Alexander Volland et al. (Hrsg.): Projektmanagement & Vorgehensmodelle 2017,
Lecture Notes in Informatics (LNI), Gesellschaft für Informatik, Bonn 2017 111

Is There a Blueprint for Building an Agile Culture?

Steffen Küpper[1], Marco Kuhrmann[1], Matthias Wiatrok[2], Urs Andelfinger[2] and Andreas Rausch[1]

Abstract: Establishing agile principles and values requires time becoming part of the organizational mindset. One approach is implementing selected agile methods first and waiting for the agile culture to emerge and mature. Nevertheless, it remains unclear if there is a way to improve the culture-building process by emphasizing factors that foster an agile culture. Research on factors that support a systematic development of an agile culture is rare. Hence, we aim to shed light on how an agile culture can be developed in a systematic way. To investigate approaches to initiate and stabilize a cultural change towards agile, we conducted a semi-structured interview with eight agile coaches. Our results comprise 50 factors that influence culture development. Furthermore, we identified two major phases of an agile transition. Even though different focal points are set, early and continuous management involvement is key to a successful transition. Nevertheless, our results do not indicate a generalizable blueprint-like approach for establishing an agile culture.

Keywords: Agile transition; agile culture; agile coaches; qualitative study; impact factors

1 Introduction

To be equipped for the increasing speed of software system development, many companies adopt agile methods [Ve14]. Since the publication of the „Agile Manifesto" in 2001, a considerable body of knowledge has grown including research, practical experience, and lessons learned from industry [Dy08]. Also, it has been broadly accepted that a transition towards agile is challenging. Agility challenges organizations as it questions „classic" management and, therefore, while developers appreciate agile methods, managers are reluctant to buy in [Mu13]. Different attempts have been made to make agility fitting into traditional environments. In 2011, West et al. [We11] coined the term „Water-Scrum-Fall" to describe a pattern frequently found in industry [Ga15, Vi16]. Houston [Ho14] stated that „*agile methods, principles and values can be arranged hierarchically*" and, thus, can also be implemented in regulated domains, such as Aerospace. In a previously conducted systematic review [Th16], we could confirm West's claim and initiated the HELENA study [Ku17], which supports Houston's position. Moreover, the HELENA results clearly indicate that hybrid approaches emerge over time and quite often pragmatically.

Problem Statement. Previous research points to an evolutionary process that makes organizations moving towards agile. Yet, quite often the perception of agility is „*Doing agile*", which means an organization demonstrates its agility by implementing agile methods. Yet, there is another level of agility [St09] and that is best described with „*Be agile*". According to Tolfo et al. [To09], being agile means that „*it is necessary to really put agile*

[1] TU Clausthal, Institute for Applied Software Systems Engineering, Wallstr. 6, 38640 Goslar, Steffen.Kuepper@tu-clausthal.de, Marco.Kuhrmann@tu-claussthal.de, Andreas.Rausch@tu-clausthal.de
[2] Hochschule Darmstadt, Fachbereich Informatik, Schöfferstraße 8B, 64295 Darmstadt, Matthias.Wiatrok@h-da.de, Urs.Andelfinger@h-da.de

values and practices into work." The problem that is addressed in this paper is concerned with a lack in proposals on the systematic alignment of organizational culture with agile methods (see also da Silva et al. [Ju15]).

Contribution. This paper presents a qualitative study on the experiences agile coaches made in supporting organizations in their agile transition projects. We contribute findings from a semi-structured interview conducted with eight professional agile coaches that aimed at identifying factors that positively/negatively influence an agile transition and, furthermore, to craft a set of suggestions to help companies approaching agile transition endeavors in a systematic way. We found 50 factors influencing an agile transition. Yet, we failed in deriving a systematic blueprint-like approach. The major issues that hindered deriving such an approach were missing generic metrics and measurement approaches as well as contextual factors that make every transition unique. Nevertheless, two basic phases of a transition and a set of phase-specific factors have been identified.

Outline. The remainder of this paper is structured as follows: Section 2 gives an overview of related work. The study design is presented in Sect. 3, and Sect. 4 summarizes our results. Section 5 concludes the paper and outlines future work.

2 Related Work

As agile has become mainstream, a lot of research on agile methods [Dy08] is available. In the context of the paper at hand, agile culture and factors influencing building an agile culture are of interest. Research and industry alike often use *organizational culture*, *agile culture*, or *agile philosophy* to summarize behavioral, social, and other cultural factors relevant for agile software development. For instance, Siakas and Siakas [Si07] describe four different types of organizational culture with respect to agile software development. Iivari and Iivari [Ii11] use the *Competing Values Framework* to describe four types of culture as well. Furthermore, they propose 13 hypotheses about the influence of a cultural type on the deployment of agile methods and discuss the question of „*how do different techniques and principles of agile methods support emergent agility*." Culture and influencing factors are further discussed, e.g., by [Di15, St09, To08, To09]. The question what factors do influence agile methods is discussed by Dikert et al. [Di16]. In their systematic review, they found management support, choosing and customizing an agile model, training and coaching, a mindset, and alignment of critical factors. These factors show that, inter alia, organizations are under pressure. For instance, Hummel and Epp [Hu15] found that „*there is this pressure by working agile that the values and leadership understanding has to change*." Management must also adopt to agile as different processes are to be established and stabilized at the organization level, such as customer involvement and delivery strategies, and the overall organizational culture. Quite often, the management is reluctant to accept and perform this required change [Me13, Mu13, Tr14].

This paper contributes 50 factors positively/negatively affecting the implementation of an agile culture. Other than pure tailoring criteria, e.g., [Ka13, Cl12, Xu08], our contribution does not aim to provide means to tailor processes. We aim to present perceptions of agile coaches, and to structure and discuss our findings to support companies in evaluating the impact of agile methods, practices, and so forth on building an agile culture.

3 Research Design

This section summarizes the research method chosen. In Sect. 3.1, we present the research objective and the research questions, before we describe the data collection procedures in Sect. 3.2. Sect. 3.3details the analysis procedures, and the section is concluded with a discussion of the validity procedures in Sect. 3.4.

3.1 Research Questions

The overall goal of our research is to understand the interaction of agile practices and organizational culture. Hence, we focus on the following research questions:

- **RQ1:** What role do individual agile practices on establishing an agile culture play, and how can the respective impact be described, measured, assessed?
- **RQ2:** How can an agile transition be initiated, and which factors influence the initialization and the stabilization?

3.2 Data Collection Procedures & Subjects Selection

To answer the research questions, we used a qualitative semi-structured interview. The instrument as well as the subject selection is described in the following.

Interview Instrument. We opted for a semi-structured interview to study two key questions: (i) How do organizations implement an agile transition? (ii) What impact do agile methods and practices have on establishing an agile culture? These key questions steered the design of the questionnaire, which is shown in Tab. 2 (Appendix A). The table shows the six main questions, whereas Q1-3 are aligned with the first key question, and the questions Q4-6 are derived from the second key question. Each question was complemented with fine-grained sub-questions to collect further details.

Subject Selection. This study is designed as an expert interview. We personally invited professional agile coaches from Germany for participation. All participants were expected to have general experience with agile and, particularly, as agile coach. Eventually, we included eight agile coaches into the study (Tab. 1).

Participant	Experience in Agile, in years	Experience as Agile Coach, in years
P1	10	3
P2	6	Approx. 3.5
P3	10	2
P4	20	more than 10
P5	more than 7	6
P6	18	12
P7	15	8
P8	more than 15	more than 13

Tab. 1 Overview of the subjects and their experience with agile methods and practices in years.

Interview Procedure. Before starting the interview, the study was presented and the invitation email was reflected. All but one interviews were conducted at the participants' work places (one was conducted via phone), and took between 50 and 70 minutes. The interview was conducted by one researcher, who took notes, audio-recorded and transcribed the interview afterwards. The interviews followed a three-staged procedure:

1. In a warm-up, metadata was collected (Tab. 2; M1-3) and the terminology used in this interview was clarified. The term "agile culture" was discussed to create common ground. For this interview, agile culture was defined as: *An organization has been implemented agile values and principles and lives these values and principles.*
2. The second stage started with question Q1 (Tab. 2), and the researcher ran the interview as a conversation in which participants were directed by the questions and, if necessary, by sub-questions and questions for clarification.
3. The third stage comprised a short wrap-up and summary. Participants were asked to provide further information they considered missing in the main part of the study or worth sharing with the researcher.

3.3 Analysis Procedures

The analysis of the data comprised a qualitative analysis and an initial quantification of the results. The qualitative content analysis was performed following the *scaling content analysis* model by Mayring [Ma15]. We adapted Mayring's method, since we could not define all variables upfront, but used the analysis instrument to identify the variables in the first analysis iterations.

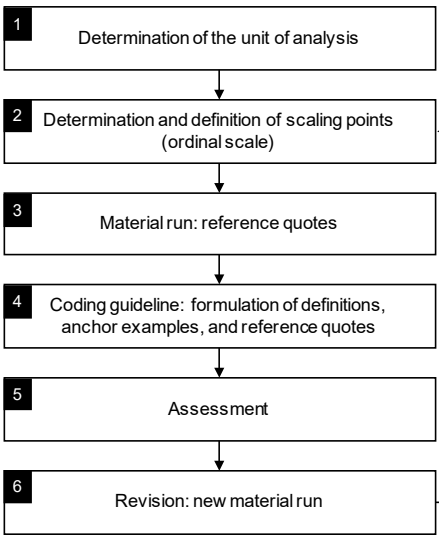

Fig. 1 Qualitative text analysis approach (according to Mayring [Ma15]).

Fig. 1 shows our adapted analysis model. The first step is the determination of the unit of analysis – in our case the interviews. During the analysis, an ordinal scale was defined to assess the effectiveness of the identified measures and factors. For the ordinal scale, we

assessed the adjectives used by the participants to decide whether a factor has a positive (e.g., essential, support, and important) or negative influence (e.g., disturbing, difficult, and problem). In the next step, a material flow identifies the measures and factors in each interview. In the fourth step, the identified measures and factors are extracted as a coding guide. Also, definitions and quotes were included into this guide. Finally, an assessment of measures and factors was performed using the ordinal scale, an anchor example, and a definition. In case, we could not apply any code or the statements were recurring, the respective factor was set to neutral. All results and findings were included in the coding guide, such that the guideline was iteratively filled with content.

In step six, the approach and outcomes were revised. The steps two to six were repeated for each interview, and the coding guide and the ordinal scale were adjusted accordingly. With every new finding, the already analyzed interviews were revisited and further quotes were added. Finally, all steps were performed with all interviews as unit of analysis.

3.4 Validity Procedures

Since the present study was designed as a qualitative expert interview, we approached few selected experts for the interview only, which introduces several validity constraints. To increase the validity of our study and our results, we applied the following measures:

To ensure the instrument's suitability, the questionnaire and schedule were continuously reviewed by two senior researchers. Furthermore, an external quality assurance by two external agile experts (not participating in the study) was conducted, and an internal trail was carried out by two researchers of the TU Clausthal. During the data analysis, we used researcher triangulation to improve the validity of our results. Transcription and initial coding was done by a researcher, who was not involved in the interviews. The researcher, who conducted the interviews, then compared audio records and transcription to assess accuracy before the text analysis started. Text analysis consisted of a two-staged coding process following the procedure proposed by Glaser [Gl98]. The outcome of the first stage was reviewed and discussed, before another researcher carried out a full coding using the audio records, transcripts, and initial coding results. The outcomes were analyzed using the refined *scaling content analysis* procedure [Ma15]. All outcomes were continuously checked by the group of researchers. Finally, another researcher was called in for final data analysis and interpretation of the results.

4 Results

The presentation of the results starts with an overview of the study participants in Sect. 4.1, before presenting the analysis results in Sect. 4.2 and Sect. 4.3. We conclude this section with a discussion of our findings in Sect. 4.4.

4.1 Demographics

Eight agile coaches from Germany were selected for the study (Tab. 1). The coaches were selected due to (i) their experience, and (ii) for the coverage of relevant fields. All coaches

have experience in introducing and establishing agile methods and practices in various industry sectors, such as telecommunication, financial services, classic engineering, or automotive software engineering. Also, all coaches are supporting teams of different sizes and entire organizations, and all coaches have collected experience as project managers, Scrum Masters, or software developers prior to their appointment as agile coach.

4.2 Research Question 1: Agile Practices and Establishing an Agile Culture

In the following, we focus on the identification of factors and their impact, and we discuss assessment and measurement of building an agile culture.

Factors that Influence Building an Agile Culture. First, we identified 50 different factors that positively, negatively, or neutrally (not detectable) impact an agile culture. Fig. 2 shows all those factors for which the experts mention a positive impact. Fig. 3 shows all factors identified having a negative impact and, finally, Fig. 4 shows those factors for which the impact is perceived neutral or could not be detected. Fig. 2, Fig. 3, and Fig. 4 show if a specific factor influences the agile principles (Label 1) and values (label 2)[3].

	Measures and factors	# of related Statements	# Interviews mentioned
1	Principles		
2	Values		
3	Scrum	##	8
4	Testdriven Development / test Orientation	17	7
5	Continuous Integration	8	4
6	Kanban	12	4
7	Retrospectives	24	6
8	Daily Stand Up	12	4
9	Pair Programming	7	3
10	Transition Backlog	1	1
11	Scrum Master	17	6
12	Product Owner	23	7
13	Development Team	12	5
14	Coaching Team	1	1
15	Transition Team	16	4
16	Feedback	29	5
17	Coffee Corner	1	1
18	Agile Assesment	1	1
20	Exchange of experience	1	1
21	Colocation	1	1
23	Structure and moderate meetings	4	2
24	Visualise work	1	1
25	Peer coaching	1	1
26	Employee survey	2	2
27	Involve cross sections	10	5
28	Agile Requirements Management	10	3
29	Change/Transition Management	20	6
30	Flat hierarchies	2	2
31	Organisational borders	4	4
33	Command & Control	4	1
34	Enable employee's self-responsibility	1	1
35	Agile leadership	1	1
36	Justify the work	5	2
37	Agile company agreement	1	1
38	Management support	4	2
39	Team onboarding	1	1
40	Dismantle fear	4	1
41	Enabler	2	2
42	Common goals/vision	13	5
43	Lighthouse project / Pilot project	13	6
44	Reason for agilisation	6	2
45	Safe Enviroment	2	2
46	Multipliers	1	1
47	Wrong expectations	1	1
48	Wrong use of terms	1	1
49	(manage) Impediments	26	7

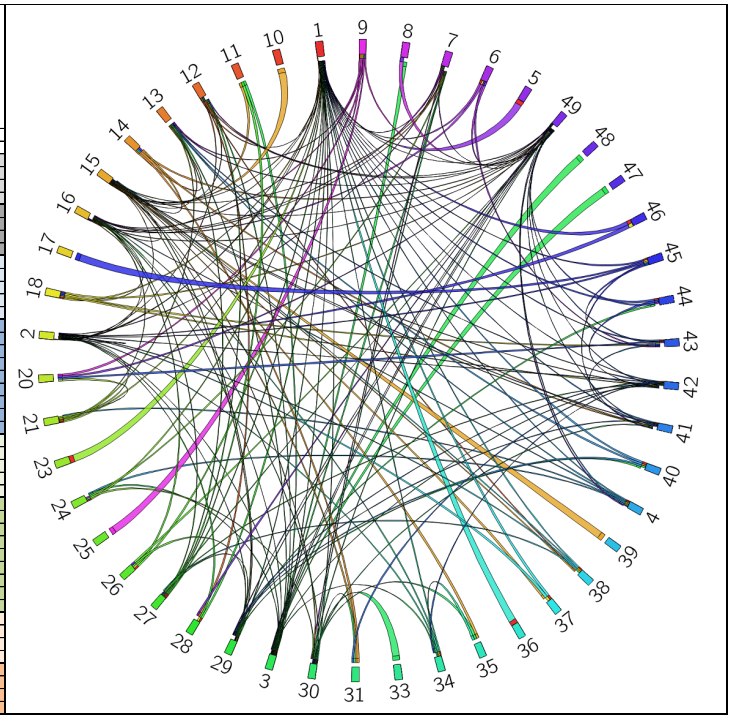

Fig. 2 Overview of the identified factors with positive impact.[4]

[3] To keep the figures as simple as possible, we omitted the individual principles and values, but present an aggregated rating only. The influence of principles and values is already analyzed in the work by Houston [HO14] and thus not belonging to the identified factors in this work.

[4] The color scheme in the tables represent the categories as used in Fig. 5 and Fig. 6

An interesting outcome is the set of factors that negatively influence an agile culture (see Fig. 3). Most of these factors are concerned with project management, such as *organizational borders* (Label 31), *command & control* (philosophy, Label 33), *wrong expectations* (Label 47), and *dilution* (Label 51), which is especially mentioned in the context of project roles and enablers at the organization level.

Fig. 4 shows a second finding of interest. Even though mentioned in one interview, *automatization* (Label 52) remains an undecided factor. That is, it remains unclear, if a high level of automatizing the software development process fosters an agile culture - notably in the light of the variety of other factors that strongly rely on sophisticated tool support, e.g., test-driven development or continuous integration.

Beyond the two points mentioned before, most of the aspects were found positively impacting the agile culture-building. However, for several aspects, the interviewed experts are undecided and cannot provide arguments nor evidence concerning the actual impact.

	Measures and factors	# of related Statements	# Interviews mentioned
1	Principles		
2	Values		
11	Scrum Master	17	6
12	Product Owner	23	7
13	Development Team	12	5
30	Flat hierarchies	2	2
31	Organisational borders	4	4
33	Command & Control	4	1
34	Enable employee's self-responsibility	1	1
41	Enabler	2	2
44	Reason for agilisation	6	2
47	Wrong expectations	1	1
48	Wrong use of terms	1	1
50	Lack of validation	1	1
51	Dilution	1	1

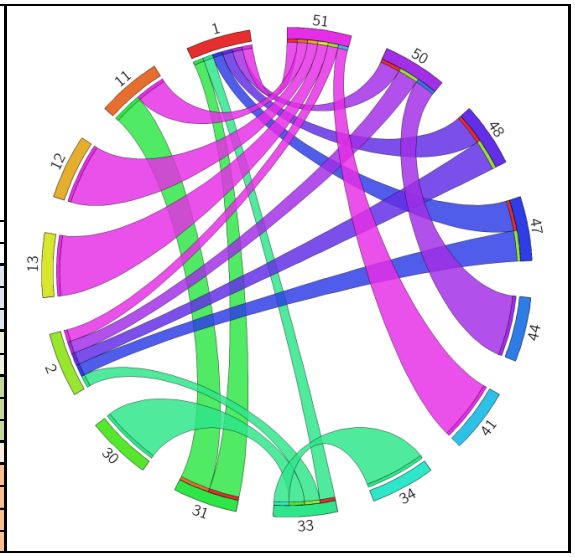

Fig. 3 Overview of the identified factors with negative impact.

For example, the experts do not make a clear point regarding benefits for building an agile culture from having a *Scrum Master* (Label 11). Furthermore, the role of the *development team* (Label 13) is neutrally rated, too. Nevertheless, all experts agree that the *Scrum process* (Label 3) is an important driver for establishing an agile culture, and that *Scrum* does not only positively impact agile principles and values, but also several further factors, e.g., *feedback* (Label 16) or *common goals/vision* (Label 42).

However, on the one hand, the graphs list 50 different factors that are related to building an agile culture in one way or the other, but, on the other hand, current data does not allow for identifying general factors and combinations thereof as the variety/diversity is too high. That is, our analysis provides few information regarding expected positive impacts only, yet, provides indication to support future work (see also Sect. 5).

Measurement and Assessment of Agile Culture Progress. As the second facet, we aim to investigate how practitioners measure the general progress of the transition towards an agile culture. In the following, we first provide a summarized reflection on the interviews presenting the participants' solution approaches.

From our data, we see different approaches to assess the degree of agility in organizations, which range from "simple" evaluations of *customer value* delivered (three participants) to explicitly defined models. For instance, one participant mentioned: "*We usually quantify* [the progress] *via a model, which we have defined ourselves and that comprises self-assessments, historical, and statistical data"*, P_8

Another participant, who stated to use a formal model, mentioned a specifically developed approach based on the "Theory of Constraints" [Ma03]. Those participants that state to use the customer value only as indicator, however, also agree that a clearly defined scope and the willingness to take responsibility are imperative.

	Measures and factors	# of related Statements	# interviews mentioned
1	Principles		
2	Values		
3	Scrum	120	8
4	Testdriven Development/Test Orientation	17	7
5	Continuous Integration	8	4
7	Retrospectives	24	6
8	Daily Stand Up	12	4
9	Pair Programming	7	3
10	Transition Backlog	1	1
11	Scrum Master	17	6
12	Product Owner	23	7
13	Development Team	12	5
14	Coaching Team	1	1
16	Feedback	29	5
17	Coffee Corner	1	1
19	Project- & Marketing events	1	1
20	Exchange of experience	1	1
21	Colocation	1	1
22	Team Charter	1	1
23	Structure and moderate meetings	4	2
24	Visualise work	1	1
25	Peer coaching	1	1
31	Organisational borders	4	4
32	Gemba Walk	1	1
34	Enable employee's self-responsibility	1	1
35	Agile leadership	1	1
37	Agie company agreement	1	1
39	Team onboarding	1	1
42	Common goals/vision	13	5
43	Lighthouse project / Pilot project	13	6
49	(manage) Impediments	26	7
52	Automization	5	1

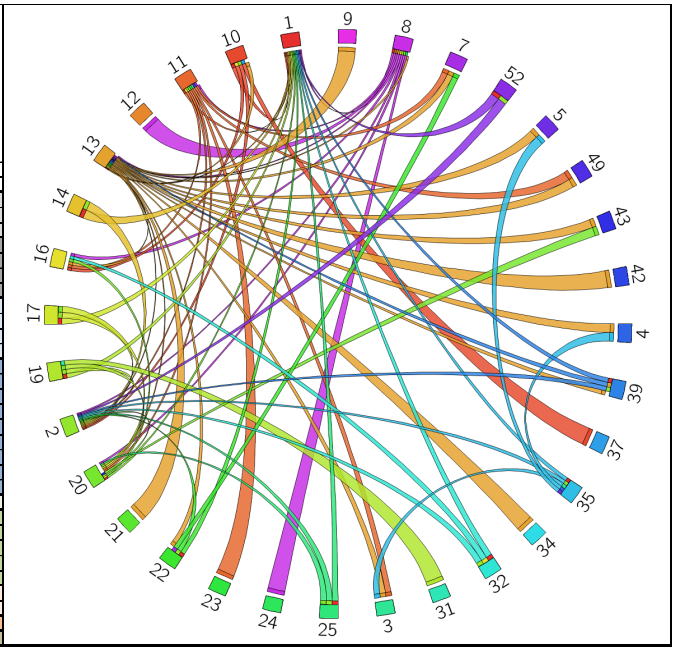

Fig. 4 Overview of the identified factors with neutral impact.

When breaking down the discussion to the individual practices, the participants are unsure if the impact of a particular (isolated) practice is measurable at all: "*Ok, if you do it slow, and isolated enough, maybe one can measure such things.* […] *We didn't do this so far, and I couldn't claim what a specific effect looks like.* […] *However, there are things where you develop a feeling for actions and effects to expect…"*, P_6

The participants agree that the scope defines what practices are considered (ir-)relevant and, hence, a selection always depends on the actual project and/or organization. This also includes the mutual influence practices have on each other. One participant stated: *„I'm still confessed that you have to implement Scrum as a framework completely* […] *to*

achieve 100% of the desired goals. […] *If I skip some elements, something is missing as I consider Scrum the minimum to be in place to manage my work properly…",* P_2

While this statement clearly advocates for implementing methods of interest entirely, the body of knowledge also shows that customized, reduced, and extended method pools are used in practice as well [Ku17, Di15a]. Some practitioners also move towards this direction by providing a differentiated discussion of specific practices. For instance, participant P_3 considers communication-related practices highly important, especially the *Daily Stand-Up*, *Sprint planning*, and *retrospectives*. However, these factors are hard to measure (see statement picked from P_6 above). And, finally, P_3 states: *„In general, I would say implementing Scrum to a 100% by the letters doesn't work.* […] *It's important to know where a company, business unit or team stays…"*

Nonetheless, a general answer, which practice has the highest impact cannot be given. Participant P_6 states in this regard that: *"In the end, culture is a reflection of my actions* […] *It is extremely important to establish things that require and foster values …"* Yet, neither of the participants could state which metrics help precisely determining impact and success of a specific factor or a combination of factors.

4.3 Research Question 2: Initializing and Stabilizing an Agile Culture

The first research question revealed a number of factors that influence building an agile culture. However, since we are aware that a transition does not happen in a blink of an eye, we discussed (standard) approaches and stages to initiate and stabilize such a cultural change. The interviews supported our assumption and revealed a two-staged approach implemented by all the experts. This approach comprises the two major phases „initialization" and „stabilization and scaling", which we discuss in the following.

Initiating an Agile Culture. The initialization of a cultural change towards an agile culture requires some preparation. Even though the participants could not provide explicit numbers, data from the interviews provide some indication towards factors that have a positive/negative influence. Experts consider the factors listed in Fig. 5 important and, thus, provide some guidance what factors should be focused *before* starting the transition towards agile.

Experts agree on the benefits provided by an explicitly appointed *transition team*, which helps the company managing the cultural change. Of similar importance are *coaching teams* and an established *change/transition management*. Other aspects are considered important as well, e.g., *finding enablers*, *involving the employees*, and *provide reasons* for the intended agile transition. Furthermore, finding *lighthouse projects* is considered important to provide a *safe environment* for testing and collecting experience. Moreover, most of the prerequisites address strategic and behavior-related aspects.

Stabilizing and Scaling an Agile Culture. Once an agile transition has been initialized and first results and lessons learned are available, the new culture needs to be stabilized. Also, if the initial implementation was done in a lighthouse project, the transition needs to be stabilized at the organization level. In the interviews, the experts considered the factors shown in Fig. 6 relevant in this second stage, i.e., influencing the stabilization and scaling of the agile transformation.

	Measures and factors	Methods	Practices	Roles	Non-exclusive agile practices at project level	Functional aspects	Institutional aspects	Strategy	Behavior	Infrastucture
		Categories								
10	Transition Backlog				o		o			
14	Coaching Team			+		+	+		+	
15	Transition Team		+	+	+	+	+	+	+	
25	Peer coaching				o					
26	Employee survey				+	+			+	
29	Change/Transition Management			+			+	+	+	
40	Dismantle fear			+		+				
41	Enabler			+		+		+	+	
43	Lightouse Project / Pilot Project				+				+	
44	Reason for agilisation							+		
45	Safe Enviroment				+			+	+	
47	Wrong use of terms					-				
51	Dilution			-			-	-		

Fig. 5 Subset of factors and their impact in the initialization phase of an agile culture (``+": positive; ``-": negative; ``o": neutral or not detectable).

Fig. 6 shows that, compared to the initialization, other factors are considered important to stabilize and scale a new agile culture. A consequent implementation, i.e., an institutionalization, of the Scrum framework is considered important, as it covers most categories. Furthermore, experts consider continuous work on the behavior category important to stabilize the agile mindset. This includes implementing the different methods, practices, and ceremonies, as well as establishing the organizational prerequisites, such as *flattened hierarchies* or *cross-section collaboration*, and reducing *command & control* style management and *organizational borders*.

Our results show that in the beginning as well as in the stabilization, *management support* is an imperative, which is in line with further studies, e.g., [Me13, Mu13, Tr14]. In the beginning, management needs to approve *transition teams*, should provide means to implement and test agile methods, and needs to provide *enablers*. After the initialization, when a decision was made to continue the transition, management still needs to provide support to enable people implementing agile methods in the day-to-day work. Moreover, the management needs awareness and willingness to participate in the change, e.g., by reconsidering the overall management structure of an organization, which can become a major challenge as for instance discussed in [Me13, Mu13, Th16, Tr14].

4.4 Discussion

Our results are grounded in the perception of professional agile coaches, and what these coaches consider important to support an agile transition. For this, we presented the factors

we extracted from the interviews, their general perceived impact (Fig. 2, Fig. 3, and Fig. 4), their impact during the initialization of an agile transition (Fig. 5), and during the stabilization of the transition (Fig. 6).

	Measures and factors	Categories								
		Methods	Practices	Roles	Non-exclusive agile practices at project level	Functional aspects	Institutional aspects	Strategy	Behavior	Infrastucture
3	Scrum	+	+	+	+		+	+	+	
4	Testdriven Development/Test			+	+				+	
6	Kanban				+			+	+	
7	Retrospectives				+	+			+	
8	Daily Stand Up			o	o				+	
9	Pair Programming			+	+				+	
11	Scrum Master	o	o		o	o			o	
12	Product Owner					+	+		+	
13	Development Team	o	o		o		o	o	o	
16	Feedback		+						+	
17	Coffee Corner				o					
18	Agile Assesment				+			+	+	
19	Project- & Marketing events				o	o				
20	Exchange of experience				o			o		
21	Colocation			+	+					
22	Team Charter		o							
24	Visualize work		+			+				
27	Involve cross sections			+	+	+		+	+	
28	Agile Requirements Management					+				
30	Flat hierarchies		+		+	+	+		+	
31	Organizational borders			-					-	
32	Gemba Walk				o					
33	Command & Control					-	-			
34	Enable employee's self-responsibility				+		+		+	
35	Agile leadership	o								
38	Management support			+		+				
39	Team onboarding			o						
42	Common goals/vision			+		+		+	+	
49	(manage) Impediments	+		+	+	+				
50	Lack of validation							-		

Fig. 6 Subset of factors and their impact in the stabilization and scaling phase of an agile culture (``+": positive; ``-": negative; ``o": neutral or not detectable).

When reviewing our results, a noticeable finding is that practices seem to have a smaller impact, and that general soft skills are considered more important. Everything that is concerned with feedback and learning is considered highly relevant by the participants to support an agile transition. Supporting an open culture, e.g., by fostering communication, discussion, and experience exchange were considered key to establish agile principles and values in an organization. For support, coaches use different approaches to ignite the knowledge transfer, such as the ShuHaRi model [Fo16] or the SECI model [No95].

However, no participant has a silver bullet for generalizing an approach to conduct an agile transition. A cultural change strongly depends on the already established culture, making it highly specific. That is, identifying and assembling the right methods and practices at the technical level as well as a strong management support are key. However, systematically planning such a transition is hard, since many contextual factors need to be considered. Proposed changes need to have a proper justification, as participant P_6 states: "*In general, it's ok to continuously adapt practices, but you have to do it for the right reasons.*" Agile methods and practices are considered valuable instruments to drive a cultural change. For instance, participant P_8 states: "*I consider practices enablers, i.e., they are a means to establish transparency. Practices solve a number of unpleasant problems, notably technical ones* […] *They provide, at least, some guidance…*"

Another finding concerns the perceived importance of the roles, which are quite often the source of conflicts. Both Scrum roles, the Scrum Master and the Product Owner are considered important. Yet, the experts consider the Product Owner having a bigger impact on establishing an agile culture. A reason might be, that the Product Owner is not only responsible for the requirements, moreover, the Product Owner is the interface with the outside world. Experts consider the Product Owner as one of the strongest multipliers for an agile transition. However, the experts make clear that "*It is highest priority to have a good Product Owner, that is, somebody who really can do this job* […] *The Product Owner needs the organization's support* […] *to just push forward the product* […] *Decision-making competencies are key; do I have it or not …",* P_1.

Besides these findings, our results do not allow for defining a generalized and measurable set of success factors that support an agile transformation. Neither of the coaches provided a specific measurement approach to help determining the progress of such a transition process. We can argue that a proper measurement is hard, since the contextual factors differ from setup to setup, and that a cultural change cannot be measured utilizing normal product- or process-related metrics (e.g., code quality, performance, etc.). However, this dimension was not explicitly addressed by the coaches. Still, the discussion got stuck when it came to the key question: What is agile after all and what distinguishes an agile team from a traditional one? While we can apply metrics to products to measure quality and performance, still, we have little knowledge about measuring a cultural change or the culture as such from a software engineering point of view. Our study results only provide some indication about the perceived impact of agile methods and practices. However, empirically determining the exact impact of applying those practices is a not yet solved issue [Di15]. This is also reflected by our results: each practitioner handles an agile transition differently from situation to situation.

4.5 Threats to Validity

Since the study at hand is a qualitative study, we discuss the validity constraints using four of Maxwell's five threats to validity in qualitative research [Ma13][5].

[5] The fifth category is omitted, since the study was neither based on a theory construct nor did it aim at developing such a theory.

- **Researcher Bias.** To mitigate interviewer-related bias, participants were asked to provide as many examples as possible, which were used as representatives for categories. Finally, we applied researcher triangulation within the different data analysis steps.
- **Reactivity.** Since the interviews were conducted face-to-face (via phone), avoiding social interaction, i.e., reactivity, is not possible. To mitigate this threat, we decided to perform the interviews at the participants' workplace, exercised the interviews in test runs, and limited interventions by the interviewer to follow-up or confirming questions only.
- **Descriptive Validity.** Data gathered from the interviews was anonymized. The analysis was performed on the anonymized transcripts only, i.e., researchers performed the analysis on the transcripts and audio records only.
- **Interpretation Validity.** For mitigation, (tentative) data was continuously checked using researcher triangulation. Also, participants were not involved in the data interpretation.

5 Conclusion & Future Work

In this study, we studied factors that positively or negatively influence building an agile culture. For this, we conducted a qualitative study with eight professional agile coaches. We used a semi-structured interview that revealed 50 factors practitioners consider relevant. Finally, two phases have been identified that occur in agile transition projects.

Management and management support were found relevant factors for a successful agile transition. However, even though a major driver, management support only is not enough. Besides "being agile", i.e., implementing certain methods and practices only, further factors need to be considered; and those factors mainly stress behavioral aspects and affect the functional as well as the organizational level. Among other things, a defined strategy (including defined goals and a shared vision) is crucial. Experts perceive developing an agile culture more a cultural change than a process change (as known from "standard" software process improvement). This becomes obvious when the question is elaborated "How much Scrum is enough?", i.e., do organizations need to provide a minimal, full, or extended implementation – and: what is minimal, full, or extended? Nevertheless, even though the present study cannot provide comprehensive evidence, it becomes clear that implementing Scrum (only) does not make a company agile. Moreover, a 100% agile culture is critically questioned if it is possible after all.

Limitations. Although we found factors relevant to support an agile transition, we have taken an external perspective only. This study omits the internal view of organizations. Therefore, we may exclude persons who are in the situation to establish agile principles and values. Furthermore, we were interviewing agile coaches from Germany only. Our findings can thus only be an indication. Finally, the study suffers from a small number of interviews and, due to the qualitative nature, is based on personal opinion, which calls for further independently conducted studies.

Future Work. This study provides an initial set of indicators about measures and their impact on a cultural change. Statistical analyses, descriptive methods, or cluster analysis may provide further insights. Future work should hence include larger studies to enhance the database and to allow for further empirical analyses. Furthermore, as the current study is limited to Germany, an extension to the international stage is the next step.

Acknowledgements

We thank the researchers and practitioners, who helped us developing and testing the instrument. We especially thank the practitioners, who participated in the interviews and shared their experience with us.

A Questionnaire

No.	Question and Rationale
M1	What is your current position in your organization?
M2	For how long do you deal with agility in general?
M3	For how long do you work as agile coach?
Q1	What does it mean to you, if an organization claims to be agile? *This question aims at determining any kind of change process, which leads to a successfully established agile culture. This question particularly aims at identifying success factors that help driving an agile transition.*
Q2	Can you describe how an organization can successfully manage an agile transition? Can you give an example? *This question aims at identifying the phases of an agile transition, how a transition was started, what was the actual approach, what are milestones to be reached during the transition, and what are typical problems and mistakes.*
Q3	Imagine, you would have to state the progress of an agile transition. How can you determine the progress? *This question aims at identifying metrics and indicators for an agile transition. The working hypothesis is that progress of an agile transition can be determined and, therefore, it should be possible to determine when such a transition was carried out successfully.*
Q4	How is an agile culture developed in an organization? *The assumption behind this question is that an agile culture develops over time and is the outcome of planning interventions. For this, this question aims at identifying suitable measures to push the organizational culture into the desired direction, aspects to be evolved by applying specific measures, sequence and schedule of measures, and critical factors to support the transition.*

No.	Question and Rationale
Q5	What impact do roles, methods, and practices have for establishing an agile culture? *The assumption behind this question is that an agile culture is an outcome of a (full) implementation of agile methods and practices. This question aims at evaluating this claim by identifying methods and practices that foster a cultural change, and those that do not have a significant impact.*
Q6	Imagine, you would have to report the impact of agile approaches and the cultural change. How can you evaluate the impact of agile practices on an agile culture? *Like Q3, the assumption is that the impact of methods and practices on the culture can be measured. This question aims at identifying metrics and indicators that help determining the impact of methods and practices on the organizational culture.*

Tab. 2 Questionnaire used to drive the interviews (M: Metadata Questions, Q: Primary Questions).

References

[Cl12] Clarke, P.; O'Connor, R.V.: The Situational Factors That Affect the Software Development Process. Towards a Comprehensive Reference Framework. Inf. Softw. Technol. 54/12, pp. 433-447, 2012.

[Di15] Diebold, P.; Šmite, D.; Méndez Fernández, D.: Results of the 1st International Workshop on Impact of Agile Practices (ImpAct 2015), SIGSOFT Softw. Eng. Notes 40/15, pp. 20-23, 2015.

[Di15a] Diebold, P.; Ostberg, J.-P.; Wagner, S.; Zendler, U.: What Do Practitioners Vary in Using Scrum?. In: International Conference on Agile Software Development (XP), Springer, pp. 40-51, 2015.

[Di16] Dikert, K.; Paasivaara, M.; Lassenius, C.: Challenges and success factors for large-scale agile transformations. A systematic literature review. Journal of Systems and Software 119/16, pp. 87-108, 2016.

[Dy08] Dyba, T.; Dingsøyr, T.: Empirical studies of agile software development. A systematic review. Information and Software Technology 50/08, pp. 833-859, 2008.

[Fo16] Fowler, M.: ShuHaRi, https://martinfowler.com/bliki/ShuHaRi.html., Status: 01.04.2016.

[Ga15] Garousi, V.; Coşkunçay, A.; Betin-Can, A.; Demirörs, O.: A survey of software engineering practices in Turkey. Journal of Systems and Software 108/15, pp. 148–177, 2015.

[Gl98] Glaser, B.G.: Doing Grounded Theory: Issues and Discussions. Mill Valley, Sociology Press, 1998.

[Ho14] Houston, D.X.: Agility beyond Software Development, in International Conference on Software and System Processes (ICSSP), pp. 65-69, ACM, 2014.

[Hu15] Hummel, M.; Epp, A.: Success Factors of Agile Information Systems Development. A Qualitative Study. In: 48th Hawaii International Confernce on System Science (HICCS), pp. 5045-5054, ACM, 2015.

[Ii11] Iivari, J.; Iivari, N.: The relationship between organizational culture and the deployment of agile methods. Information and Software Technology 53/11, pp. 509-520, 2011.

[Ju15] da Silva Junior, G.C.; Amaral, J.P.; Matsubara, P.G.F.; Neto, V.V.G: Influences of Organizational Culture in the Adoption of Agile Methodologies in Information Systems Development. A Systematic Mappin. In: XI Brazilian Symposium of Information System, pp. 31:227-31:234, ACM, 2015.

[Ka13] Kalus, G.; Kuhrmann, M.: Criteria for Software Process Tailoring: A Systematic Review. In: International Conference on Software and Systems Process (ICSSP), pp. 171-180, ACM, 2013.

[Ku17] Kuhrmann, M.; Diebold, P.; Münch, J.; Tell, P.; Garousi, V.; Felderer, M.; Trektere, K.; McCafferey, F.; Linssen, O. Hanser, E.; Prause, C.R.: Hybrid Software and System Development in Practice. Waterfall, Scrum, and Beyond. In: Proceedings of the International Conference on Software System Process (ICSSP), pp. 30-39, ACM, 2017.

[Ma03] Mabin, V.J.; Balderstone, S.J.: The performance of the theory of constraints methodology. Analysis and discussion of successful TOC applications. International Journal of Operations & Production Management 23/03 pp. 568–595, 2003.

[Ma13] Maxwell, J.A.: Qualitative Research Design. An Interactive Approach, 3rd Hrsg., SAGE, 2013.

[Ma15] Mayring, P.: Qualitative Inhaltsanalyse. Grundlagen und Techniken, Weinheim: Beltz, 2015.

[Me13] Melo, C.O.; Santos, V.; Katayama, E.; Corbucci, H.; Prikladnicki, R.; Goldman, A.; Kon, F.: The evolution of agile software development in Brazil. Journal of the Brazilian Computer Society 19/13, pp. 523–552, 2013.

[Mu13] Murphy, B.; Bird, C.; Zimmermann, T.; Williams, L.; Nagappan, N.; Begel, A.: Have Agile Techniques been the Silver Bullet for Software Development at Microsoft. International Symposium on Empirical Software Engineering and Measurement, 2013.

[No95] Nonaka, I.; Takeuchi, H.: The Knowledge-Creating Company, Oxford University Press, 1995.

[Si07] Siakas, K.V.; Siakas, E.: The Agile Professional Culture: A Source of Agile Quality. Software Process Improvement and Practice 12/07, pp. 597-610, 2007.

[St09] Strode, D.E.; Huff, S.L.; Tretiakov, A.: The Impact of Organizational Culture on Agile Method Use. In: 42nd Hawaii International Conference. IEEE, 2009.

[Th16] Theocharis, G.; Kuhrmann, M.; Münch, J.; Diebold, P.: Is Water-Scrum-Fall Reality? On the Use of Agile and Traditional Development Practices. In: International Conference on Product-Focused Software (Profes), pp. 149-166, Springer, 2016.

[To08] Tolfo, C.; Wazlawick, R.S.: The influence of organizational culture on the adoption of extreme programming. The Journal of Systems and Software 81/08, pp. 1955-1967, 2008.

[To09] Tolfo, C.; Wazlawick, R.S.; Ferreira, M.G.G.; Forcellini, F.A.: Agile methods and organizational culture. Reflections about cultural levels. Journal of Software Maintenance and Evolution 23/09, pp. 423-441, 2009.

[Tr14] Tripp, J.F.; Armstrong, D.J.: Exploring the Relationship between Organizational Adoption Motives and the Tailoring of Agile Methods. In: Hawaii International Conference on System Sciences (HICSS), 2014.

[Ve14] VersionOne: State of Agile Survey, 2006-2014, http://www.versionone.com/agile-resources/more-resources/blogs/, Status: 01.04.2017.

[Vi16] Vijayasarathy, L.R.; Butler, C.W.: Choice of Software Development Methodologies. Do Organizational, Project, and Team Characteristics Matter?, IEEE Software 33/16, pp. 86-94, 2016.

[We11] West, D.: Water- Scrum-Fall Is The Reality Of Agile For Most Organizations Today. Forrester Research, Tech. Rep., 2011.

[Xu08] Xu, P.; Ramesh, B.: Using Process Tailoring to Manage Software Development Challenges. IT Professional 10/08, pp. 39-45, 2008.