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SMART EDUCATION CONCEPT FOR PRODUCT DEVELOPMENT TEAMS IN AGILE INNOVATION PROJECTS

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ABSTRACT

The digital transformation is changing working as well as private and social lives through new technologies. In this context, education is a promising but little-noticed area. However, it is very important to realize and exploit the potential of this digital knowledge revolution with the central themes of lifelong learning and on-the-job trainings. As employees need to continuously develop their competences in times of frequent changes, companies need new methods and processes for the continuing training, especially in new agile approaches within the product development. One key aspect is that the social components also play a decisive role in technology-supported education processes. Therefore, the use of a smart education concept, built on digital knowledge transfer combined with practical workshops and reflection sessions, leads to an opportunity for companies to realize a systematic and distributed education of product developers based on the required competences of their individual project work. The hybrid learning approach is introduced, which is already applied within different university teaching projects. This empiric research transfers the approach with its learning process, activities and roles into a corporate education concept.

KEYWORDS

Action Learning, Engineering Education, Product Development, Hybrid Learning, Innovation Coaching

1. INTRODUCTION

Driven by extending customer requirements and the resulting complexity of the products, digital transformation is leading to globally working development teams and finally towards the current organizational change. This digital change is only possible due to the availability of new technologies to support communication and collaboration. [17] Especially in the early phase of PGE - Product Generation Engineering, the early integration of experts in the process is essential to cope with increasing product complexity.[6] Thus, the distributed and interdisciplinary collaboration not only increases the complexity but also the heterogeneity of the entire product development process. Product development teams face challenges in the areas of knowledge management, system integration and, above all, communication [16; 32; 43].

Therefore, many companies are increasingly trying to act flexible by implementing agile approaches in order to respond to the dynamic boundary conditions and to exploit the advantages of distributed product development. Based on the ASD – Agile Systems Design approach, measures have to be derived that especially address the transformation on the micro levels of the activities and the method implementation in the product development process [4]. In order to successfully master this transformation process, it is of crucial importance to aim for the integrated

consideration and inclusion of the dimensions technology, organization as well as the individual people affected by change as the center of product development. [3]

The people in product development teams are significantly responsible for the success of new products through their work. For the best organizational support the processes and methods must be adapted accordingly.[5] In addition, the teams should be composed interdisciplinary with complementary competences.[9] With regard to the social aspect of putting the human being in the center of innovation processes the approach of Innovation Coaching supports the people in agile innovation projects [19]. The so-called innovation coach enables people in development teams to apply their competencies into a flexible and structured innovation process [28]. To achieve a successful collaboration and outcome, the product developers need to apply their theoretical knowledge in practice. They need an implicit practical expertise in addition to their explicit theoretical knowledge. To gain this ability they need to master theoretical knowledge, practical expertise and reflect the interaction. [36] Digital education concepts and continuous competence trainings are two strategic elements to address the upcoming challenges of organizational changes. It is necessary to apply these elements within universities as well as corporate education programs to prepare students and employees for distributed cooperation and the use of their newly required competencies. [25]

In both cases, locally distributed and bound, the team competencies could be monitored throughout the development process in order to recognize project specific competence requirements and allow the possibility for on-the-job-trainings. With the advent of digital media, many new learning opportunities appear. In contrast to conventional approaches, parts of the theory or explicit knowledge needs no longer be conveyed by "reading aloud" in training classes but can be acquired by the learners through publicly accessible video content on demand, also known as Massive Open Online Courses (MOOCs). The content is provided by recorded video material, which can be adapted to the individual needs of the learners. Advantages are that learners and teachers do not have to be in the same geographical spot as well as the possibility to use MOOCs from external domain experts. [26] Additionally, the approach of action learning of Revans [33] offers a pedagogical method to realize the practical learning accompanying the project work to convert the theoretical knowledge from MOOCs into ability. This has been proven effective among others in case-based action learning environments within university teaching [29].

2. THEORETICAL FRAMEWORK

2.1. Competence Requirements in Agile Innovation Projects

Due to volatile changes in the market as well as rapidly changing customer requirements and therefore uncertainties in the development process of new products more and more companies apply agile approaches for their product development teams [37]. The different approaches support the development of new software products as well as mechatronic systems but lack in the conscious integration of technical and process-related knowledge [21]. The application of agile principles and methods in companies not only involves opportunities but also challenges, caused by the change and new framework conditions of today's working world especially in distributed product development [10]. This changes not only the way of work, but also the way organizations are developed. [23; 41]

Self-organized and interdisciplinary product development teams are a distinguishing element of agile approaches in product development. A self-organizing team means that the team is capable of combining the abilities of all team members in order to effectively implement the activities and tasks. They do this independently, i.e. autonomously from the principle, without any request from an external.[24] Interdisciplinary teams join members with different backgrounds and disciplines. Through cooperation in several disciplines, individual competencies are bundled, which allows complex tasks to be solved comprehensively.[9]

The competences of a team can be summarised under the term *team competence*. It is therefore a characteristic of a working group and is the prerequisite within the team for being able to act successfully. Team competence is acquired for specific social situations and includes orientation towards goals, knowledge of the action field and the possibilities as well as skills and abilities for action execution. The self-organization competence of a team is a prerequisite for strengthening motivation amongst its members, enabling room for action and carrying out one's own self-reflection. This way, the team's empowerment and integration aspects come to the center of attention. [48] Even if the team

competence is considered within the teamwork, there are potentials which can arise through an interaction between the group view and the individual view of the individual team members. Because of the growing complexity of the task requirements, the individual competences have to be considered more and more. [48] In order to become clear about one's own competences and potentials, an assessment must be made. This means that the company and its employees must be aware of what knowledge, references and skills are available and what needs to be achieved. Potentials here can generally be understood as competence deficits that can be further developed. Therefore competency models are used, which can be defined as „a detailed, behaviourally specific description of the skills and traits that employees need to be effective in a job" [27]. A competency model makes it possible to identify and compare skills that are brought into a team by employees and which are required for business activities. This way, deviations can be identified which are then eliminated by further developing the existing team competence. [30]

A variety of methods are available for recording and measuring individual competencies. Basically, a distinction can be made between quantitative and qualitative methods. Objectivity is at the centre of quantitative methods. Their aim is to make competencies uniformly measurable and assessable by using scales. Possible methods are, among others questionnaires, interviews, estimation scales, Delphi methods, checklists and systematic observation procedures or competence tests, which usually allow conclusions to be drawn about the knowledge of an individual. [12] In contrast, qualitative methods take into account the fact that a completely objective measurement of competences is not possible. They concentrate more on the structure and quality of individual competence characteristics. This is done, among other methods, through unstructured interviews or case studies. Furthermore, self-assessments, third-party-assessments or a combination of both can be carried out. Often a compromise is made between quantitative objectivity and qualitative subjectivity, so that the methods used take into account aspects of both approaches. The determination of deviations between target and actual competence profiles forms a basis for the further competence development of employees. A corresponding study reveals training needs, which can then be planned and implemented. [7; 13]

Since competencies always manifest themselves in actions and personal experiences, they can only be built up and further developed by dealing with practical problem situations. In order to further support the learning process, a coach can be consulted to help the learner develop an independent and self-responsible problem-solving behaviour. A multitude of different learning modes is conceivable for this purpose. [13]

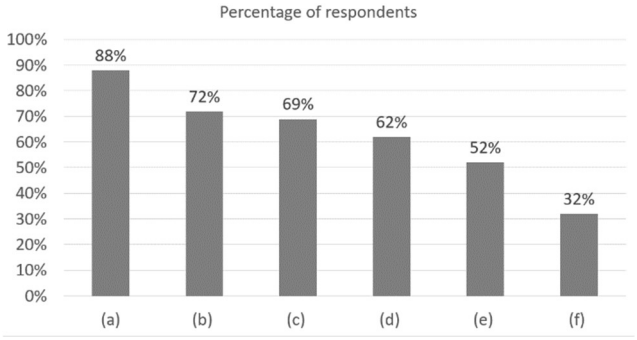
2.2. Digital Education Approaches

Technology and new business models continually disrupt almost every area of our lives, resulting in constant shifts across all segments of our society. The corporate education sector is no exception. Effective digital transformation isn't just about technology, though. It requires a willingness to adopt technology in new ways, beyond administrative process. It must be continual and evolutionary in order to enhance teaching and learning, support business processes and improve efficiency. It also necessitates collaborative working, vision and leadership, culture, process and methodology – and the technology itself. [46]

Digitalisation in particular makes frequent and continuous education of employees absolutely essential for enterprises. German companies invest more than 33 billion EURO per year in internal training solely. [40] Therefore digital education concepts are increasing as well. [44] Online- and distance learning are two of the fastest growing areas in educational development. [42]

Among several digital education approaches and Online Education Ressources (OER) like Flipped Classroom, Educational videos (e.g. on Youtube or TEDx Talk) Massive Open Online Courses (MOOC), a special form of digital social education approach, in particular have experienced rapid growth and scholarly and applied interest since their first release in 2008 (see Figure 1). [14] MOOC's are considered as a valuable tool for lifelong learning. The didactic approach of these courses derives from the connectivism teaching paradigm. This describes learning as the creation of connections between different building blocks of information. Social web features can support this process. In particular, the cooperative exchange of content in a learning community fosters the knowledge of the individual, since personal knowledge is introduced but also incorporated. This is also referred to as the cycle of knowledge. [18; 45]

New generations of employees are growing up in a globalized and digitized world. After a period of initial growth in the private sector, especially in the area of



(a) Video-based learning (YouTube type) will play a dominant role in in-company education and training.

(b) Social types of learning (e.g. MOOCs or learning communities) will become indispensable in corporate learning.

(c) In the case of paid learning offers, payment based on the degree of individual support will in future be more important than the "purchase" of learning content.

(d) Enterprises will move towards introducing social media services (such as Slack, Yammer) - with the aim of broader, cross-departmental and multi-disciplinary exchange and learning.

(e) New educational providers with innovative business models (e.g. Udacity) will lose large market shares to traditional educational providers.

(f) "Industry 4.0" will be one of the most important drivers for learning in companies in the coming years.

Figure 1: Trends in Corporate Trainings [44]

corporate training and competence-based learning environments, potential opportunities can be developed with online education resources. New service models and concepts will emerge. [47]

The continuous availability and the opportunity to access the content at any place and in different intensity is characteristic for this digital education approach. Initial research indicates that increasing availability of learning content leads to improvement among learners. [35] The courses are most successful if they are directly adapted to the work content of the respective individual and integrated into everyday working life. This integration is possible using blended learning. [15] In blended learning, educational content is provided in a combined approach of face-to-face interaction and technology respectively computer-based interaction.[8] The terms blended learning, hybrid learning and mixed-mode learning are often used interchangeably in research and emphasized according to geographical location. [31] In the process, variations of this rather broad definition are repeatedly developed. This also applies to the hybrid learning concept including the Action learning approach at the University of Applied Sciences Karlsruhe. [36]

2.3. Education Models and Approaches

Nowadays, mere factual knowledge is usually available in a matter of seconds, due to technical developments. Decisive is no longer only what people know, but whether and how they transform this knowledge into competencies in real working environments and the related challenges they face.[11] In order to be able to apply what has been learned to solve this kind of problem, the acquisition of implicit knowledge (vs. explicit) has proven to be a successful approach. [38] Action Learning is a method of imparting implicit knowledge. Usually a small group of people tries to solve a real and relevant problem while undergoing an iterative and reflective process. In this practical learning environment they encounter and resolve problems, risks and uncertainty. Within small learning communities the problems are reflected and tackled together by sharing opinions, knowledge and ideas about possible solutions. Due to the relevance of a moderation of the groups' discussion as well as some special expertise in sharing knowledge and questioning insights the role of a tutor or coach is necessary. [34; 39] But there is no predefined process to apply action learning as it is an open concept on group learning. The challenge is that each learning community needs to identify their own ways to learn and reflect [20]. In Hybrid learning, the Action Learning approach, is complemented by the exploitation of the potential of new technologies and digital education possibilities. [36]

Radical Innovation is a concept at the University of Applied Sciences Karlsruhe where hybrid learning has already been applied. The participants are confronted with the real challenge of a corporate partner to radically innovate. During an all-day workshop at the partner's location, the participants first receive detailed insights into the processes of the organization. In addition, expert interviews are conducted with various business units to obtain information regarding the company, their competencies and culture. The iterative and reflexive practical approach is complemented by theoretical content from the field of radical and disruptive innovations in the form of a MOOC. In a phase of work lasting several weeks, which takes place in exchange with the corporate partner and in discussion with the lecturers/coaches, possible solutions to the problem are elaborated in small groups. In a joint closing event, the new approaches to solve the problem are presented and

discussed. In the previous projects, concepts were developed which are pursued further in the companies and supported with additional university projects. [22]

A further application case as well as expansion of action learning is the case-based action learning course *ProVIL – Product Development in a Virtual Idea Laboratory* at the Karlsruhe Institute of Technology. [2] The students in Mechanical Engineering, Industrial Engineering and International Management acquire knowledge about innovation methods and processes by working on a real development project of an industrial partner. Guided by the ASD – Agile Systems Design approach [4] the students run their own development projects within the interdisciplinary teams, which form their learning community. In regular meetings with all teams the students learn the theoretical background of the tasks and goals of the upcoming development phase. This theoretical knowledge is deepened by some virtual on-the-job training workshops that allow the students to participate from different locations. This guided workshops mediates new knowledge or ability by applying the theory on the actual development tasks, for example in a creativity method workshop or a business model generation workshop. Results show, that the education model of *ProVIL* is highly successful in mediating competences and especially problem solving skills for interdisciplinary teamwork. [29] It expands the disciplinary, methodological and social competences of an engineer as well as elaboration and creative potential. These competences are relevant for an integrated understanding of product engineering and taught in the Karlsruhe Education Model for Product Development (KaLeP). The holistic education model is the case-based action learning environment of *ProVIL* as the implementation of knowledge, which bases on the taught theoretical knowledge in lectures and applied knowledge in laboratories beforehand. [1]

3. RESEARCH QUESTION AND METHODOLOGY

The use of a digital and smart education concept leads to an opportunity for companies to realize a systematic and distributed education of product developers based on the required competences of their individual project work. There are already teaching approaches in university innovation projects that integrate digital education approaches combined with guided learning groups for knowledge exchange in education. But there are challenges in transferring these approaches into business application. On the one hand, the identification of knowledge gaps in companies is much more complex than in the university setting, which makes systematic and individual training more difficult. In contrast to university education, where all students follow the same curriculum, the education and knowledge levels in a professional context can be very diverse and therefore an individual and personal identification of knowledge gaps is necessary. On the other hand, the relevance of the social aspects in action learning and digital education approaches is not sufficiently considered nor actively integrated into teamwork. This results in a research gap on how need-specific problem-solving skills can be digitally trained and the social aspects of digital learning can be taken into account and integrated into the work of agile development teams within corporate education concepts. The following research questions arise in more depth:

- How can the problem-solving skills of team members in a development team be trained to their specific needs and further be promoted during the project work?
- What implications does this have for the application of the Hybrid Learning concept in corporate applications?

Within the research environment of the education models and simultaneously innovation projects *Radical Innovation* and *ProVIL* at the two jointly researching universities, a smart teaching and learning concept called hybrid learning was developed in a design oriented research approach. Behind this designation is the principle of the transformation of knowledge into ability. Applying the new education approach and constantly evaluating it, with weekly questionnaires and studies regarding the mediated competences and learned abilities of the students, the approach was iteratively optimized. Therefore the resulting hybrid learning concept is based on the empirical research results of three *ProVIL* and *Radical Innovation* (2017, 2018, 2019) projects in which the students' competences were built up during the actual project work. In addition to teaching evaluation and own observations, the gain in knowledge came from the analysis of more than 51 experience reports of the innovation coaches who accompanied the teams in their work and managed their problem solving skills. The evaluation and in-depth analysis of the approach leads to answering the research questions and to an extension of the approach towards the application in companies.

4. RESULTS

4.1. Hybrid Learning concept

The Hybrid Learning concept combines the three core elements theory, practice and reflection. In a modular arrangement a learning approach is developed in order to transfer knowledge to ability. As with lifelong learning, the Hybrid Learning (HL) concept is not a start-finish process but a cyclical and iterative model (see Figure 2). Thus, both theory and practice can be starting points. In the following example of a Hybrid Learning concept at the University of Applied Sciences Karlsruhe, a theoretical element is used as a starting point for the explanation of the model.

Initially, explicit, theoretical knowledge is provided to the learners. At this point, current technologies such as MOOC's are used to transfer knowledge. The objective is to enable learners to understand and retrieve explicit knowledge. In collaborative exchanges within the learning community, the lecturer provides relevant practical experience. Based on the theoretical content, these experiences stimulate a discussion among the participants. Within the framework of this reflection, practical know-how is transferred and an important step towards the practical application of the knowledge is made. According to the Action Learning philosophy, these contents are applied to a real, unsolved problem. Within the framework of practical application, the evaluation and creation of content is taught as implicit knowledge based on own experiences during the application. In a further reflection, the content acquired is abstracted with the help of the Lecturer and linked to the explicit knowledge from theory. This analysis and evaluation of the application content leads to a theoretical knowledge. This ensures that knowledge and skills in theory and practice are acquired both explicitly and implicitly during the process.

4.2. Application of Hybrid Learning in Smart Engineering Education

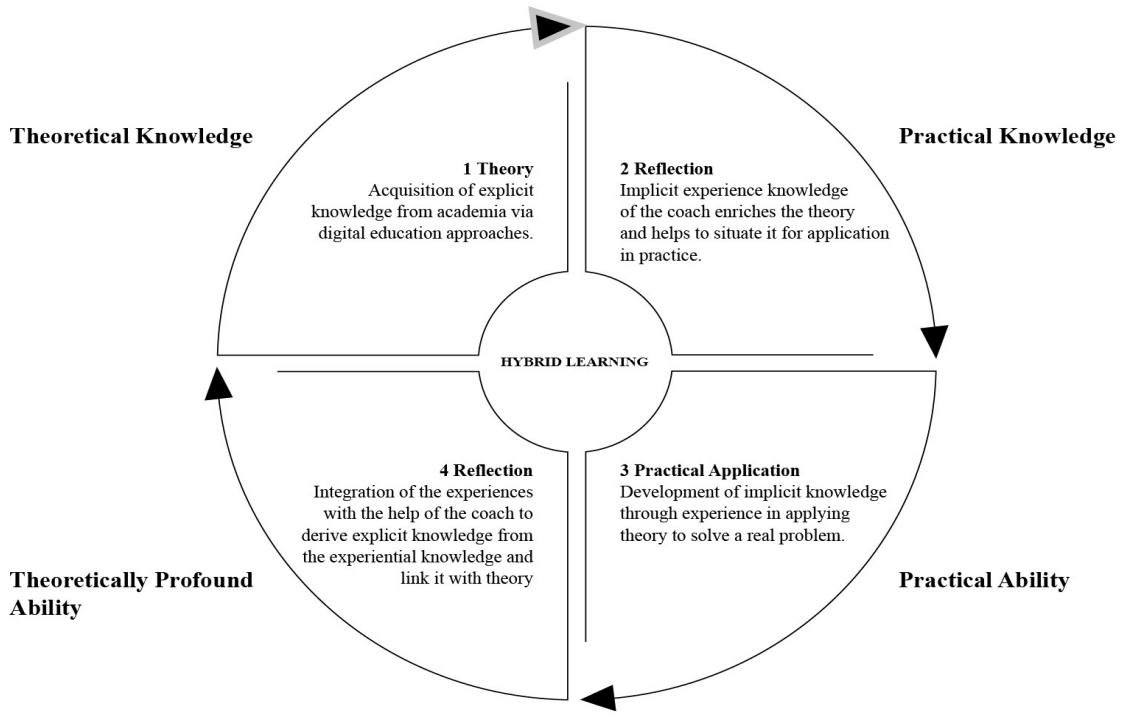


Figure 2: Hybrid Learning Concept

A first implementation of the Hybrid Learning Concept has already taken place in three iterations in the *Radical Innovation* project within the University of Applied Sciences Karlsruhe involving more than sixty students and fifteen company representatives. As already briefly described in chapter two, in cooperation with an enterprise, a real problem is

addressed in the innovation environment. More precisely in the area of radical innovation.

The lecturer is, based on the curriculum, aware of the fact that the participants have previous knowledge in the area of innovation management but knows that the participants might have competence gaps in the specific area of radical innovations. These competences are taught at the theoretical level with the help of a MOOC (theoretical knowledge) and then get reflected in a second phase within the participant community together with the lecturer (competence coaching and reflection) on the basis of practical relevance and individual experiences (practical knowledge). Once these knowledge bases have been laid, a workshop will be held at the project partners place in order to understand the real-world challenge. Within the project work the practical ability of the team competencies will be analyzed and the learnings of the participants will be discussed as well as general feedback which is recorded and evaluated. This ensures continuous development and improvement of the concept. At the conclusion of the course, the gained theoretical ability is tested by a digital examination and thus condensed.

The Hybrid Learning approach is also applied in the course *ProVIL*, a joint course of the Karlsruhe Institute of Technology (KIT) and the University of Applied Sciences Karlsruhe, involving more than fifty students in seven to eight development teams every year. The teaching of the theoretical knowledge is done by several small kick-off events at the beginning of each development phase as well as online video tutorials and virtual workshops on the digital innovation platform to train the phase-specific needed

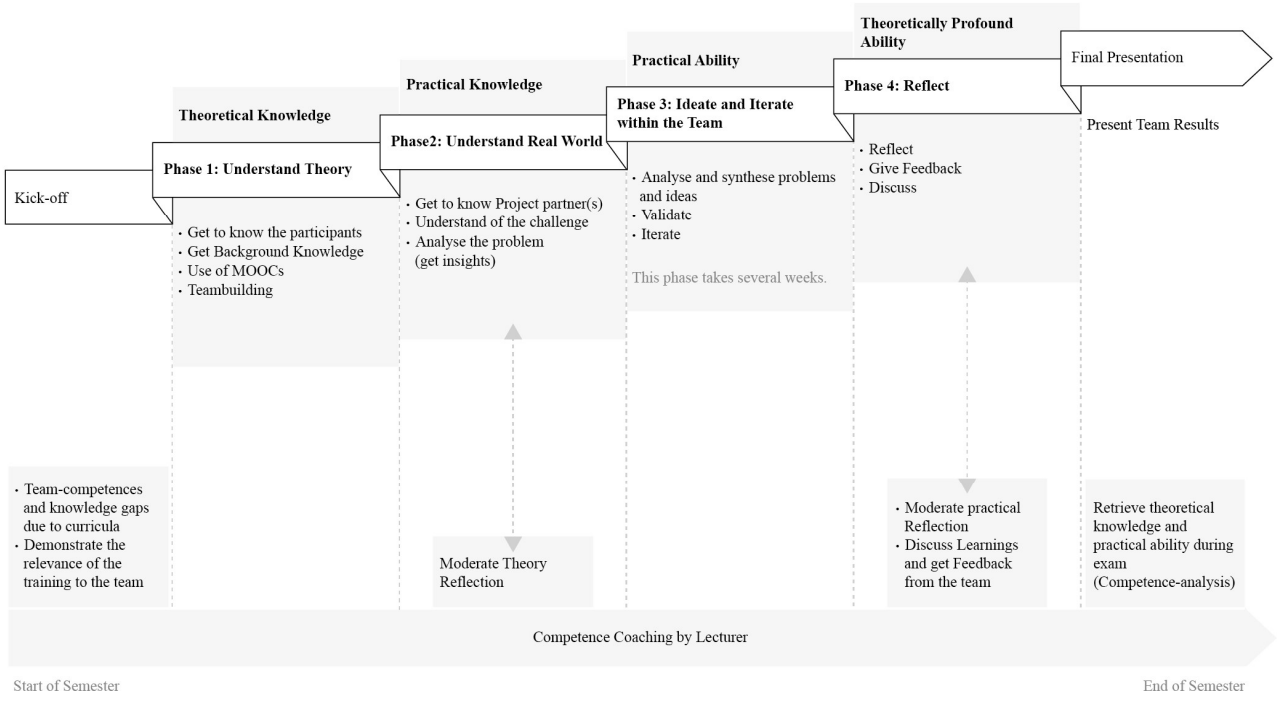


Figure 3: Radical Innovation Project based on Hybrid Learning

participants is accelerated. The teams apply the learned content from phase one and two immediately by going through the iterative ideation and validation phase of the radical innovation or product development project. In the fourth phase, the practical experience achieved in phase three and the teamwork will be reflected. In cooperation with the lecturer, a connection to the theoretical contents from phase one will be established. Subsequently, the newly acquired knowledge. Therefore, the innovation platform includes various digital elements: Team-specific digital workplaces helps the team to meet virtually to work on their tasks without meeting physically as well as to serve as virtual data storages. The integration of communication tools like skype as well as task planning tools as Jira allow a simplified communication and distribution of tasks. In comparison to the *Radical Innovation* project, where

the lecturer moderates and reflects the knowledge, the development teams in *ProVIL* have an integrated innovation coach as team member. He is taking over this tasks by moderating e.g. the creativity methods conducted on the digital innovation platform as well by providing and evaluating the online questionnaires to identify the knowledge gaps and the self-reflection. His aim is to increase the creativity and problem-solving potential of the team during the project work, through the promotion of self-reflection of the team and personal feedback.

Regarding the action learning approach, the knowledge transfer occurs during the activities and workshops of the distributed development process. Based on the ASD – Agile Systems Design process, the students generate new inventions with high innovation potential in cooperation with an industrial partner who sets the development challenge. The interdisciplinary teams are working together in a digital collaboration tool where they carry out creativity and development methods in virtual spaces. In order to take into account the social component of digital learning, some joint training sessions are conducted in which methodological knowledge is taught theoretically and is applied directly in practice through the students individual project work (see Figure 4) The combination of distributed collaboration and virtual workspaces with the personal interaction within the training sessions increases the social competence and digital literacy of the engineers. This is particularly important in the interaction between people, technology and organization, which has an even more important role in distributed product development due to the changed boundary conditions. The implemented education model enables the students to gain theoretical abilities and to fit their complementary competences in order to solve problems and generate inventions with high innovation potential.

4.3. Smart Corporate Education Concept

Based on the Hybrid Learning concept and the learnings from applying this concept in student's real-world innovation projects a smart corporate education concept is developed to transfer the existing approaches to entrepreneurial use cases. In reference to the action learning approach a combination of experience-based and action-oriented learning is implemented, so that every participant gains his own practical experience (see figure 5). The participants act within the framework of the actual project work of the development team in order to achieve the project as well as learning goals at the same time. The learning process is guided and accompanied by an innovation coach, who supports the reflection process of the

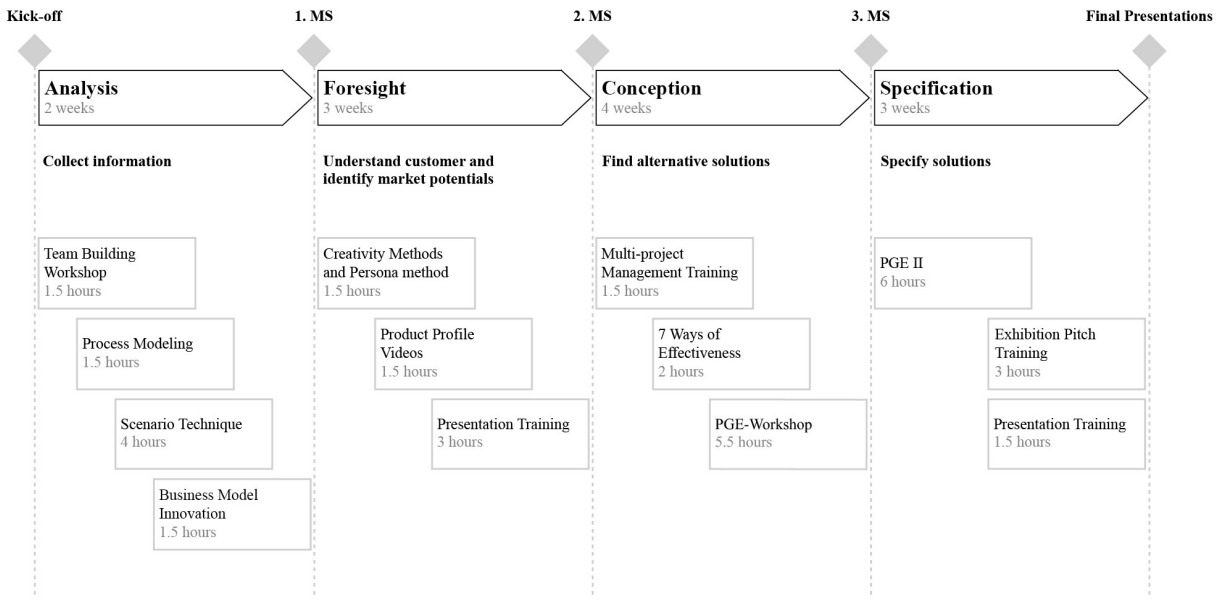


Figure 4: Additional Training Sessions in ProVIL

learning group and guides the teams during so-called InnoAction Workshops. The encouraged social interaction leads to higher motivation towards the absorption of knowledge and exchange of practical experience.

Within the aim of a systematic development of competencies during real innovation projects, a first important step is the determination of competency requirements that significantly affect the abilities of the product developers. Furthermore the identification of knowledge gaps is pivotal and can be done by applying a modular competence model regarding the disciplinary, methodological and social competences as well as elaboration and creative potential of the KaLeP. By exploiting qualitative and quantitative studies the innovation coach uses the competency model, which supports the identification of relevant competency requirements within the team. With the resulting training goals, the innovation coach demonstrates the relevance of the upcoming trainings to the team in order to increase their learning motivation.

After the preparation und motivation of the team upfront, the Smart Corporate Education Concept starts with the acquisition of theoretical knowledge via digital education approaches, such as MOOC's. Within reflection sessions, which are moderated by the innovation coach, the knowledge gets enriched by joint discussions and is linked to the application in practice. The implicit experience knowledge of the coach enriches the theory and helps the team to reflect.

Since competencies always manifest themselves in practical applications of the theory, they can only be built by dealing with real cases. In InnoAction Workshops the development teams apply the learned methods and theories. They are encouraged to reflect and mix up the new learnings with their personal experience and knowledge in order to bridge the lack of information. This ensures an informal gain in competence through the confrontation with a real and unsolved task. The innovation coach helps the participants to develop an independent and self-responsible problem-solving behaviour. As an example, one of the InnoAction workshops conducted, focused on the development of promising product profiles for the respective innovation task. Hence, each team got a set of 17 process steps on the platform *JIRA*, which is useful to develop product profiles. These were used for project planning and through the application of the process the teams face real-world problems of innovation process planning within a short period of time. At the end, each team analysed their applied process to improve their process planning ability. The evaluation results showed, that

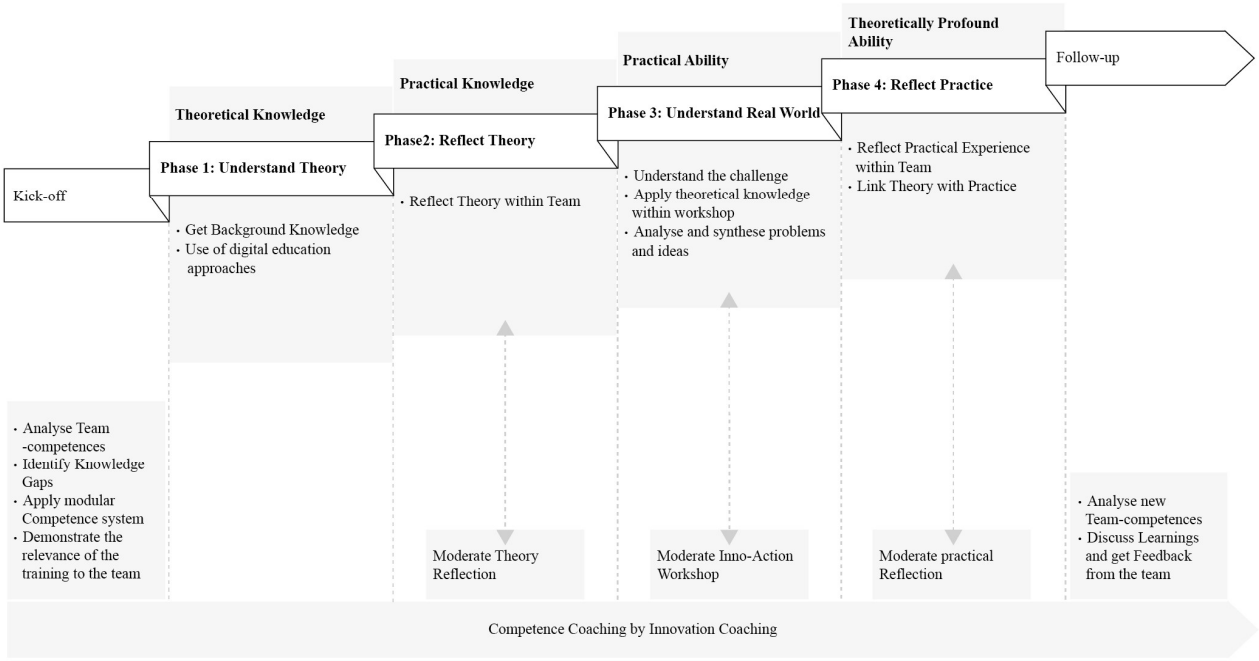


Figure 5: Smart Corporate Education Concept based on Hybrid Learning

especially unexperienced developers gained new competences in innovation management and assured that they will be able to apply the learned practices, e.g. developing product profiles or using a creativity method, in upcoming projects.

Due to the InnoAction Workshops the teams developed implicit knowledge through experience in applying the theory while solving a real problem. During reflecting the practical experience within moderated discussions, the teams derived explicit knowledge from the experiential knowledge and were able to link it with their theoretical knowledge. This retrospective view, regarding the learned theory and their own experiences lead to theoretical profound abilities.

During the continuous process, the innovation coach analyses the team competences afterwards in respect to the upcoming tasks and in order to identify further training possibilities. Therefore, the coach supports the problem-solving capability of the team in the upcoming development activities.

The application of the Hybrid Learning concept in corporate use cases implicates the strategic combination of actual project work with corporate trainings. To support the competence development process and the iterative reflection in social learning groups, a dedicated role needs to be implemented to manage and observe the development of competences. This can be done by the integration of an internal innovation coach, who is part of the team and supports the problem-solving capabilities within agile innovation projects.

5. CONCLUSION

Creating an effective digital learning environment is not just about offering convenience and familiarity to learners. However, the use of a digital and smart education concepts leads to an opportunity for companies to realize a systematic and distributed education of product developers based on the required competences of their individual project work. The presented Hybrid Learning approach creates a digital learning environment to train the problem-solving capabilities of learners in interdisciplinary development teams which can be applied in university teaching as well as corporate trainings. For the realization, a first step is the identification of knowledge gaps via personal assessment of a coach. The missing competence will be trained trough the mediation of theoretical knowledge from digital educational videos and the following practical application in workshops. Promoted and moderated learning communities deepen the competences towards theoretical profound abilities of the learners. The implementation of innovation coaches in corporates aims to increase the team's ability to solve problems through their competence coaching and considers the social component of learning.

In conclusion, the Hybrid Learning concept is based on five principles, as shown in figure 6. These are: the education process within a social learning community trough interdisciplinary teams, theoretical knowledge mediation trough digital education approaches, real project work to apply the gained knowledge in guided trainings and to foster the motivation of the learners, reflection and discussion of the experiences and a coach who supports the team during the process steps of the Hybrid Learning concept.

Figure 6: Principles of Hybrid Learning

6. DISCUSSION AND OUTLOOK

The results of this contribution show the successful application of the Hybrid Learning concept in two education models which are simultaneously innovation projects, *Radical Innovation* and *ProVIL*. They enable the participating students to increase their personal competences through the combination of the three core elements theory, practice and reflection. Based on the Hybrid Learning concept and the learnings from applying this concept in university teaching, real-world and problem-solving innovation projects, a smart corporate education concept was developed to transfer the existing approaches to entrepreneurial use cases. The use of a digital and smart education concept leads to an opportunity for companies to realize a systematic and distributed education of product developers based on the required competences of their individual project work. This also gives the chance to combine project work and on-the-job education at the same time, which provides a way to solve the problem of further education outside the job within daily or weekly courses.

By implementing the smart corporate education concept in companies, limitations as the necessary time effort to set up and apply the Hybrid Learning

concept within the actual project, the employer´s motivation, the availability of digital learning tools as well as the availability and integration of an innovation coach need to be taken into account to ensure a successful realization. Furthermore the Hybrid Learning concept could be used as a complementary set up to existing corporate training concepts. Regarding these limitations, the smart corporate education concept needs to be validated in real corporate application. Further research is needed in order to adjust the concept of Hybrid Learning for corporate use. Possible use cases for this research might be the application of Hybrid Learning for innovation challenges within corporates. Another possibility is the adjustment of the concept regarding individual education programs for employees or even for the use of training concepts for the corporates' customers. This will be done by the setup of an individual education concept for a past project partner of the radical innovation project.

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