraints. Therefor they needed efficient methods to deal with these issues. The idea was to test, to which extend agile methods would be helpful.
Main beneficiaries:	The employees of three groups within one department, all of them engineers
Stakeholders involved:	▪ Head of department ▪ 3 group leaders ▪ Human resources department ▪ Internal training academy ▪ Researchers
Set-up / Main processes:	The process had two stages: 1. Understanding the idea and the principles of agile working (i.e. working in short stages, taking the tasks for the stage from a backlog, review and retrospective after each stage) and familiarizing the employees with the main tools of agile working. An analogue Kanban board was introduced as well as moderation technics. The team learned how to estimate the work that could be finished until the next review and how internal communication had to be organised to make the agile approach work. 2. When these agile methods were understood from the first phase, the team checked where in their daily working processes agile principles and methods could be applied, too. Some phases of the workflow activities were well structured and consecutive (and in these phases agile methods would not

	bring advantages), but others were volatile and very different activities had to be done in parallel by different groups. For these phases the agile approach of short stages with a shared sprint backlog and reviews with the entire team, including the head of department, proved very helpful. So for these phases the approach was installed permanently.
Methods used:	Using agile principles: • Starting with a "backlog": Setting the objectives and determining the work that had to be completed to reach them • Taking a limited number of tasks for the coming stage out of this backlog (into the "sprint backlog") to have a clear goal for the coming stage • Working in short stages / "sprints" with Review and Retrospective at the end; • Another sprint planning with a sprint backlog before the next stage started; Also several agile tools were introduced to facilitate the work, first of all a Kanban board. This was at first analogue board and in the second stage the IT-tool "Kanboard" was provided. For work load estimation "planning poker" was introduced and SharePoint and OneNote as tools for planning, implementing and communication.
Evaluation and Quality Assurance	The team was highly motivated and eager to understand the agile principles. However, the commitment was limited by a high workload which left little time for any additional undertakings. The repeated retrospectives helped to reach an adequate level of activities. There were at this time no valid standards of agile work in the company, so the team became a pace setter for all of the company. That made them proud but orientation, what is ok and what is not, was rather difficult. Members of the department, which were involved later, had sometimes difficulties to leave known routines behind. Perhaps it would have helped to involve them at an earlier stage. All digital tools beyond the Microsoft Windows package) Kanboard, SharePoint etc.) were not accepted and could not be established. After the end of the project the team and their colleagues applied agile principles to an additional phase of their workflow and showed by this, that they had understood them, accepted them and were willing to use them in other contexts when applicable.
Possible shortcomings:	The project was not only a teaching/learning process, but also an organisational development. This requires experts not only in learning processes but also in change processes – and in this case also persons that are familiar with the technical content of the work.
Financed by:	Partly by the German Ministry of Science and Education as part of a research project, partly by the company itself.

Transferability:	Difficult to transfer due to the parallelism of learning and organisational development (see above)
Sources:	Eberle, G. & Longmuss, J. (2020). Wir lernen es, indem wir es tun: Wenn agiles Vorgehen agil gelernt wird, in: Longmuss, J., Korge, G., Bauer, A. & Höhne, B. (2020). Agiles Lernen im Unternehmen. Berlin: Springer Viewեg https://doi.org/10.1007%2F978-3-662-62013-7

3.3.Good practise example 1 – InVivo BioTech

Country / Company:	Germany – InVivo BioTech Services GmbH a BRUKER company (former start-up) (DE3)
Good Practice:	Development of leadership and communication skills in an agile learning project
Carried out by:	Sustainum – Institute for a Sustainable Economy Berlin
Short description	When the start-up was sold to a holding, “group leaders” were introduced as a new level of hierarchy. The new group leaders (until then highly qualified technical experts) had to develop the new structures in parallel with leadership and communication skills. The did that in a structured agile learning setting.
Reference to agile learning	Agile learning as a tool to organise the competence development process
Level of implementation:	Company level The team of new group leaders comprised 7 persons, that was the total number out of 60 employees
Level of roll-out:	Company
Main aim:	Personal development of the team leaders from technical experts to junior managers
Main beneficiaries:	New group leaders
Stakeholders involved:	• New CEO (brought in by the holding) • Other senior managers • The new group leaders • Partly the employees who had to work with them
Main processes:	The team acquired leadership and communication competences in an agile learning setting. E.g. they had to learn how to plan and carry out a meeting, how to give feedback to their subordinates and how to organise the communication among themselves. In parallel they had to determine what their duties, tasks and responsibilities would be. They did that by collecting topics they encountered in their new position, bind them together in a “backlog” and work on the topics in short stages. They were accompanied and supported by coaches.
Methods used:	Agile principles: • Collecting learning needs in a backlog • Working on them in short stages / “sprints” with Review and Retrospective at the end; • sprint planning with a sprint backlog before the next sprint started;

	• Digital Kanban Board ("Kanboard," open source software); "Slack" as a communication tool
Possible shortcomings:	There was a high pressure for fast changes. So sometimes the personal development process was pushed very hard – little time for a deliberate approach.
Financed by:	Mainly by the German Ministry of Science and Education as part of a research project, partly by the company itself.
Transferability:	Very individualised learning in a specific situation. It did not follow a replicable Schedule and needed flexible support by the coaches. However, the overarching process itself can easily be transferred to other companies with similar tasks.
Sources	Longmuss, Korge, Bauer & Hoehne (eds.) (2020). Agiles Lernen im Unternehmen. Springer Vieweg Berlin

3.4.Good practise example 2- Stihl AG

Country / Company:	Germany – ANDREAS STIHL AG und Co. KG, Waiblingen (DE4)
Good Practice:	Agile train-the-trainer teaching/learning
Carried out by:	ZNL TransferZentrum für Neurowissenschaften und Lernen der Universität Ulm
Short description	To make engineers and mechanics familiar with a new type of testing equipment, a 2-step approach had been chosen: Training of multipliers at the head office, then decentralised trainings at three different international branches, in both steps two weeks of full-time agile learning. The teams were each accompanied by a technical coach and a learning coach.
Reference to agile learning	Agile learning as approach to work integrated learning, using multipliers who were trained in an agile manner themselves
Level of implementation:	A technical department with 4 branches in different countries
Level of roll-out:	Department
Main aim:	A fast, focussed and flexible training at the workplace
Main beneficiaries:	Engineers and mechanics
Stakeholders involved:	• Head of department • Development engineers who designed the testing equipment and who provided the technical coaches • HR who provided the learning coaches • External learning experts who made the concept and were supervising the process
Main processes:	The technical department, that had designed the testing equipment, delivered a list of (technical) learning tasks that were required for it's use. This list was transferred into a backlog for the training. First the multipliers had to go through this training and learned also about the agile teaching methods, then they were guiding trainings at their local sites themselves.
Methods used:	Agile principles: • Collecting learning needs in a backlog • Working on them in short stages / "sprints" with a review and a retrospective at the end • Sprint planning with a sprint backlog before the next sprint started • Analog Kanban Board
Possible shortcomings:	The documentation of the testing equipment and the development of the learning tasks were very time consuming. However, it payed, because time was saved and efficiency raised within the trainings.

Financed by:	Partly by the German Ministry of Science and Education as part of a research project, partly by the company itself.
Transferability:	The process can easily be transferred to other companies with similar tasks.
Sources	Jungclaus & Hocquel (2020). Agiles Lernen – weltweit vernetzt. In: Longmuss, Korge, Bauer & Hoehne (eds.) (2021). *Agiles Lernen im Unternehmen*. Springer Vieweg Berlin

4. Netherlands

The Dutch case studies and good practices are all examples of the use of agile methods, two of them (NL2 and NL4) also at the systemic / design level.

4.1. Case Study 1 – One Minute Wonder app

Country:	Netherlands (NL1)
Case Study:	One Minute Wonder app / iPad Wilhelmina Children Hospital Utrecht
Short description	Employees in the OR department of the Wilhelmina Children's Hospital had moments of idle time or forced waiting time at work, while they often lack time to follow a course or training. One Minute Wonder is an app with short substantive questions about pediatric oncology; a subject that many OR staff wanted to know more about. The iPads with this app are placed in special stands at the locations of the OR department where the employees experience the most waiting time.
Reference to agile learning	The initiative refers to agile learning in that employees have the opportunity to learn at free moments (forced waiting time) in the operating room – to a large extent self-guided -, and on subject matter (pediatric oncology) that employees have asked for themselves (learner centered). The short questions make it possible to learn quickly, even, for example, for a couple of minutes and a couple of questions only. It is not that much action-oriented and no form of social learning. The digital component also makes it possible to provide immediate feedback on the responses on questions.
Level of implementation:	The one minute wonder app is implemented in the operating room (department) of the children hospital. It might be implemented elsewhere as well, but part of its success has to do with the idle time/forced waiting time in the operating room.
Level of roll-out:	site-based
Main aim:	The main objective of the app/iPad is knowledge acquisition (further training), indirectly this could also lead to general improvement of processes.
Background and rationale:	Employees indicated to want to know more on pediatric oncology, yet time to take part in (formal) learning activities was/is very limited. The app on iPads provides a very easy opportunity to learn (quickly) at moments when possible, and employees can choose for themselves whether they want to use them.

	It is not known when the app/IPads were introduced.
Main beneficiaries:	Health care, employees working in the operating rooms of the hospital.
Stakeholders involved:	Management, HR/L&D.
Set-up / Main processes:	Unknown.
Methods used:	The one minute wonder app/Ipad uses digital technology to provide employees with individual opportunities to learn about a subject matter they want, and at a time that suits them. The questions provide opportunities for direct feedback on answers.
Evaluation and Quality Assurance	Not known.
Possible shortcomings:	The app/iPads mainly aim at knowledge acquisition and strengthening/ reinforcement of existing knowledge, not on knowledge development. It is also not specifically action-oriented, nor can it be defined as social learning. In addition, it is noted that not all employees might find it attractive to use the app and ipad as a way of learning.
Financed by:	The hospital itself.
Transferability:	The concept of the direct availability of an app with relevant work-related questions on a tablet can be applied in a wide variety of work settings/sectors. There also are several tools available to help in developing this kind of microlearning, such as edapp, powerapp, and knowingo.
Sources:	Wagenaar, S. (2018). *Microlearning: kennis in hapklare brokken opgediend*. (Microlearning: knowledge served in bite-sized chunks). Retrieved from https://www.pwnet.nl/personeelsmanagement/nieuws/2017/12/microlearning-kennis-hapklare-brokken-opgediend-10125955?io_source=www.pwnet.nl Interview S. Wagenaar. 04-09-2020 https://www.youtube.com/watch?v=61Gy95szZk4

4.2.Case Study 2 - Aldowa

Country:	Netherlands (NL2)
Case Study:	Aldowa (organisation)
Short description	Aldowa is a Rotterdam-based organisation that has 40 years of experience in engineering, manufacturing and installing metal facade cladding (on/for buildings). A couple of years ago the management wanted to start doing business in a different way, according to the Semco-model; more self-management by employees, joint decision making, and functioning as a learning organisation.
Reference to agile learning	The reference to agile learning is evident in the use of so-called daily stands; short daily team meetings on work processes (see methods). The daily stands refer to agile learning in that they contain elements of social learning and cooperation, fast and continuous feedback, and with a focus on the result (product) rather than the process. Learning is also self-evident outside the daily stands; employees are continually stimulated to learn and develop. Employees can make a proposal for training or development themselves. This refers to the self-responsibility for learning, but these do concern all kids of training and development. In order to optimally stimulate employee development, there is no reimbursement scheme for training courses followed.
Level of implementation:	The organisation
Level of roll-out:	site-based
Main aim:	The main aim of the entire process is to transform the organisation into a learning organisation, following the Semco-model. Continuous learning and development is considered a crucial element, and as such on-boarding / further training / general improvement of processes are all targets. The main aim of the daily stands is to have everyone in the company be aware of what is going on, and to be able to switch quickly if necessary. Through this daily reflection, any errors are quickly picked up, thus preventing the organisation to make these mistakes again in the future.
Background and rationale:	The changes started approximately in 2014, mainly due to a desire to allow employees to take more self-direction and to become a learning organisation.

	By involving everyone in more than their own position, a sense of responsibility and broader expertise are created.
Main beneficiaries:	Employees and customers
Stakeholders involved:	All staff, occasionally external trainers in case of training programs.
Set-up / Main processes:	In working towards becoming a learning organisation Aldowa started small; out of each department one employee was asked to participate in a leading coalition to implement the seven principles of lean and learn. This was gradually expanded towards the other employees.
Methods used:	The organisation has no functions or departments anymore. Of course everyone has a specialization, but the focus is on thinking along in the total process, because everyone can learn from each other. Experienced welders and setters mainly perform the same tasks, new employees are deployed as widely as possible within the organisation. This is practical in the performance of tasks and it makes the work more challenging for the employees. The company encourages employees who have been performing the same tasks for a longer period of time to take up something different. When recruiting new employees, the focus is mainly on whether someone's personality fits the company, rather than on certificates or diplomas. Daily stands: each project team has a short daily consultation about what went well and what did not go well yesterday, what is being done today, what could be improved and whether there is a request for help. The actions are recorded on a board. The office also has a daily standup with representatives from logistics and production. This way everyone in the company is aware of what is going on and it is possible to switch quickly. Through this daily reflection, any errors are quickly picked up, so that they are prevented in the future.
Evaluation and Quality Assurance	No information about formal evaluation or any quality assurance procedure is available, but a review of the project by one of the learning and development funds refers to results mentioned by the owner of Aldowa: - greater involvement of employees in the company - employees have more autonomy, possibility to do things themselves - the organization has become more flexible. Tasks can be more easily taken over from each other, which has increased continuity of the organisation - work is done more efficiently; projects are smaller and more in the shorter term, making it clearer what needs to be done - more turnover, more room for investments as a result.

Possible shortcomings:	Although the daily stands are an example of agile learning, some of the learning also takes place in a more traditional way – eg. through courses and training. The following factors have been listed as success / failure factors: - 'letting go' by managers, no directive/guiding leadership - ensure that employees often speak to each other and that no power relations arise - ensure focus in product range - split the company by more than 50 employees - not solely focusing on profit - give room for consultation.
Financed by:	The organisation itself – possibly to some extent co-financed by the sectoral learning and development funds.
Transferability:	The case provides interesting leads for SME's to transform into a learning organisation. The daily stands can easily be transferred to other organisations and sectors.
Sources:	Heijboer, M., & Rijndorp, S. (2018). *Werkplekleren in de techniek*. (Workplace learning in technology). Triamfloat. Allard Droste (Aldowa): '*Ons geheim? Dat we niemand als klein kind behandelen'* ('Our secret? That we don't treat anyone like a child'). Retreived at 10-09-2020 from: https://www.mt.nl/made-in-nl/bedrijfsvoering/allard-droste-aldowa-ons-geheim/

4.3.Good Practice Example 1 – Brewery app

Country:	Netherlands (NL3)
Good Practice:	Brewery app
Short summary	Microlearning; a digital app containing videos and quiz questions on a new production process within the brewery. Employees can use the app to learn for themselves individually, or in competition with a colleague.
Reference to agile learning	It relates to agile learning in that employees have the opportunity to use the app at a moment they want to (self-steered/learning on demand). Quiz questions provide an opportunity for direct feedback on knowledge – thus supporting employees' learning-, and the possibility to play in competition (gamification) with a colleague might be considered a form of social learning.
Level of implementation:	Implemented at the level of the organisation
Level of roll-out:	Probably site-based, not known
Main aim:	The main aim of the app is to support employees in work-related learning (further training), it might, however, also be used in on-boarding processes for new employees to get familiar with the (new) production process. The opportunity to collect information about employees' learning activities on a general level might be used by the organisation to improve processes, but this is not the main objective of the app.
Background and rationale:	The introduction of a new production process implied a need for learning. The app provides opportunities to learn in an easy, fast (chunks of information) and fun way, at a moment that suits employees. By answering multiple choice questions about the production process employees can receive direct feedback on their level of knowledge, as well as that they can play in competition with a colleague.
Main beneficiaries:	Employees, L&D
Stakeholders involved:	Unknown
Set-up / Main processes:	Unknown
Main processes:	Employees
Methods used:	The app provides small chunks of information by means of videos and quiz questions. Employees can choose for themselves whether and when they want to use it (self directed).

Possible shortcomings:	The app (at this point) provides some opportunity for competition, but it lacks other possibilities to stimulate social learning. In addition, it is mainly directed at knowledge acquisition and therefore less action-oriented.
Financed by:	The organisation (brewery).
Transferability:	Smaller organisations might have limited opportunities (supplies) to implement an app of their own, but in general the concept of a comparable app seems easily transferable to other organisations and sectors.
Sources	Wagenaar, S. (2018). *Microlearning: kennis in hapklare brokken opgediend*. (Microlearning: knowledge served in bite-sized chunks). Retrieved from https://www.pwnet.nl/personeelsmanagement/nieuws/2017/12/microlearning-kennis-hapklare-brokken-opgediend-10125955?io_source=www.pwnet.nl

4.4.Good Practice Example 2 – Knowledge sandwich

Country:	Netherlands (NL4)
Good Practice:	'Knowledge sandwich' / 'colleague college'
Carried out by:	HAN University of Applied Sciences - Academy of Education
Short summary	Two comparable initiatives to promote knowledge sharing within HAN University of applied Sciences, Academy of Education. In both cases, employees voluntarily – but usually on demand - present about their specific (personal) interest or work-related expertise to colleagues at free moments or during lunch breaks. Subjects differ, and other employees are free to participate. To some extent, subjects are chosen on specific contemporary issues or on popular demand (referring to learning on demand).
Reference to agile learning	Although organised, employees are free to choose whether and which meeting they attend (self-directed). The meetings are often concluded with discussions about what it can mean for one's own work, for example, how research results on educational topics can be used in everyday educational practice (action-oriented / capacity to act). The discussions stimulate social learning.
Level of implementation:	Implemented at the level of the department/academy.
Level of roll-out:	Meant for employees of the Academy of Education, although others are be welcomed as well.
Main aim:	The main aim of these meetings is to share knowledge about specific (mostly) work-related topics, theoretical but often also providing examples of how to use in own work practice. Eg., a lunch meeting where a researcher presents about research results on how starting teachers can be supported in their first years of teaching experience, in order to prevent them from leaving the profession.
Background and rationale:	The meetings were initiated after realising that (individual or division-specific) work-related knowledge is often not shared, while a lot can be useful for all employees within the academy. The meetings are organized in such a way that as many employees as possible are able to attend them, using for example lunch breaks (sometimes lunch is also provided). The subject of a meeting will be shared by e-mail well in advance.
Main beneficiaries:	Employees of the Academy
Stakeholders involved:	Employees of the Academy (different)
Set-up / Main processes:	Unknown
Main processes:	Usually two employees organise the meetings, by asking a colleague to present or organise a workshop (or something like it). A date and

	time are arranged, and all is communicated by e-mail to all other colleagues.
Methods used:	T-he success of the meetings as 'learning interventions' has to do with the recognized relevance of the topic/subject matter (on demand or common contemporary issues), the opportunity to (voluntarily) take part at a convenient moment and keeping meetings short in duration, and the exchange with colleagues – from other divisions and different professions as well.
Possible shortcomings:	Although open to all employees of the Academy, participants of the meetings are often the same – a small part of the total number of employees. Meetings do also differ in their setup; some can be rather theoretical and less action-oriented.
Financed by:	The Academy of Education.
Transferability:	Easily transferable to other organisations.
Sources	Interview.

5. Comparative Analysis and Outlook

5.1. Agile learning in modern education systems

The term 'lifelong learning' has been dominating the European discussion on effective and modern educational and training systems for the last 20 years now and is still up to date. This term does not only reflect to the fast-changing competence needs in modern 'knowledge societies', but also to effective educational systems.[1] In an ever-changing society and economic environment with high influence of technological developments (IT, communication), related production measures (IoT, Industry 4.0) and new forms of services (also often driven by technologies like the so-called "platform economy") knowledge and competences are of crucial importance but show much less stability over time. Modern European educational systems need to be reflective, adaptive, lean governed, and consider prior knowledge and existing competences. Learning should therefore take into account the different learning objectives and different learning motivations (not only from learners, but also from society and employers).

Especially vocational education and training (initial VET as well as continuing VET) is often confronted with newly emerging production and service technologies (new materials, new machines), and with a growing number of regulations and support structures for clients, competitors, public authorities, and societies. The so-called 'half-life' (i.e. actual relevance) of knowledge is shortened by these developments.

This leads to the necessity of new formats of education and training, where 'action oriented and agile education' plays an increasingly important role: This goes alongside a crisis of traditional educational and training formats combined with the need to address the experiences and knowledge base of learners themselves. Putting the learners in the focus makes it clear that there is hardly any broad competence base that would serve as entry qualification, especially when it comes to learning in new production settings and service structures. Learning must take place in a way that allows for adaptability (to get insight into new topics quickly), connectivity (to the own knowledge base, to the working environment) and scalability (to allow learning in a limited number of hours up to some months)[2]. For the HoWARP project, we previously defined agile learning as follows:

- short-term learning opportunities
- with short but recurring learning episodes
- including reflection cycles
- learning in day-to-day work situations
- self-organised learning in a team
- for continuous improvement of skills

This includes the goal of learning in a resource-optimized way (both for employers and employees): directly on the job, or on case studies of the job, so that skills and knowledge needed on the job may directly be applied.

[1] Cedefop (2019). The changing nature and role of vocational education and training in Europe. Volume 7: VET from a lifelong learning perspective: continuing VET concepts, providers and participants in Europe 1995-2015. Luxembourg: Publications Office. Cedefop research paper; No 74. http://data.europa.eu/doi/10.2801/357

[2] Jörg Longmuss, Gabriele Korge, Agnes Bauer, Benjamin Höhne (2021) (Ed.): Agiles Lernen im Unternehmen. Springer Vieweg, Open Access.

Based on current research[3], we differentiate between the following three 'functions of learning' in further education[4]:

Conditional learning refers to the achievement of the minimum requirements (competences) one needs in order to participate fully in society and in the labor market.[5] In a broad sense this concerns social participation. In a narrower sense, this is about conditions for being economically active - to function in the labor market or to gain access to a job. This access is formalized through diplomas and certificates. Sometimes this vocational or higher education needs to be supplemented with certificates, such as a driving license (for truck, forklift, etc.), first aid diplomas, and safety certificates. Schooling can be a precondition for sustainable participation, for example for immigrants or for people without schooling. Conditional learning in education also happens when job losses are imminent or because a different career path is aspired.

Learning also takes place in order to keep up with the fast and continuous socio-cultural and economic changes: ***reactive learning.*** These developments require keeping up to date in order to remain a participant in society and in the labor market. In a narrow sense, it is about learning new skills in order to continue to practice the profession, in a broad sense, about continuing to learn in and for a changing social system. Employees (and organisations) are often confronted with, for example, new technology and different work processes and procedures. Reactive learning often takes place while working, by exchanging experiences - a form of informal learning. In addition, (formal) training programmes or courses are offered, also when changes require additional learning paths from employees. Reactive learning is often paid for by the employer.

Proactive learning: Learning as a proactive process is linked to the initiation of developments, i.e. anticipating and steering economic and socio-cultural developments. Proactive learning thus refers to learning during change processes or innovation initiatives. It concerns search- and learning processes, the outcomes of which are uncertain – trying to organise learning processes without having clear learning outcomes/objectives. This learning usually takes place in processes aimed at innovation or improvement of work processes and products.[6]

Proactive learning means preparing for new, often not yet fully know future tasks and for personal development into a new field of work, where even the entrance criteria ("what should they know if they want to participate?") are difficult to determine. Learning objectives ("What is indispensable, what is optional?") are less clear. Individual progress and adaptability are what counts.

5.2. Indicators

Based on these definitions of IO1, IO2 seeks to provide further insight into the topic of agile learning by introducing best practice examples which follow the criteria described, in differing ways. For this purpose, indicators for comparing agile learning examples were developed which include the descriptors mentioned above:

- **Sector / Field:**

[3] Nieuwenhuis, Gielen & Nijman, 2018
[4] apart from 'basic learning', which aims at transporting the fundamentals of a subject and is rather close or even identical to initial education and training.
[5] Nieuwenhuis, Gielen & Nijman, 2018
[6] Ibid.

We follow the hypothesis that action oriented agile learning especially plays an important role in sectors or professional fields with a short 'half-life' of knowledge, as they are fast changing or totally new and therefore under-represented in traditional educational formats. In IO2 this leads to fields with the following characteristics:

- concrete professional training
- modern, complex, innovative and rapidly changing environments and knowledge
- fields where different professions work on a larger common goal

Whereas the case studies still show a variety of fields and sectors, for the following steps of the Erasmus+ project HoWARP we will mainly concentrate on a sector which very well reflects all of the above-mentioned criteria, the energy-efficient buildings sector.

- **Target Groups:**

Choosing a learner-centred approach, also in terms of educational research, makes it necessary to have a target group-specific approach, which is still leaving room for the reflection of different individual experiences and knowledge bases.

At this point, a distinction between three 'functions of learning' might be helpful: as described in 5.1., we differentiate between conditional, reactive and proactive learning. For HoWARP, mirrored in the examples described, the distinction and connection between conditional, reactive and proactive learning is the most relevant – where reactive learning provides opportunities to certify acquired competences while reactive learning prospers from active participation and communities of practice.

As learning in continuing education becomes more and more individualised, the prior knowledge and experience of each participant has to be taken into account as well as the individual learning speed and the personal learning goals. By this, a learning event has to be adapted in many ways, not only to the target group in general – which is common also in traditional CVET – but also individually to each specific group of participants. These adaptations are at the same time the main challenge for the agile learning approach and, if they happen to work appropriately, its main advantage over more traditional learning systems.

How to make these adaptations time- and cost-efficient and still suitable for the learners will be the core question for the following steps of the HoWARP project.

- **Connection to formal education systems:**

This connection is important to be reflected especially when traditional learning formats are in crisis. There is still a need of connecting new learning formats to formal and non-formal education systems in terms of accreditation and acknowledgement. Recognition of individual learning pathways may also be needed to effectively show the availability of specific skills and competences e.g. to negotiate better income. However, this is usually more relevant for the learner than for the employer.[7]

This need of accreditation and acknowledgement is particularly important when safety standards and / or legal requirements are involved. Here the employers are often forced to document that the employees received a specific instruction or passed a defined examination. Since this is usually

[7] Cedefop (2020): Perceptions on adult learning and continuing vocational education and training in Europe. p.4 (https://www.cedefop.europa.eu/en/publications-and-resources/publications/3086)

closely connected with a standardised curriculum, agile learning formats do not fit well, as they rather emphasize the acquisition of competences than teaching a pre-defined set of knowledge.

In the case of the proactive learning described above, to which agile learning formats are tailored, it is often difficult to determine the exact learning results in terms of a body of knowledge. The learning takes the form of 'an individual journey with individual results'.

Remarkably, this coincides with a new development regarding certification: according to practitioners from different sectors and qualification levels within the building sector, certificates are losing importance.[8] Employers as well as contractors from private companies (not the state as employer or contractor) often rather ask for competences than for certification. A reason for this might be the fast change of the required expertise (see above), but also the rising number of construction workers from abroad[9] with very different histories of formal and non-formal education and training. This development opens doors for more agile learning settings.

Most of the challenges for implementing agile learning formats also apply to traditional learning providers such as schools and universities. Very often they are not used to rapidly changing curricula, nor able to react quickly to employers', societies' and employees' needs. The question of defining and measuring learning success is another relevant issue. Agile learning may therefore at best take place in some modules of curricula, as an additional learning format or a new form of didactics, but would hardly cover full curricular pathways.

- **Type of agile intervention: systemic or methodological**

The selected case studies may reflect agile learning in two different ways: on a more systemic level, meaning that the structure and design of the initiative follow the agile principles laid out above, or on a methodological level, meaning that agile learning formats are being used.

Interestingly, a tendency can be observed that brings together both aspects. For example, in new projects of the HoWARP partner ecoplus the border between 'teachers' and 'learners' becomes blurred. If the subject of a CVET-seminar is very new and not yet well-established, the 'teacher' has often not yet mastered this subject fully themselves. Instead, she or he depends on contributions and examples of practice from advanced participants. In some cases, CVET-'seminars' are even rather a joint development of new ideas and insights than a traditional learning setting. The 'teacher' then basically takes up the role as a moderator and by no means the traditional lecturer. These seminars then tend to follow the agile principles as well as using agile learning formats. This can also be interpreted as an example of proactive learning: stimulating and facilitating learning processes/cooperative learning (with a teacher as coach) without clear learning objectives.

- **Timing:**

[8] The term "Certification" is used for several types of certificates. A differentiation can be made according to the institution who awards the certificate: there are institutes with and without accreditation/quality assurance system. By accreditation we understand the formal approval by an authoritative body, that a conformity assessment body fulfils the relevant requirements for qualification and equipment and thus is regarded as competent. Another way of differentiation is to differentiate between mandatory and non-mandatory certifications. Regarding the construction sector, most of safety-relevant works require certificates, in the other fields certificates are non-mandatory but may be related e.g. to warranty issues.

[9] See e.g. https://ec.europa.eu/growth/sectors/construction/observatory_en

We understand agile learning as more independent from traditional learning settings, mainly through offering short term learning opportunities and short recurring learning cycles – see also the last paragraph in 'connection to formal education systems'.

- **Methods of learning:**

Indicators for agile learning regarding the form of learning include:

- Learning in work situations
- Self-organised learning in teams
- Repeated reflexion cycles
- Possibility of continuous improvement of skills

5.3 Characteristics of the presented examples

Comparing the case studies and good practices regarding the indicators laid out in the previous chapter, we can see that the **sectors** represented show a substantial variety, including IT, medicine and pharmaceutics, construction, engineering and manufacturing, education, logistics, as well as one initiative aimed at SMEs in general, with regional focuses. This shows that our characteristics definitions of:

- Short/limited 'half-life' of knowledge
- concrete professional training
- modern, complex, innovative and rapidly changing environments and knowledge
- fields where different professions work on a larger common goal

are more wide-spread than one might initially expect.

The main **target groups** of the agile interventions consist of employees at various stages (newly hired employees, apprentices, employees in management positions). It can therefore not be derived that there would be any specific group of employees specifically prone to agile learning interventions. Rather, as stated earlier, the importance lies in ensuring an appropriate learner-centeredness and possibility to 'pick up the learner where they stand', taking into account their prior knowledge and building on it.

Regarding the **connectedness to formal education systems**, it becomes obvious that most of the described examples, except the ones describing the use of agile methods within the formal education system (AT5) and the non-formal CVET system (AT4) are not clearly connected to formal education systems, nor do they tend to provide any form of certification, even though some of them coincidentally take place within the formal system (NL4) or are carried out by formal system institutions (DE4). Certification, other than proof of attendance, is provided by very few of the described initiatives, mainly by AT1 – which primarily makes use of non-agile learning formats while being set-up in an agile way. Thus, currently it appears as though agile learning is mostly used in informal learning, with some of them having non-formal value within the organization or the sector, even without certification.

The first column of Table 1 shows the **type of intervention** the case studies and good practices refer to. Most of them are systemic – thus describing the overall approach to learning as agile, rather than

the teaching methods. This is especially the case in the Austrian case studies, which describe an agile attitude towards the process, which reacts to general learning demands by either companies or individual learners. The German examples all describe agile approaches using agile methods as well, whereas the Dutch examples mainly include interventions which are based on agile methods being implemented, in the form of mobile applications. Due to the low number of examples, these differences are rather coincidental and do not describe national differences.

The colored columns show which of the criteria according to the projects' definition of agile learning are fulfilled by the initiative, and which are not, or only partly fulfilled.

When it comes to the **timing of learning**, all described examples refer to short-term learning opportunities which happen – at least partially – in short recurring learning cycles. The **methods of learning** used all strive for the continuous improvement of skills, but they do so in different ways. It becomes evident that agile interventions based only on methodology are self-directed, but most often lack the additional aspect of social learning/learning in a team. This mainly refers to the described mobile applications.

Some of the more systemic approaches, however, inherently lack the embeddedness into work-processes, as they are provided externally and are often only partly taking place at the workplace, rather using work-based problems as the basis for case studies (AT2, AT4, AT5).

The importance of reflexion cycles is visible: almost all of the described initiatives refer to some kind of reflexion within their learning processes, some rather on a system level than an individual level, most on both.

Table 1: Comparison of examples of good practice in the partner countries

	Type of agile intervention	Timing		Methods			
		Short-term learning opportunities	Short recurring learning	Reflexion cycles	Learning in work situations	Self-organised learning in a team	Continuous improvement of skills
AT1	Systemic	Yes	partly	partly	no	yes	yes
AT2	systemic, partly methodological	Yes	yes	yes	yes	yes	yes
AT3	Methodological	Yes	yes	yes	Yes	no	yes
AT4	Systemic	Yes	partly	partly	no	partly	yes
AT5	Systemic	Yes	partly	partly	no	partly	yes
DE1	systemic and methodological	Yes	yes	yes	yes	yes	yes
DE2	systemic and methodological	Yes	yes	yes	yes	yes	yes
DE3	systemic and methodological	Yes	yes	yes	yes	yes	yes
D4	systemic and methodological	yes	yes	yes	yes	yes	yes
NL1	Methodological	yes	yes	yes	yes	no	yes
NL2	systemic and methodological	yes	yes	yes	yes	yes	yes
NL3	Methodological	yes	yes	yes	yes	no	yes
NL4	systemic and methodological	yes	yes	no	no	yes	yes

Regarding the **methods of agile learning** used in the examples, they reflect a wide range of types:

- system-level ('systemic') agile reactions to training needs (AT1)
- an established (often external) format which reacts to the training needs in an agile way (AT1, AT2 and NL4, though being internal, but not directly included into the work process)

- a complete ‘agile learning toolbox’:
    - including backlogs
    - sprints
    - Kanban boards (DE1-4)
    - IT solutions such as ‘Slack’
- singular interventions in the form of microlearning apps (AT3, NL1, NL3)

All of these forms will have to be taken into consideration for the further development of the project, the description of methods and the curriculum design.

6. References

Allard Droste (Aldowa): 'Ons geheim? Dat we niemand als klein kind behandelen' ('Our secret? That we don't treat anyone like a child'). Retreived at 10-09-2020 from: https://www.mt.nl/made-in-nl/bedrijfsvoering/allard-droste-aldowa-ons-geheim/

Cedefop (2020): Perceptions on adult learning and continuing vocational education and training in Europe. p.4, available online: https://www.cedefop.europa.eu/en/publications-and-resources/publications/3086)

Cedefop (2019). The changing nature and role of vocational education and training in Europe. Volume 7: VET from a lifelong learning perspective: continuing VET concepts, providers and participants in Europe 1995-2015. Luxembourg: Publications Office. Cedefop research paper; No 74.; available online: http://data.europa.eu/doi/10.2801/357

Heijboer, M., & Rijndorp, S. (2018): Werkplekleren in de techniek. (Workplace learning in technology). Triamfloat.

Höhne, B. & Longmuss, J. (2017): Agile Learning for Vocationally Trained Expert Workers. Expanding Workplace-based Learning One Sprint at a Time, DOI: 10.1016/j.promfg.2017.04.003

Longmuß, J. / Korge, G. / Bauer, A. / Höhne, B. (2021) (eds.): Agiles Lernen im Unternehmen. Springer Vieweg, Open Access. Available online: https://link.springer.com/book/10.1007%2F978-3-662-62013-7#about

Longmuß et al. (2016): Agile learning. Bridging the gap between industry and university. A model approach to embedded learning and competence development for the future workforce. Available online at: https://www.researchgate.net/publication/317549528_Agile_learning_Bridging_the_gap_between_industry_and_university_A_model_approach_to_embedded_learning_and_competence_development_for_the_future_workforce

Ovos (2020): A simple formula: better training – less fluctuation. Available online at: https://ovos.at/en/projekte/a-simple-formula-better-training-less-fluctuation/

Wagenaar, S. (2018): Microlearning: kennis in hapklare brokken opgediend. (Microlearning: knowledge served in bite-sized chunks). Retrieved from https://www.pwnet.nl/personeelsmanagement/nieuws/2017/12/microlearning-kennis-hapklare-brokken-opgediend-10125955?io_source=www.pwnet.nl

Short-term qualification consortia (2020): https://www.oesb.at/projekte/management-consulting-gleichstellung/impuls-qualifizierungsverbuende.html; https://www.ams.at/unternehmen/personal--und-organisationsentwicklung/impuls-qualifizierungs-verbund-iqv https://www.impuls-qv.at/oberoesterreich