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Situation- and need-based method recommendation for coaching agile development teams

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Abstract

Interdisciplinary product development teams are responsible for the solution of complex problems and the creation of innovative ideas. Innovation Coaching within the approach of ASD-Agile Systems Design fosters agile product development processes by realizing agility in the work of development teams. With the aim to implement ASD-Innovation Coaching in practice, a support is needed to enable coaches to select and apply coaching methods based on the team´s situation and need. Within a systematic literature review, 217 proven coaching methods were identified and evaluated regarding their applicability and success in product development projects. Based on specific quality criteria a total of 51 methods are selected and presented in a systematic and intuitive process model.

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Keywords: Agile Product Development; ASD – Agile System Design; Innovation Coaching; Method Selection; Coaching Process

1. Introduction

To handle the dynamic and uncertain phases of product development, agile approaches are increasingly implemented in organisational structures and the daily work of development teams [1]. To meet arising demands the approach of ASD - Agile Systems Design provides a conceptual basis to handle structuring and flexible elements in the product development process in a systematic matter [2]. However, the basis for success is to develop as a self-organising team and being able to react flexibly to spontaneous changes. A solution approach is the ASD-Innovation Coaching framework, which aims at supporting the team's ability to innovate, solve problems and reflect on their own, in order to achieve best results in the product development process. It is provided by an internal coach of an organization and follows the paradigm of systems engineering [3]. Within this framework and the progress of coaching in the recent years, coaching is increasingly aimed at individuals and groups who contribute the highest share to the value chain, such as agile teams. These interdisciplinary and self-managing teams need support as they are responsible for the solution of complex problems and at the same time face the challenge of finding and developing themselves as a team as well as being able to react flexibly to spontaneous changes [4,5]. However, there is the challenge that existing coaching methods mainly refer to individual business coaching for managers by an external consultant. Accordingly, most of the existing instruments and models in coaching are adapted for use in individual coaching and mainly relate to the promotion of leadership and management skills [6].

Within the coaching of agile teams, the challenge occurs to apply generically described activities and handle the variety of different coaching methods to be selected from according to the situation and needs of the team. Therefore, a systematic approach is needed to support coaches to select and implement the right methods at the right time, regarding the context of the development work [3]. As a prescriptive study, this research answers which existing methods of business and agile coaching

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can be transferred to the internal coaching of agile development teams in industrial product development. Furthermore, a systematic and intuitive process model is developed to present in which ASD-Innovation Coaching activities and problem-solving phases these methods can be used.

2. Theoretical Framework

2.1. Agile Innovation Processes

Agile approaches have found their way into innovation processes of manufacturing companies for a while [7]. The core of agile working is the short cyclical development and continuous validation of products under a continuous adaptation of plans [5]. However, new challenges usually arise, since these approaches (e.g. Scrum) are often based on the culture of software development and lead to new risks in the environment of physical product development [7–9]. This makes a successful implementation in the processes of the companies difficult [10]. Besides, since every application of agile approaches has an individual purpose, approaches must be adapted to the context [11,12]. This problem is addressed by the approach of ASD - Agile Systems Design [2]. It is based on 9 basic principles for agile development of mechatronic systems [13]:

- *The developer is the center of product development*
- *Each product development process is unique*
- *Agile, situation- and demand-oriented combination of structuring and flexible elements*
- *Each process element can be located in the system triple and each activity is based on the fundamental operators analysis and synthesis*
- *All activities in product engineering are to be understood as a problem-solving process*
- *Each product is developed on the basis of references*
- *Product profiles, invention and business model form the necessary components of the innovation process*
- *Early and continuous validation serves the purpose of continuous comparison between the problem and its solution*
- *For a situation- and demand-oriented support in every development project, methods and processes must be scalable, fractal and adaptable*

The principles serve as guidelines and are introduced into the development process by a suitable and individual selection of methods as well as structuring and flexible process elements [14]. A central method in ASD is the SPALTEN problem solving process. It structures the problem-solving process into continuous recurring cycles of information generation and aggregation. SPALTEN is an acronym that stands in the German language for the 7 problem solving activities *situation analysis* (**S**ituationsanalyse), *problem containment* (**P**roblemeingrenzung), *alternative solutions* (**A**lternative Lösungen), *solution selection* (**L**ösungsauswahl), *consequence analysis* (**T**ragweitenanalyse), *decision and implementation* (**E**ntscheiden und Umsetzen) and *recapitulate and learn* (**N**achbereiten und Lernen) [15]. For example, the SPALTEN process can be used to model product engineering processes to support the individual product engineering activities. Thus, specific development methods can be assigned to these activities to support them. In the iPeM - integrated Product engineering Model, product engineering processes can thus be modelled and activities can be represented iteratively. In addition, the product development is modelled in an integrated way, so that in addition to the development of product generations, the development of the corresponding validation system, the associated production system and the strategy can also be represented. In this way, for example, the resources of an organisation can be considered in their entirety for product development and dependencies can be recognised early on [16].

2.2. Coaching

Coaching aims at enabling people to reach a certain goal [17]. Since the word *coaching* is not a protected term, there are many different definitions and concepts in literature and in practice [18]. However, these show a common basic understanding of coaching as a form of consultancy in which the coach takes on the role of a process consultant. The coach does not act as an expert, but rather intends to help people to help themselves through the targeted control of processes [19,20]. In the increasing popularisation of job-related coaching, different facets of coaching have developed like agile-, executive- or business coaching [18].

Regarding the coaching perspective, two different forms can be distinguished, which are used in business coaching. For an organisation, external coaching has the advantage of a high degree of neutrality and impartiality, but the challenge of a low level of familiarity and knowledge of corporate culture, policies and processes, which can have a negative impact on the coaching process [21,22]. Internal coaching includes employees who distinguish themselves through their affiliation to an organisation and therefore has the advantage of internal knowledge and networks [23].

The coaching setting describes the constellation of persons within the coaching and can be differentiated between the one-on-one coaching as well as group and team coaching [18]. Whenever coaching is mentioned in the literature or in practice, this usually implies the individual, one-on-one coaching, since this is most widespread in its practical application [21]. In contrast to the setting of individual coaching, coaching in groups or teams offers less space for dealing with confidential or personal issues of a person. On the other hand, synergy effects can be created, as the participants can mutually benefit from their different experiences, perspectives and knowledge [21,22]. Coaching a team with joint objectives and tasks has become particularly popular at middle and lower levels of organisations and is very suitable for implementation with internal coaches. The focus of team coaching is in the area of team development, especially in the promotion of communication, motivation and cooperation [21].

Since coaching has developed from practical application, it is not based on a scientifically founded theory of its own. It makes use of the theories and methods of related professions, such as psychology, psychotherapy, philosophy as well as economics and management theory [20,24]. Each of these sciences has its own framework concepts and practices, which brings its own strengths and qualities to coaching [25]. The empirical scientific theories presented by Stober and Grant [25] are recognised as fundamental coaching knowledge in the context of the

"Evidence Based Coaching Handbook" which comprise four main theories:

- The humanistic approach with focus on feelings [26]
- The cognitive approach with focus on thoughts [27]
- The behavioral approach with focus on behaviors [28]
- The psychodynamic system approach with focus on interrelationships [29].

2.3. ASD-Innovation Coaching

The application of coaching in agile development projects promotes creativity, self-reflection and team development. Internal coaches are most valuable by implementing and scaling agile approaches [30]. In complex and uncertain phases of product development the approach of ASD-Agile Systems Design provides a conceptual basis but its implementation needs to be supported by a coaching specified on the systems engineering. Therefore ALBERS ET AL. [3] defined ASD-Innovation Coaching as "[…] the process-oriented support of people in development projects by an organisation's internal coach, which follows the paradigm of systems engineering. The concept encourages the identification and promotion of all necessary competences for the actual development activities with the aim to set-up and realise self-organising and cross-functional development teams. Core elements are the mediation of problem-solving competencies, the ability to apply methods according to the situation and needs of the team as well as the conscious steering of the team development. By the target driven application of this elements a degree of agility is implemented that is appropriate to the complexity of the task to be accomplished" [3].

To enable problem-solving teams in agile development projects of ASD – Agile Systems Design there are nine core activities an ASD-Innovation Coach needs to perform (see Figure 1). As each development project is unique and individual [31], these activities are formulated in a generic matter and their application need to be decided individually based on the situation and demand.

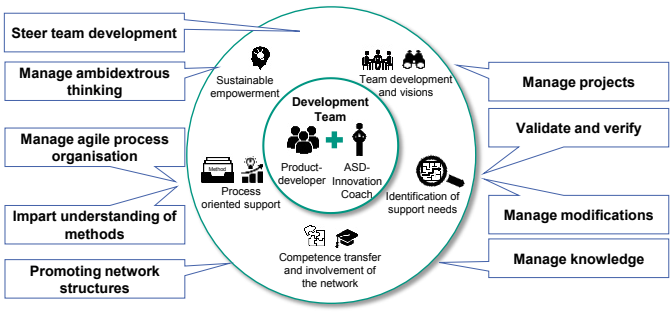

Figure 1: ASD-Innovation Coaching Activities [3]

The defined core activities focus on the process-oriented support as well as promotion of creativity, self-reflection and team development in order to implement the right degree of agility that is appropriate for the team and its tasks. However, the defined activities are generic and not easy to execute [3]. In addition, there is the challenge of a large variety of different coaching methods and the requirement to select methods according to the situation and needs of the team [32,33].

2.4. Coaching Processes, Tools and Methods

Since there is currently no generally accepted approach to coaching, several coaching process models exist. According to Fischer-Epe [17], the coaching process can be divided into three phases: clarification of the assignment, coaching discussions and process evaluation. The main phase of the coaching discussion can be further divided into four sections of the orientation phase, situation analysis, solution development and transfer assurance [17]. Vogelauer [33] presents a five-step coaching process which has proven itself in practical application. The main phase, the so-called work phase, begins with the diagnosis phase, in which the environment of the situation is analyzed. The subsequent phase, in which the work on problem solving and design is carried out, represents the most extensive phase in terms of time and is made up of several conversations or conversation stages [33]. Another model of an ideal-typical coaching process is the so-called COACH model according to Rauen [33]. The model is divided into five successive phases, as shown in Figure 2. The initial letters of the phase designations become the acronym COACH and each of the phases is characterized by different activities and objectives.

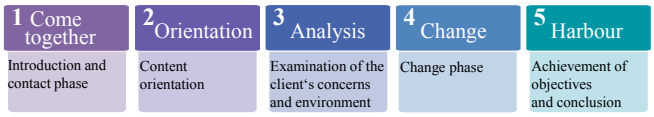

Figure 2: COACH process [25]

When comparing the presented selection of coaching process models from the literature, it becomes clear that all processes have the same basic structure of the preliminary, main and final phases. Since coaching generally focuses on the solution of problems, the entire coaching process can be understood as a phase-oriented problem-solving process [34].

With the aim to create a uniform terminology, avoid misunderstandings and thus promote a consistent understanding of Coaching, the terms method, technique, intervention and tool are separated from each other. In the context of coaching, a method is therefore "[...] a way to achieve change in the client" [35] and represents a combination of different techniques [36]. A technique is defined as a specified manner of proceeding in a certain way and thus represents the application of the method [35]. A technique is composed of smaller, concrete steps of action, the so-called interventions, which, in turn, are defined as the smallest step in the interaction between coach and client and represents a concrete action such as a question, gestures, posture. Methods, techniques and interventions in combination form a tool which can originate from one or more different methods [36].

3. Research Design

ASD-Innovation Coaching (ASD-IC) enhances innovation, problem-solving and self-reflection skills of development teams by providing internal team coaching to achieve best results in the product development process according to ASD-Agile Systems Design. To enable coaches to apply the defined activities [3] a methodological support is needed which should

contain different aspects from business coaching in order to apply these in the context of a process-oriented, internal coaching of agile product development teams.

The aim of this research is to analyze existing tools and methods for their applicability in ASD-IC and to present them in a structured process model. Therefore, the following two research questions were derived:
RQ1: *Which existing instruments from business coaching can be transferred to the internal team coaching of agile development teams in industrial product development?*
RQ2: *In which ASD-IC activities and problem-solving phases can the identified instruments be used?*

Since business coaching offers a wide range of literature on the various focal points like team and agile coaching as well as many practice-oriented compilations of various authors, an empirical research approach is chosen for the methodical procedure. According to the Design Research Methodology (DRM) [37], a systematic literature research is conducted as clarification of research. The collected sources were analszed and selected regarding the relevance and scientific nature of the content as well as the authors' field of expertise and work. In this process a total of 217 methods, techniques or interventions were collected and compiled in a tool list. For each entry, the information required for the structure of the profiles was recorded, which had previously been developed in a scientific discussion. Based on the quality requirements according to Heß and Roth [38] selection criteria for the use in ASD-IC were developed (see Table 1). Coaching methods applied in the coaching process of agile development teams should especially aim at enabling the members of the team to contribute their competencies to a flexible and structured innovation process. After the development of criteria the collected methods, techniques and interventions were evaluated. According to this procedure, a total of 65 tools were rejected, that did not meet the requirements. Among other things, tools with a strong reference to psychotherapy and leadership-related topics were excluded.

Table 1: Selection criteria for identified tools

Structural Quality	- Is the tool suitable for use in development teams, in the form of individual or team settings? - Is the tool suitable for implementation with an internal coach? - Is the tool applicable in terms of space and time?
Process Quality	Is the tool suitable for use in a professional context where the focus is on improved performance and collaboration?
Quality of Results	Does the tool enable the coach to ... promote the positive development of the team? ... promote the innovative ability of the team? ... develop the problem-solving skills of the team? ... promote the innovation culture of the organisation?

Based on the results of the descriptive study a subsequent prescriptive study was conducted to classify the remaining 152 methods, techniques and interventions into the phases of the problem-solving methodology SPALTEN as well as the COACH process and to allocate them to the activities of ASD-IC. Within this step it was possible that one tool can be located to several phases or activities. Regarding the applicability of the process model the remaining 152 tools were further filtered and selected during scientific workshops of the authors. The selection of the favorites was based on applicability and comprehensibility in practice as well as on the expected added value. For tools with multiple possible assignments to phases and activities, the main fields of application were determined to reach a more precise and clearer model. The resulting final collection comprises a total of 51 methods, techniques and interventions. These tools were then located and visualised in a process model to create an overview. Additionally, these tools were described and explained in depth within standardised profiles to improve the applicability and comparability of the tools for the coaches.

In a consecutive descriptive study, the success and practical applicability of the process model was validated by qualitative and quantitative surveys within a real innovation project with seven interdisciplinary development teams.

4. Results

4.1. ASD-Innovation Coaching Process Model

The result of the described research methodology is a process model with a collection of 51 different methods, techniques and interventions which is systematically structured according to the activities of ASD-IC and the problem-solving methodology SPALTEN. Figure 3 provides an overview of the instruments clustered according to their assignments. The numbers illustrate how many tools are available for selection in each field. It should be noted that multiple mentions of an instrument can occur in several problem-solving phases or AD-IC activities.

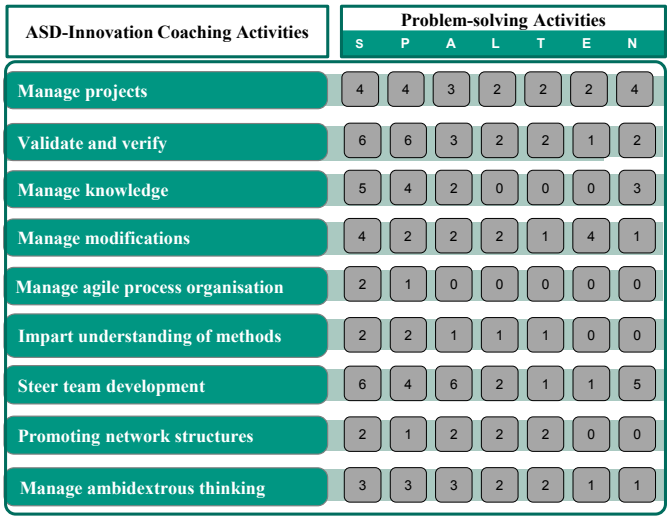

Figure 3: ASD-Innovation Coaching Process Model

The set-up of the process model is based on the logical structure and comprehension of the iPeM - integrated Product engineering Model. The people in the development team are in the focus as a central system element in the system of objects of the ASD-IC, including the agile work organisation, necessary competence models, and the team development. With the goal to enable the people in the development team to contribute their competencies to a flexible and structured innovation process by effective team collaboration, methodical problem solving and self-reflections the ASD-IC activities are listed on the left side.

Structured by the problem-solving methodology SPALTEN an action system with 51 selected and described tools is set up for applying ASD-IC. This supports the situation-specific selection and implementation of specific methods, techniques and interventions of ASD-Innovation Coaching, considering the quality criteria in coaching.

This mental framework supports the localisation and awareness of activities of a coach, the classification of the actual situation in the team and provides structured as well as comparable tools to choose from.

4.2. Method Profiles

The 51 tools of the process model are additionally prepared in a standardised profile which serves a quick familiarisation and comparability by the coach in the selection process and furthermore supports the actual application of the tool. Since not all profiles can be explained in detail due to the scope of the content, a selected instrument from the cluster *steering team development – situation analysis* will be explained in more detail. This serves as exemplary explanations and can be derived from the same understanding for all tools in the other fields.

Determine and set the Team Clock	
Activities of the ASD-IC	Steer team development
Methodical approach	Humanistic approach Type: Tool Method: Stimulating reflection
Brief description	With the use of the tool, the team's development status is analyzed together with the team members using the Team Clock, which is based on the stages of team development by Tuckman. Further reflective questions are asked according to the coaching hypothesis.
Classification by SPALTEN & COACH	Situation Analysis (S) & Analysis (3)
Areas of application	promote/support team development
Objectives / Benefits	Evaluation of team development through reflection. Creating transparency of the team's development status.
Detailed description	1. The coach introduces the team to the model of the Team Clock, which is based on the stages of team development according to Tuckman (see template 1). 2. The coach asks the participants the question: "What time is it on the team clock? All participants receive a sticker and are asked to stick it on the Team Clock time according to their evaluation …

Detailed description	The result is an overall picture, which in turn will expand the team's understanding of the overall system. […] Template 1: 'Team Clock'
Competencies required	n.a.
Resources required	• 2-12 participants • 30-60 min • printout of the template 'Team Clock' • flipchart, writing tools, adhesive dots • meeting room
Sources	Andresen, J. (2018). Agiles Coaching. Die neue Art, Teams zum Erfolg zu führen. München: Hanser. p. 342–343.

Figure 4: ASD-Innovation Coaching Method Profile

The tool "Determine and set team clock" is a tool that the coach carries out together with the product development team if his activity is *steering the team development* and his assessment of the current situation in the problem-solving process is the *situation analysis* (see Figure 3). The method profile of the tool gives an overview about coaching approaches and phases as well as necessary resources and competences. Due to the description of the objectives and the procedure the coach is support by his selection and application of the tool.

The profile shows that the area of application is the promotion and support of team development. Its basic orientation is the humanistic approach, as the thoughts and emotions of the individual team members are in focus. By using reflection stimuli, the tool tries to expand the perception of the participants and analyse situations.

By using the tool, the coach can promote the team members' ability to reflect on the team situation. This makes the participants aware of what is already working or not working within the team and how the current situation is perceived by the other team members. Based on the gained insights and new perspectives, the team members can then jointly plan measures that help them to achieve a higher value on the team clock. The coach does not provide the team with ready-made solution proposals but acts in the form of a process consultant. This means that he or she encourages the team to perceive and work out alternative courses of action independently through further reflection questions and impulses. By visualising the situation in the form of the clock metaphor, the starting position is clearly shown and goals can be made measurable by the clock times. In contrast to a simple scale, this offers the team a more creative and memorable representation.

5. Discussion and Conclusion

Due to the wide range of publications from a variety of specific coaching topics, this research cannot cover all area of the existing literature of coaching tools. In the theoretically oriented literature on the topic of business coaching, a focus on the areas of team-, internal- and agile coaching increases. However, publications that are pure collections of tools and methods for practical application are still predominantly related to individual coaching for managers. Since coaching in general has developed from practical application and has no independent theoretical foundation, the effectiveness of the tools presented in the literature cannot be clearly assessed. The lack of a uniform theoretical basis also means that there is no shared understanding of definitions, coaching processes and modes of action. Furthermore, many tools can be used in different variations and variants, depending on the initial situation and the subject matter. Therefore, the classification in ASD-IC activities and problem-solving phases as well as the process description represents an exemplary field of application from a potential majority of application fields.

51 existing tools from business coaching were collected and evaluated for suitability on the basis of a list of requirements based on the quality criteria in coaching as well as criteria for applying ASD-IC. These tools enable the coach to promote a positive team development, the innovation and problem-solving ability of the team as well as the methodical problem solving in agile development processes. The identified methods, techniques and interventions are assigned to the ASD-IC activities and located in the phases of the problem-solving process SPALTEN, considering the described objectives and fields of application. The presentation in standardised profiles with all the information required for the selection and implementation supports the comparability and applicability. This realises the appropriate use of tools depending on the initial situation, objectives of coaching and personal skills.

The results of the descriptive study validate, that the situation- and need-based method recommendation of coaching methods enables the execution of ASD-Innovation Coaching in agile product development projects. The systematic and intuitive process model supports the selection and application of the most suitable methods regarding the team´s situation and need. To assess the effects of the support, the validation needs to be continued on a comprehensive application and success evaluation.

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