How Do Individual Social Agile Practices Influence the Development Success? An Exploratory Study

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Abstract. Although agile software development (ASD) is widespread, the contributions of individual agile practices to development success are still largely unclear. In this paper, we explore the hidden cause-effect relationships between the application of social agile practices, the realization of social agile principles, and the resulting contribution(s) to ASD success. To capture ASD success, we consider both the effects on developer acceptance and economic business values. Based on an initial ASD success model and data from a survey of 197 developers, we found that social agile practices such as reflection, business IT alignment, and self-organization seem to particularly promote ASD success. We also found indications that the realization of these principles is primarily driven by practices such as retrospective meetings and shared leadership, whereas prominent practices like daily meetings and pair programming seem to have no effect. Our results thus call for reassessment of agile practices and their use in practice.

Keywords: Agile Software Development, Agile Business Value, Agility

1 Introduction

ASD methodologies such as Scrum or Extreme Programming introduce whole sets of new practices that can lead to higher productivity [1, 2], better requirements meeting [2], shorter time to market [3], and/or increased job satisfaction [2, 4]. While the impact of ASD methodologies on the development success has been studied extensively, the specific effects that their individual agile practices unfold are much less clear. This seems to be particularly true for the effects of social agile practices, such as daily meetings, that are assumed to promote the principle of "social interaction, collaboration and direct communication" [5]. Although they are commonly regarded as key elements of ASD [5, 6], the individual effects of social (and other) agile practices are not well understood yet [5, 7]. Therefore, it remains difficult to explain how agile methodologies specifically achieve their promised benefits [8].

Gaining a better understanding of the effects of individual agile practices appears to be particularly important since ASD has not developed into a coherent, well-established concept yet. Instead, it encompasses several abstract principles (like communication) and concrete practices, which differ between ASD methodologies and are often used in customized combinations – sometimes even in concert with traditional practices [9].

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Clarifying the effects of individual agile practices would therefore not only contribute to a better understanding of ASD as a concept, but also support a more purposeful selection of individual agile practices to achieve certain benefits.

To contribute to the closure of this research gap, we present the results of a study, in which we examined the individual effects of several social agile practices on the development success. We concentrate on social agile practices for two reasons: first, while we wanted to provide a broad picture, we had to limit the scope of our study to a set of thematically related practices. Second, social agile practices are regarded as important constituents of ASD [5, 6] and seem to have a particularly significant potential to contribute to the development success since software project failures often emerge from social and political deficiencies [10]. We examine the following research questions: "*How do social agile practices promote the realization of social agile principles? How does the realization of social agile principles create business value?*"

To answer these questions, we develop the initial version of an ASD success model, which relates the social agile practices used on site with the achieved contributions to development success. Taking an exploratory approach, we evaluate this model using a survey of 197 developers, who reported on their ASD projects. The results contribute to the body of knowledge on ASD in two ways: first, the model describes how agile practices contribute to the success of an ASD project by promoting the realization of certain agile principles on site. Second, we provide new indications regarding the effects of individual social agile practices, which are still debated in literature [5, 7]. While this study aims at gaining a broad, initial picture of the effects of social agile practices, the results are also meant to provide a starting point for identifying agile practices with particularly noticeable effects that should be studied in further detail.

We proceed as follows: next, we describe the constituent elements of ASD methodologies, followed by an examination of prior research. In section 3, we develop our ASD success model. Section 4 describes the research method used to evaluate our model. In section 5, we analyze the gathered empirical data. The findings, implications, and limitations of our study are discussed in section 6. Section 7 concludes the paper.

2 Theoretical Background

2.1 Agile Software Development

ASD methodologies introduce a set of concrete *agile practices* to improve the agility of development teams [11]. While the concept of software development agility is still debated [12], the major definitions share a focus on the ability of development teams to handle and instill change in the development process. For the purpose of our study, we adopt the definition of Baham and Hirschheim (2021) and perceive agility as "a software development team's ability to anticipate, create, learn from and respond to changes in user requirements through a process of continual readiness" [12].

To provide a unified basis for conceptualizing software development agility, the Agile Manifesto defines 12 *agile principles* that characterize the essence of the term [13]. These principles focus on different aspects of agility and can be understood as

abstract “guidelines” [14] to achieve agility through the application of agile practices. Principles such as communication or self-organization thereby emphasize “individuals and interactions” [13] and can hence be summarized as *social agile principles*, while others rather concentrate on technical aspects such as “working software” [13].

Agile practices introduce concrete working, interacting, and managing procedures for the development process [7]. They aim at promoting development agility by supporting the implementation of agile principles on site. The proposed agile practices differ between ASD methodologies. Moreover, the individual practices aim at fostering different aspects of agility. Like agile principles, they can broadly be classified into technical and social practices [7]: *social agile practices* are depicted as the subset of practices that promotes “social interaction, collaboration and direct communication of ISD team members” [5]. This subset encompasses practices such as daily meetings, retrospective meetings, or pair-programming [15]. Technical agile practices, on the other hand, pertain “to the software engineering-oriented aspects of software development” [7]. Among others, this subset contains practices like refactoring [7].

2.2 ASD Success and Business Value of ASD

Extant studies have found that the successful application of ASD methodologies can lead to the realization of benefits of different forms [16]. Consequently, there seem to be many ways to view the success of ASD. While traditional approaches often examine the success of development projects as the business value in terms of the resulting economic output (e.g., costs, productivity, or quality), the business value of ASD consequently ought to be defined more broadly [17]. Literature particularly proposes to view ASD success as multidimensional concept, which encompasses both the created economic values and the values added for the involved stakeholders [17, 18].

Next to economic values, various studies have therefore also examined additional benefits that developers may achieve from the utilization of ASD practices. Besides their job satisfaction [4], these benefits also include factors such as the compatibility of ASD practices to the preferred working habits of developers, which also determine the acceptance of ASD in practice [3]. Despite that these benefits might not lead to direct economic effects, they ought to be viewed as business values as well. While the business value of ASD is still subject to ongoing research, the discussion shows the multidimensionality of the concept, which needs to be addressed in our study design.

2.3 Related Work

In the domain of software development success [19], we can broadly distinguish three research strands, which shape our current understanding of the factors influencing ASD success. The first research strand focuses on the *product* that is to be developed. Studies in this area of interest identified several characteristics such as the scope or complexity of the product, which have an influence on the success of ASD [13–15].

The second research strand concentrates on the ASD *team*. Research in this area found that the success of ASD is influenced by individual factors such as the personal

motivation of the developers as well as group-specific characteristics like the diversity of the team and organizational factors such as the management support [20–22].

The third research strand is related to our study and concerns the effects of the *agile practices* used on site. Research in this area has mostly focused on examining the effects of ASD methodologies such as Scrum, which introduce a whole set of practices to support the development process. While studies have shown that ASD methodologies can promote ASD success in several ways [1–4], little is known about the contributions of their individual agile practices. So far, only a few frequently emphasized agile practices such as pair programming have been specifically examined [23, 24]. Moreover, findings on less prominently discussed ASD practices such as retrospective meetings remain particularly scarce [8].

Extant findings additionally suffer from a lack of comparability as they refer to different conceptions of agility and ASD success. As the latter is often conceptualized using criteria such as on-time and on-budget completion, some studies even run the risk of ignoring the specific, agility-related benefits of ASD. Furthermore, the few extant studies concentrate on the benefits of singular ASD practices only [25], while a comparative perspective is lacking. Hence, our understanding of the comparative effects of ASD practices on ASD success is still nascent.

3 Research Model

To facilitate a goal-driven application of ASD, it appears necessary to gain a better understanding of the contributions of its individual constituents to ASD success. As a starting point for a comparative analysis of social agile practices and the created business values, we present the initial version of an ASD success model. Figure 1 illustrates the model, its core constructs, and the relationships between them. It assumes that the use of social agile practices on site promotes the realization of certain agile principles, which in turn contribute to ASD success, thus creating business value. To describe the relationships of the model elements, we built upon the literature. In particular, we adapted and generalized a concept from a related study, which depicts the application of ASD practices and the resulting behavior that causes performance increases [26]. To substantiate our understanding of the realization of ASD success, we moreover referred to the generic ISD success process model [19]. It states that the application of an ISD methodology affects the development process and leads to different outcomes (i.e., business values), which characterize ISD success as multifaceted concept. To identify relevant constructs for the three main constituents of our model, we performed a literature review, thereby adhering to the guidelines for systematic literature reviews of vom Brocke et al. [27]. We identified and adapted social agile practices as described in literature for our model [5, 6]. Accordingly, we included daily and retrospective meetings, pair programming, co-location of team and customer as well as shared leadership as techniques with a social emphasis.

To identify relevant agile principles characterizing social behaviors of the team, we inspected the Agile Manifesto [13] and studied its statements, thereby taking a socially-oriented stance. We found communication, reflection, business-IT alignment, and self-

organization to be relevant principles with a social emphasis, as these principles are particularly in line with the notion of "social interaction, collaboration and direct communication of ISD team members" [5]. To solidify our findings, we verified our interpretation of the principles with their appraisal in literature before including them into our model. Communication is depicted as the primary way of transmitting information and represents a key social element of ASD [23]. Reflection is considered as a means to increase team effectiveness and adaptation [28], representing the second identified social principle. As a third social principle, we identified business IT alignment (BITA), which usually is referred to as collaboration in the ASD literature. As there is a close interrelationship between communication and collaboration anyway,

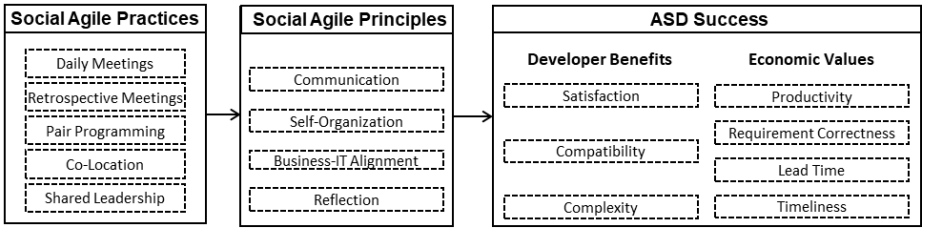

Figure 1. Agile software development success model

we rather interpreted the statement as a guideline to establish BITA, which emphasizes the need for daily interaction between business and IT [29], thus also embodying a social note and being in line with the perspective on social agile principles. Lastly, we found self-organization to be an important social agile principle that governs team interactions and internal team management [21].

Based on the observation that agility of the team contributes to ASD success [30], we propose that it is the realization of agile principles (which characterize agility) that contributes to development success and helps to achieve different business values. To represent the multidimensionality of ASD success and to derive relevant indicators, we built upon the literature. To characterize the economic value of ASD, we selected requirement correctness [31], lead time [32], timeliness [20] and productivity [33] as relevant dimensions for our study. To characterize the benefits that the developers may draw from the application of ASD practices, we included satisfaction [4], compatibility [3], and complexity [32] as factors into the model. This list of indicators might not be exhaustive. However, we deem it to provide a sufficient basis for our study.

Given the still nascent knowledge base in this research area, we are not able to propose concrete effects of particular social agile practices on specific agile principles and business values. We rather explore those effects to gain first indications.

4 Research Methodology

4.1 Survey Instrument Development

We conducted an online survey to evaluate our research model and identify concrete effects of social agile practices. When developing the questionnaire, we derived items for the constructs based on established measurement instruments from literature where

possible. The constructs, sources and the obtained reliability scores are listed in Table 1. Blank spaces indicate constructs that had to be newly developed as they were not yet defined in literature. To measure the use of social agile practices, we decided to rely on a single-item approach. Accordingly, we asked if a specific practice was in use and measured the response on a 7-point scale ranging from "never in use" to "always in use". Although single-item measures are sometimes regarded with critique, research found them to be "as predictively valid as multi-item measures" [34] if the construct is concrete, singular [35], sufficiently narrow, and unambiguous to the respondent [36, 37]. While we deem these prerequisites to be fulfilled, we admit that we are unable to reflect differing implementations of agile practices with our strategy. Note, however, that the goal of our study is to obtain an initial picture of the effects of the various practices. We therefore considered the use of a direct question to be appropriate. To measure agile principles and success dimensions, we used three-item measurements because we viewed these constructs to be more complex in nature and to possess different facets. All items for agile principles and success dimensions were measured on a 7-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (7).

4.2 Data Collection and Data Analysis

The web-based, open survey was accessible for 18 months and advertised via e-mail, professional social media forums (e.g., thematically relevant LinkedIn groups) and on the chair's homepage. To account for national and international participants, we developed a German[1] and an English[2] version of the questionnaire. Due to the described lack of theoretical understanding of the underlying cause-and-effect relationships between agile practices, agile principles, and resulting business value, we adopted an exploratory data analysis strategy. We decided to employ a multiple regression analysis, which provides a validated approach to explore the relationship between influencing factors and outcomes [42, 43]. As we focus on ASD projects and the developers of the ASD team, we defined a subsample of our dataset, which only includes ASD projects, and the project members involved.

Table 1. Construct Validity Measures

Construct	**α**	**ID**	**Construct**	**α**	**ID**	**Construct**	**α**	**ID**
Communication	0.802	[5, 38]	Productivity	0.910	[39]	Compatibility	0.921	[40]
BITA	0.831	[38]	Lead-Time	0.672		Satisfaction	0.931	[4]
Reflection	0.832		Timeliness	0.808		Complexity	0.730	[41]
Self-Organization	0.703	[5]	Requirement Correctness	0.814	[20]			

In our setting, the first regression analysis investigates the relationship between social agile practices and social agile principles. The second regression examines the relationship between social agile principles and the resulting ASD success, including economic dimensions and developer benefits. In addition to the variables described

[1] https://doi.org/10.6084/m9.figshare.16988395
[2] https://doi.org/10.6084/m9.figshare.16988893

before, we included age, gender, the degree of distribution of the project and the team size as control variables. To account for potential cases of heteroscedasticity, we selected a robust sandwich estimator (HC3) as recommended by Hayes and Cai [44]. We further tested the models for multicollinearity concerns using the VIF-values obtained during the analysis. The results indicated no issues of multicollinearity among the independent variables, as all VIF-values were within the recommended threshold of VIF < 10 [45]. In case of missing values, we opted for a listwise deletion.

5 Study Results

Overall, our sample includes 235 responses. 38 had missing values and were excluded from the final sample, resulting in a final sample size of 197 observations. 85.3% of the respondents were male, 14.7 % female. The largest age group represented in our study included participants between 30-40 years of age (n=72), followed by the group of 20-30-year-old participants (n=49). Most of the respondents were employed in the IT software industry (n=73), followed by 37 participants from the finance sector and 23 participants from the consulting business. 72 responses came from Germany, 68 from Switzerland, 32 from India, 7 from the United States, and 18 from other countries. As shown in Table 1, all of our newly developed constructs or adapted measurement items for the questionnaire, except for the construct "lead time", exhibit satisfactory internal consistency and item reliability, with the Cronbach's Alpha values ranging above $\alpha > 0.70$ as recommended by Nunnally (1978) [46]. The α-value for the construct "lead time" ($\alpha = 0.67$) still satisfies the acceptable minimum of $\alpha > 0.60$ recommended for exploratory studies [45, 46]. All constructs are thus included in the analyses.

5.1 Effects on Social Agile Principles

First, we explore the effects of social agile practices on social agile principles. All dependent variables are influenced by at least two significant predictors, lending support to the proposition that social agile practices lead to the implementation of social agile principles. Shared leadership and responsibilities show significant effects on most of the social agile principles, especially on communication ($\beta = 0.227$, $p < 0.001$), reflection ($\beta = 0.179$, $p < 0.001$) and self-organization ($\beta = 0.220$, $p < 0.001$), while BITA is only slightly affected ($\beta = 0.159$, $p < 0.05$). Retrospective meetings also show a positive impact on communication ($\beta = 0.139$, $p < 0.05$) and self-organization ($\beta = 0.139$, $p < 0.001$). Moreover, retrospective meetings promote reflection ($\beta = 0.296$, $p < 0.001$). The practice of co-location of the team and the customer slightly improves BITA ($\beta = 0.120$, $p < 0.05$) and self-organization ($\beta = 0.133$, $p < 0.01$). Surprisingly, daily meetings and pair programming hardly show any significant influences on social agile principles. Pair programming even negatively affects self-organization ($\beta = -0.192$, $p < 0.01$). Self-Organization ($R^2 = 0.273$) has the most significant predictors of all examined social agile principles, while reflection shows the highest R^2 observed ($R^2 = 0.338$). The obtained R^2 values for the social agile principles communication ($R^2 = 0.209$) and BITA ($R^2 = 0.080$) imply moderate explanatory power.

Table 2. Results: Social Agile Practices → Social Agile Principles

	Social Agile Principles			
	Communication	**Reflection**	**BITA**	**Self-Organization**
Daily Meetings	0.031	0.058	0.031	0.030
Pair Programming	-0.078	-0.023	0.008	-0.192**
Co-Location	0.075	0.043	0.120*	0.133**
Retrospectives	0.139*	0.296***	-0.028	0.171**
Shared Leadership	0.227***	0.179***	0.159*	0.220***
Adj. R^2	0.209	0.338	0.080	0.273

Notes: * p < .05; ** p < .01; *** p < .001, overall F-value & p-value significant for all models

5.2 Effects on Acceptance Factors and Economic Values

Next, we examine the effects that social agile principles have on the acceptance factors and the economic outcomes. All success dimensions are significantly predicted by at least one social agile principle, thus supporting the presumption that the realization of social agile principles promotes ASD success. Reflection and BITA show a positive impact on all acceptance factors, supporting the proposition that the realization of social agile principles influences the acceptance of agile methodologies. Reflection reduces the perceived complexity (β = -0.311, $p < 0.001$). Moreover, it improves both the compatibility of a methodology with the developer needs ($\beta = 0.461$, $p < 0.001$) and the overall satisfaction ($\beta = 0.546$, $p < 0.001$). Similar effects of BITA on the acceptance dimensions were observed for reflection (Table 3). In contrast, communication and self-organization show no influence on the acceptance factors. The R^2 values indicate good explanation, ranging from $R^2 = 0.351$ for complexity to $R^2 = 0.497$ for compatibility.

Table 3. Results: Social Agile Principles → Acceptance Factors & Economic Business Values

	Acceptance Factors			**Business Values**			
	Com-plexity	**Compa-tibility**	**Satis-faction**	**Produ-ctivity**	**Lead Time**	**Time-liness**	**Requirement Correctness**
Commu-nication	-0.039	0.082	0.009	0.050	0.017	0.047	0.000
Selforga-nization	-0.052	0.122	0.168	0.239**	-0.094	0.377**	0.133
Reflection	-0.311***	0.461***	0.546***	0.518***	-0.337**	0.121	0.345***
BITA	-0.281**	0.249**	0.272**	0.140	-0.030	0.191	0.200**
Adj. R^2	0.351	0.497	0.473	0.538	0.128	0.178	0.460

Notes: * p < .05; ** p < .01; *** p < .001, overall F-value & p-value significant for all models

The results moreover indicate that self-organization, reflection and BITA positively influence the economic value, while communication does not imply significant effects. Productivity is positively affected by self-organization ($\beta = 0.239$, $p < 0.01$) and reflection ($\beta = 0.518$, $p < 0.001$). The latter also shows significant effects on the reduced lead-time required to deliver initial results (β = -0.239, $p < 0.01$) and improves the timeliness of the project ($\beta = 0.377$, $p < 0.01$). Furthermore, requirement correctness is

increased through frequent reflection ($\beta = 0.345$, $p < 0.001$) and BITA ($\beta = 0.200$, $p < 0.01$). The R^2 values in Table 3 show good explanatory power for productivity ($R^2 = 0.538$) and requirement correctness ($R^2 = 0.460$), while for timeliness ($R^2 = 0.178$) and lead-time ($R^2 = 0.128$) the values indicate moderate explanation.

6 Discussion

6.1 Key Findings on Social Agile Practices and Social Agile Principles

The results indicate that the use of social agile practices supports the implementation of social agile principles and thus the realization of agility. To our surprise, however, this does not seem to apply to all investigated practices. Although daily meetings are one of the most widely adopted agile practices [47], they apparently do not influence any of the social agile principles. Some scholars suggest that daily meetings may imply an additional overhead to the schedule of developers [48], as they frequently exceed the defined time limits [48, 49] and are often used to discuss other problems, potential solutions [50], or topics of lesser relevance [49]. Our findings seem to corroborate this proposition, thus suggesting a reassessment of the value and effects of daily meetings.

In contrast to the findings on daily meetings, retrospectives seem to have a more prominent effect on social agile principles. As retrospectives are arranged to discuss and reflect on issues that occurred during the development process, they facilitate the exchange of thoughts and thus support continuous learning [51]. Our results suggest that retrospective meetings particularly stimulate the communication and self-organization of the team, while generally enabling reflection of the development process, which is in line with extant literature [28]. In practice, however, they are often abandoned due to a lack of support and tight time budgets, thereby increasing the risk of process erosion [28, 52]. In the light of our findings, this negligence appears worthy of reconsideration, as retrospectives show effects on most of the social agile principles.

As regards shared leadership and responsibilities, our results indicate this practice implies the most significant effects of all practices on the social agile principles. Both communication and reflection seem to be positively affected, presumably due to the team being responsible for the coordination of the process, which requires frequent conversations and adaptation [53]. Thus, to understand and coordinate the objectives specified by the business, the development team needs to be closely aligned to the business stakeholders, which suggests the observed effect on BITA. In line with our findings, research also describes shared decision authority and leadership as important for the autonomy of self-organized teams [15]. In contrast, pair programming seems to negatively affect the degree of self-organization in the team. These results raise the question whether a separation into pairs of two could have negative influences on the overall coordination of the team, e.g. due to conflicts [54] transcending into the team.

6.2 Key Findings on Social Agile Principles and ASD Success

With respect to the influence of social agile principles on ASD success, the results are partially surprising. They indicate that communication does not significantly affect any of the ASD success dimensions, while related work frequently portrays communication as an important success factor [55, 56]. Other researchers, however, also report that communication "is no 'silver bullet' for successful agile SD" [23] and per se may have no or even negative effects on performance and SD success" [23]. In contrast, BITA seems to affect all acceptance factors, and several economic value dimensions. As such, BITA could reduce the perceived complexity, improve the compatibility, and increase developer satisfaction. It also seems to help meet requirements, presumably due to the improved reciprocal understanding [29]. BITA hence could be an important factor for ASD success, although it is not yet well understood in the context of ASD. In literature, communication is a widely acknowledged success factor for BITA [29, 57]. A post-hoc analysis of our data revealed that communication was especially effective when BITA was low, whereas it had almost no effect when BITA was already high.

Furthermore, our findings suggest that reflection might play a more central role for agility than presumed. Reflection seems to reduce the perceived process complexity and to increase compatibility and satisfaction, implying several benefits for developers that apply ASD methods. From an economic perspective, improved productivity, and requirement fulfillment as well as the reduced time to market underline the relevance of reflection. The literature on reflection in ASD research also reports increases in overall effectiveness [13] and productivity [28] of the team, supporting our findings. Based on the results, we suggest reflection could be an important factor to avoid process erosion [28] and to support sustainable development, thus leading to ASD success.

As a third potential driver of ASD success, self-organization seems to raise developer productivity and allows for higher timeliness of development results. Self-organized teams thus seem to meet deadlines better as well as to be more productive, which corroborates previous findings [1, 21]. In recognition of productivity benefits of self-organized teams previously reported by other scholars, such as reduced repetitions of errors [1], we conclude that self-organization is an important key to ASD success.

6.3 Implications and Limitations

From our findings, we derive five propositions to guide both academia and practice towards a better understanding and application of ASD methodologies:

P1. Reassess the effects of widely applied ASD techniques in practice. Our results suggest that the implementation of daily meetings may not necessarily contribute to the agility of the team. As daily meetings frequently lack clear focus and present a temporal burden, practitioners question their usefulness [47, 49, 50]. Considering that BITA was one of the key drivers for the success of ASD in our study, establishing BITA in daily meetings through joint, reciprocal exchange of information between developers and business could thus provide more benefits than solely promoting communication in the development team as a strategy for daily meetings. Practitioners should hence consider reassessing the way these meetings are executed in

their organization. In addition, given the identified negative effect of pair programming on self-organization and other problems reported by practitioners [54], further effort seems to be required to better understand the effects of this popular ASD practice.

P2. Promote the use of underestimated ASD techniques in practice. Considering the observed disregard of reflection in ASD research and practice [28, 52], our results call for a reinvestigation of retrospective meetings. Conducting more reflection-oriented meetings could generally prove beneficial for the establishment of agility, as reflection resulting from retrospectives was identified to be beneficial for ASD success. As suggested by Babb et al. [28], ASD teams should inspect the process more frequently and improve the team's agility by frequent reflection of previous sprints.

P3. Provide teams with shared responsibilities and leadership participation. Based on our results, it could also prove helpful for development teams to be provided with more authority and freedom regarding the execution of the development work. External influences, such as management actions, can reduce the autonomy of the development team and thus hamper their performance [15]. In contrast, our results suggest that agility may improve when teams are provided with adequate autonomy and shared leadership. Previous research also revealed that shared leadership in agile teams improves team innovation as well as team effectiveness to a certain degree [58], which corroborates and extends our findings. Carefully providing teams with autonomy and decision rights may thus prove beneficial for the realization of ASD success.

P4. Examine the role of BITA and its relationship with communication in ASD. A prominent insight of our study concerns the relationship of communication and BITA and their impacts on ASD success. While communication is considered a central factor of ASD in literature [23, 55], BITA has thus far been neglected in ASD research efforts, despite their close relationship. In our study, communication did not affect ASD success dimensions per se, whereas BITA was identified as an important factor. As our post-hoc analysis shows, communication is only significantly important in cases where BITA is low. In the light of these results, we propose that communication as such might not be a primary success driver. Instead, we suggest using communication as a means to promote BITA, which potentially increases the success of ASD. This assumption is in line with IS research [29, 57] that identified communication as a driver of BITA in other domains. As such, an examination of BITA as a hidden driver of ASD success could also contribute to the missing "theoretical glue" required to explain ASD [59].

P5. Conduct further research to grasp the complexity of ASD methodologies. As a part of the results seems to be somewhat unexpected, the findings of our study call for a reassessment of the effects of agile practices and principles. We propose that the conceptual logic of the proposed success model can help to guide those efforts, as the model allows for modular extensions of the practices, principles, and value dimensions. While our results illustrate a rather initial picture of the effects that individual ASD practices have on the development success through the promotion of agile principles, they may still serve as a point of departure for future research in this particular field.

Our findings are not without limitations, however. As described, the ASD success dimensions in our study are by no means exhaustive. Instead, we aimed at proposing an initial set of criteria that adequately represent the specificities of ASD and allow us to explore the effects agile practices and principles may have, while other dimensions

need to be investigated further. Secondly, the sample size of our survey is comparably small, with most participants stemming from only three countries. To determine significant differences in regional subsamples and to increase the generalizability of our findings, a larger and more diverse sample is required. In future research, we thus intend to address a larger field of participants and different roles in ASD to allow for a broader applicability of our derived findings. A third limitation that needs to be acknowledged concerns the design of our study. As we conducted a cross-sectional-single-informant study with an exploratory analysis approach, we are only able to draw limited causal conclusions from our results. While the results only allow for limited causal inferences, we think that the conceptualization of an ASD success model and the results deliver interesting starting points to further investigate initial agile practices. Based on our suggestions, future research on social agile practices and ASD success may help establish the lacking theoretical glue [55] in the ASD context.

7 Conclusion

Agile methodologies receive high attention in practice and research. Despite an increase in adoption and research efforts, several questions regarding the effects that individual social agile practices may have for the realization of agility and the resulting ASD success remain unanswered. To contribute to a better understanding of ASD, we investigated these unclear cause-and-effect relationships in more depth. Our findings provide initial insights on the particular effects of social agile practices. The results suggest that retrospective meetings and shared leadership efforts might be of higher importance than previously assumed. While these practices are frequently less regarded in theory and practice, our findings indicate that more attention should be paid to those particular practices, as they seem to foster agility. Surprisingly, daily meetings and communication did not affect the dimensions of ASD success.

All in all, our findings open new avenues to examine the effectiveness of different ASD practices and to investigate both popular and less regarded principles of ASD, for instance BITA and reflection. Especially these principles showed a notable potential to promote developer acceptance and create economic value. Thereby, we identified BITA as a so far mostly hidden, but relevant success factor that requires further examination to be understood in the context of ASD.

With our findings, we intend to contribute towards unveiling the missing "theoretical glue" [59] of the ASD concept. We hope that the presented ASD success model helps to examine the effects of further ASD practices on different business value dimensions and encourages additional contributions to achieve a better understanding of ASD in general from both a theoretical and practical standpoint.

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