AGILE OR TRADITIONAL PROJECT ORGANISATION: A QUANTITATIVE ASSESSMENT OF DECISION CRITERIA AMONG FIRMS IN THE DACH REGION

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Abstract

The so-called agile approach is increasingly popular in the world of project management as a response to more dynamic and competitive environments. This study follows the question: What are the decisive criteria that result in the use of agile process models in practice? Therefore, a broad range of decision criteria is investigated, representing different reasons for firms to decide in favour or against the usage of agile process models, namely: Time-saving, increased efficiency, availability of qualified personnel, uniform terminology, project comparability and functions as a knowledge base. Most existing research on agile project management is of qualitative nature; this study uses a quantitative approach to assessing 51 firms and nine different industries within the DACH region. The collected data was analysed in a binary logistic regression model. Results reveal that time-saving positively predicts the use of agile process models, while high ratings in function as a knowledge base and project comparability predict the absence of agile process models. Therefore, practitioners are suggested to educate project and portfolio managers in the creation of hybrid environments and integration of agile process models in traditional project portfolios.

Implications for Central European audience: The results of this study provide valuable insights into the selection of project management approaches across different industries in the DACH region.

Keywords: agile; traditional; waterfall; project organisation; process models; decision criteria
JEL Classification: L23, L30, M00

Introduction

Process models in project management have become an essential element for project success, regardless of the industrial sector or size of the project. The more suitable the selected process model is for a project, the higher the probability of the projects' success

(Chin & Spowage, 2010; Thesing et al., 2021). Linear phase-based and standardised process models such as suggested by the Project Management Institute (Guide to the Project Management Body of Knowledge, PMBoK-Guide), the International Project Management Association (Individual Competence Baseline, ICB), or AXELOS (Projects in Controlled Environments, PRINCE2) have been prevalently implemented across different industries for a long time, and are referred to as traditional or waterfall process models (Habermann, 2013; Klotz & Marx, 2018; Kononenko & Lutsenko, 2018; Timinger, 2017). However, an increase in global competition and increasingly dynamic and digitalised business environments require companies to adjust their project management to remain competitive (Ciric et al., 2019). Therefore, more iterative, incremental, and collaborative processes in so-called agile approaches, such as SCRUM (Scrum.org, 2019), have been suggested and adopted by project management practitioners across industries (Habermann, 2013; Klotz & Marx, 2018; Kononenko & Lutsenko, 2018; Salameh, 2014; Timinger, 2017). The flexibility that is required for the core tenets of agile project management, such as regular reviews, quick implementation of changes, close customer contact and changing team constellations, often pose a challenge for firms with established phase-based processes and structures for a traditional project and portfolio management in place (Stettina & Hörz, 2015). It is further suggested that it is the combination of traditional and agile methods which offers particular potential for effectiveness, depending on the project scenario (Habermann, 2013). Such derivates are also referred to as hybrids. Since there are no established standards for hybrid project management in the industry, these approaches are suggested to be mostly reflected by actual practice rather than a predefined process (Wysocki, 2007). Subsequently, the introduction of agile process models can happen in the context of a hybrid project organisation or individual agile projects. This study aims to provide insights on decision criteria explaining why some firms decide to use agile process models while other firms refrain from agile organisation models and remain with traditional project management processes, following the question: What are decisive criteria that result in the use of agile process models in practice?

1 Theoretical background

1.1 Decision criteria

Standardised project management methodologies offer tools which the project manager can use to optimise the execution time when carrying out a project (Matos & Lopes, 2013). However, there are differences in the time management of traditional and agile process models. Traditional process models have their emphasise on creating and following a detailed initial project plan (Špundak, 2014). This planning phase can take large quantities of time to develop a detailed plan, of which components or the whole plan is ultimately discarded when too many changes become necessary (Collyer et al., 2010; Olsson, 2006). Agile project management, on the other hand, has proven itself a practical way to manage time-sensitive projects due to its iterative approach and more intense involvement of the customers in the development process (Salameh, 2014). Instead of investing time into thorough planning, it focuses on project execution (Chin, 2004; DeCarlo, 2004; Leffingwell, 2007; Manifesto, 2001; Williams, 2005). It does not rely on time-consuming documentation but rather on direct communication and allows changes by reviewing and evaluating the project requirements in each iteration with the inclusion of the customers' opinion, reducing the risk of spending time on ideas or plans that later must be discarded (Boehm, 2002; Chin, 2004; Hass, 2007). In

Volume **11** | Issue **5** | 2022
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agile project management, the project team is ideally authorised to decide how to reach the goal of each iteration in a more self-organising manner, by which long decision processes can be avoided compared to the more traditional waterfall approach in which problems and decisions often must be escalated through various layers of hierarchies (Boehm, 2002). Such fast-paced decision-making and implementation cycles are supposed to accelerate the projects that are particularly difficult with the traditional process models. Project time constraints are therefore considered one of the main reasons why a traditional approach is not suitable for projects in faster-developing environments and industries (Williams, 2005). Therefore, time-saving is hypothesised to be a decision criterion favouring the usage of agile process models.

H1: *Time-saving as a decision criterion has a positive effect on the decision to use agile process models.*

Process models are said to make work processes in project management more efficient (Chin & Spowage, 2010). Although there are different understandings and perspectives on how to measure efficiency in the context of project management, one of them is focusing on minimising project cost and implementation time. Other definitions of efficiency highlight that the project should be carried out in the best possible way, considering the required resources, while creating an outcome that is the best suitable and optimum for the customer (Sundqvist et al., 2014). Therefore, in contrast to the decision criterion of time-saving, efficiency also includes other factors such as cost savings and product-market fit. The iterative review and evaluation of the project requirements within an agile approach take place to help reduce the risk of incurring excessive expenses on features that turn out to be of low value (Hass, 2007). The direct communication and the closer collaboration with project stakeholders in agile project management make key information accessible to the whole team and have proven to increase project success by enabling the project team members to make appropriate and well-informed decisions (Müller & Turner, 2007). Moreover, the involvement of the project customers in the development process improves the validation of customer requirements for new feature development and increases the likelihood of product-market fit (Hass, 2007). While traditional project organisation aims to achieve efficiency by finalising the project within time, budget, and scope through initial planning (DeCarlo, 2004; Shenhar & Dvir, 2007; Wysocki, 2007)**,** the implementation of changes in traditional project organisation is much more complex and time-consuming, since the budget, time and scope planning must be adjusted considering every change (Salameh, 2014). The reliance of traditional project management on an initial plan without frequent customer interaction and adapting it to changing market needs (Špundak, 2014) holds the risk of creating a product which will not have adequate product-market fit. For these reasons, it is hypothesised that increased efficiency as a decision criterion has a positive effect on the usage of agile organisation models.

H2: *Increased efficiency as a decision criterion has a positive effect on the decision to use agile process models*

The concept of agile project management, which originated from software development and gained visibility with the publication of the agile manifesto in 2001, is a relatively new approach compared to the traditional waterfall approach, which principles were established in the 1950s (Špundak, 2014). The competence of the lead project manager was found to be one of the key determinants of project success for traditional process models (Radujković &

Sjekavica, 2017). While there is a wide range of project management certifications available, some recruiters have found that there often is a large gap between the project manager's explicit knowledge and actual experience, with the latter being considered particularly important for project success (Starkweather, 2011). Although the number of certifications for agile process models like SCRUM is growing, most of the certified project managers have only a few years of experience in managing agile projects (Alvarez-Dionisi et al., 2016; Scrum.org, 2019). Most companies claim that they are yet to have high levels of competencies with agile process models (Digital.ai, 2020). Although interest in agile project management outside of the software industry is increasing (Ciric et al., 2019) and it is predicted to become even more important in the future (Alvarez-Dionisi et al., 2016), the traditional project organisation has been in use for a much longer time, so that the number of experienced project managers is likely to be higher with traditional standards than for agile process models. Furthermore, a survey among executives suggests that finding the right people is a critical criterion for achieving agility (Catalant, 2018; Storme et al., 2020). Thus, a shortage of qualified personnel for agile project management could result in a firm's decision to not use agile process models in order not to expose their projects to the risk of inexperienced project managers.

H3: *Availability of qualified personnel as a decision criterion has a negative effect on the decision to use agile process models*

A standardised project management methodology provides specific terminology, creating a common language in the project environment (Chin & Spowage, 2010). A shared project management language can help to avoid serious communication problems (Delisle & Olson, 2004). For successful project implementation, all project stakeholders should therefore be familiar with the terminology. Most companies are still maturing in the use of agile methods (Digital.ai, 2020) and could therefore be less familiar with the agile terminology than the traditional one. Therefore, if a company switches to agile, serious communication problems could arise among its stakeholders due to the lack of knowledge in agile terminology. In this case, the introduction of an agile process model would require the communication and explanation of the new terminology to all project stakeholders, which, depending on the size of the company and the number of stakeholders, could be associated with great effort and would also require their acceptance of the new terminology. Accordingly, companies could refrain from using agile process models to maintain the uniformity of terminology among all project stakeholders to avoid the effort of explaining the new terminology and the risk of it not being accepted by the collaborating partners.

H4: *Uniform terminology as a decision criterion has a negative effect on the decision to use agile process models*

Control and coordination of several projects in a company, in other words, project portfolio management, requires the strategic allocation of resources and the associated prioritisation of projects to achieve the company's strategic goals (Cooper et al., 1997). The prioritisation of projects requires their comparability in terms of progress, structure, and costs, which is a challenge when using both agile and traditional process models for different projects in the portfolio (Stettina & Hörz, 2015). Agile-organised projects are carried out iteratively and differ in terms of structure and progress from traditionally pre-planned projects (Salameh, 2014). In agile project management, costs, time, and quality are rather fixed, while the scope can change over the course of the project iterations (Salameh, 2014). In traditional project

Volume **11** | Issue **5** | 2022
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organisation, an initial plan defines the project scope and content. For such projects, the focus is on keeping the estimated project costs and duration in line with the pre-planned budget and schedule (Salameh, 2014). Subsequently, project controlling, progress, and structure differ depending on the chosen process model. Since agile project management is a relatively new approach and practices in project portfolio management are more established for traditional process models (Digital.ai, 2020; Stettina & Hörz, 2015), we suggest that in firms with a high need for project comparability, agile process models are avoided.

H5: *Project comparability as a decision criterion has a negative effect on the decision to use agile process models.*

The application of standardised process models helps with the integration of tools, techniques, and knowledge to increase the project's success (Chin & Spowage, 2010). Bodies of Knowledge are standardised guides (Morris et al., 2006) that aim to define and streamline the terminology and prerequisite knowledge of project managers (Morris, 2001). Most Bodies of Knowledge were created in the 1980s when traditional project management was the only existing approach. Although new approaches have been implemented in the following editions, traditional process models are still predominately represented in the Bodies of Knowledge (Špundak, 2014). It was also found that traditional standards are considered helpful where there is an absence of tacit knowledge, providing guidance to managers with less experience and knowledge of project management. Moreover, traditional standards help to adopt lessons learned from the project to the project. One part of the basic lesson-learned process is to archive, organise and make the knowledge acquired accessible to current and future project teams (Chin, 2004). Furthermore, documented knowledge also becomes essential in organisations consisting of multiple teams (Stettina et al., 2012). Here the phase-based nature of traditional project standards usually requires additional documentation and knowledge as in- and output among the phases that can be harvested for project knowledge (Schindler & Eppler, 2003). In contrast, the rather informal, direct communication and exchange of tacit knowledge that agile management approaches enforce creates additional complexities (Boehm, 2002; Chin, 2004; Hass, 2007; Stettina et al., 2012). Subsequently, it is suggested that the implemented process models should serve as a knowledge base for future practices. Agile process models, on the contrary, are less likely to provide such bases.

H6: *Function as a knowledge base as a decision criterion has a negative effect on the usage of agile process models.*

1.2 Firm size and agile organisation

Larger firms require significant adaptations on the project and organisational level due to their often more bureaucratic organisation and well-established traditional methods and established governance frameworks that contradict the agile principles (Hobbs & Petit, 2017; Barlow et al., 2011). The flexibility and time efficiency of agile project management arise through its iterative approach, frequent feedback loops and close collaboration with the customer (Hoda et al., 2010; Stettina & Heijstek, 2011). However, the introduction of such agile processes usually requires a change in the way of thinking (DeCarlo, 2004; Shenhar & Dvir, 2007), which becomes more difficult with the number of people who need to change. Furthermore, most literature showcasing success with agile process models is taking place

in smaller organisations and projects, which are suggested to do better in providing agile environments (Barlow et al., 2011). Subsequently, the use of the agile process model is expected to depend on firm size, with agile process models more likely to be found in smaller firms.

1.3 Agile organisation in IT and other industries

Agile project management has its origin in agile software development practices (Salameh, 2014). For software and IT projects, traditional project management has been considered unproductive as the project requirements in IT are often vague, intangible, unpredictable and subject to change (Chin, 2004). As a result, agile project management was developed to meet the requirements of software development (Salameh, 2014). After it successfully emerged in the IT sector, agile project management is now used in other industries as well (Owen et al., 2006). Because of the shortcomings of the traditional approach addressing more dynamic environments and the increasing digitalisation, companies of all industries adapt their project organisation to remain competitive. For this reason, there is an increasing interest in agile project management in industries beyond IT (Ciric et al., 2019). However, advantages of the agile approach over the traditional approach have been reported, especially in the IT area, while practitioners in other industries have experienced disappointment and failures with the agile approach (Thamhain, 2014). Since agile project management originated in software development and corresponded to its needs, it is expected to be used more frequently in the IT sector. Thus, we examine the influence of the industry (IT or other non-IT industries) on the usage of agile process models.

2 Methodology

2.1 Questionnaire

First, a questionnaire with items based on the reviewed literature and hypothesised decision criteria was designed. The survey started with an explanation of the topic and the use of the collected data. To avoid language barriers in the DACH region, the questionnaire was originally formulated in German. The final questionnaire was reviewed by two survey experts and three project management experts regarding its neutrality and comprehensibility before distribution. The answer formats in the questionnaire included single selection to indicate their firm size and industry, polytomous multiple selections on the type of process models they use within their company, and 5-point Likert scales for rating the decision criteria deducted from the reviewed literature, and the degree of agility in case they use individually designed standards or process models to organise their projects, such as a hybrid approach. Table 1 lists the items of the questionnaire along with the measures and references.

Volume **11** | Issue **5** | 2022
https://doi.org/10.18267/j.cebr.308

Table 1 | Overview of the items of the questionnaire

Variables	Item	Measure	Based on
Usage of agile process models	Which process models do you use to work on your projects?		
	A0301 IPMA ICB from GPM/PMA A0302 PRINCE2 from AXELIOS A0303 PMBoK from PMI A0304 SCRUM A0305 Individual model	Polytomous multiple selection	Kononenko & Lutsenko, 2018; Habermann, 2013; Klotz & Marx, 2018; Timinger, 2017
Agility of process model	Which approach is your process model suitable for?		
	DA0302 agility of approach	1-5 scale, 1 = agile, 5 = traditional	Timinger, 2017
Decision criteria	For what reasons do you use the process model you chose?		
	DA0101 Time Saving	1-5 scale, 1 = strongly disagree, 5 = strongly agree	Matos & Lopes, 2013
	DA0102 Increased efficiency		Chin & Spowage, 2010
	DA0103 availability of **qualified** personnel		Own conception
	DA0104 Uniform terminology		Own conception
	DA0105 Project comparability		Own conception
	DA0106 function as knowledge base		Chin & Spowage, 2010
Company size	How many employees does your company have?		
	A0201 <10 A0202 10-99 A0203 100-499 A0204 500-999 A0205 >1000	Single selection	Institut für Mittelstandsforschung, 2018
Industry	What industry do you work in?		
	A0101 IT A0102 Manufacturing A0103 Power supply A0104 Trade; maintenance and repair of vehicles A0105 Provision of financial and insurance services A0106 Provision of professional, scientific, and technical services A0107 Provision of other economic services A0108 Public administration, defense; social insurance A0109 Health and social services A0110 Other industries	Single selection	Statistisches Bundesamt, 2007

Source: own representation

2.2 Data collection

This study uses data that was collected via an online survey that was designed and carried out among the customer network of a project management software provider in the DACH

region. The cooperating firm provides comprehensive software solutions for all different project management standards and approaches for their customer firms. A financial incentive in context with their already existing licensed software agreement was provided for participation in the study. Subsequently, a convenience sample for a cross-sectional study on the responding firms' project management landscape was collected, providing insights on the design of the project organisation amongst the projects in their portfolio. The 254 participating firms are active in different industries and use different process models for project organisation. Among the participating firms, 56 provided all necessary information and qualified to be considered for our final sample, resulting in a response rate of 8,37%. Firms that indicated to have an individual project management standard but didn't state whether this is a more agile or traditional approach were not considered for the analysis and therefore removed from the sample. Following, a final data sample of 51 firms (n = 51) in total is analysed.

2.3 Analytical strategy

To analyse the relationship between the hypothesised decision criteria and the presence of agile process models, a binary logistic regression analysis is applied. Logistic regression can be used to analyse the relationship between multiple independent variables and a single dichotomous dependent variable. In this case, the dichotomous dependant variable is the usage of agile process models with two possible outcomes (0 = no agile process models are used, 1 = agile process models are used). For the latter, a scale with two manifestations was created. Firms that use SCRUM were scored as 1. Firms that don't use SCRUM but an internal individual process model, which they labelled as more agile than the traditional approach, were also scored as 1. If SCRUM is not used by the company and they rated an internal individual process model as a more traditional approach, the firm was scored as 0. Firms that didn't use SCRUM and stated no tendency towards an agile or traditional approach regarding the nature of their individual process model were therefore removed from the sample, resulting in a sample size of n = 51. The independent variables are the decision criteria x_1 = time saving, x_2 = increased efficiency, x_3 = availability of qualified personnel, x_4 = uniform terminology, x_5 = project comparability and x_6 = function as a knowledge base. Two control variables x_7 = industry and x_8 = firm size, are added to the model, with industry designed as a categorical variable with the dimensions IT and "Other". The analysis was carried out with the Statistical Package for Social Sciences (SPSS Version 27). The Wald statistics and the p-values are considered to assess whether the suggested causalities result in significant correlations in the model. For this study, a p-value of $p < 0.05$ is considered significant. The Hosmer-Lemeshow test is applied to determine the overall quality of the model (goodness-of-fit), providing information to what degree the estimated model fits the data sample, dividing the observations into groups and comparing the predicted observations with the actual observations for each group. Based on this comparison, the Chi-square test is then carried out. The result showed significance ($p<0.05$), indicating that there is a significant deviation between the model and the data. The odds ratio (Exp(ß)) is considered to assess the effect strength of the respective predictor variables. The odds ratio gives the change in the probability of the event Y=1, if one independent variable is increased by one unit, given that all the other variables of the model are held constant. For negative odds ratios, the reciprocal value is calculated.

Volume **11** | Issue **5** | 2022
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3 Results

3.1 Data Sample and Descriptive Analysis

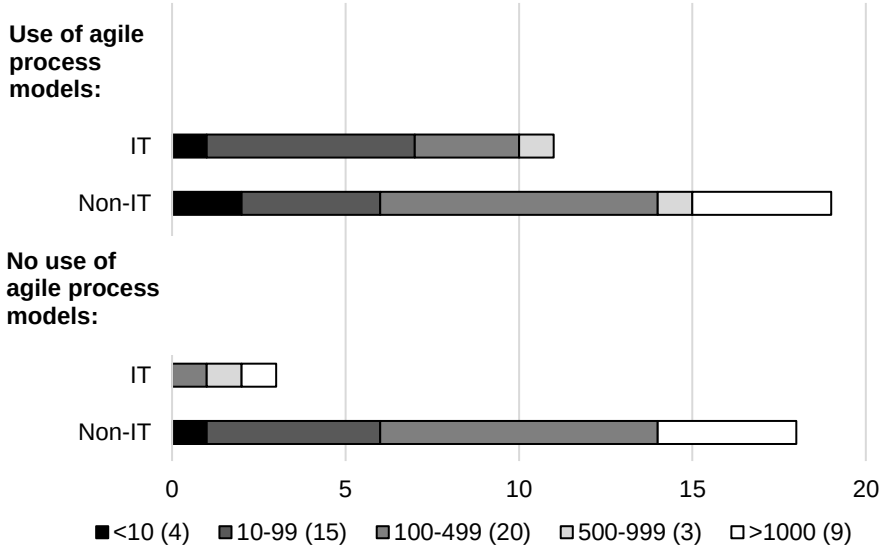
Overall, there are 14 firms in IT and 37 firms from other non-IT industries. Table 2 provides an overview of the surveyed firms in the data sample. Within the total sample, 30 firms use agile process models. Figure 1 provides an overview of the firms that use agile process models, including a subdivision into industries and firm sizes. While large firms (≥ 100 employees) reveal no tendency the use agile process models, 13 out of 19 of the small firms (< 100 employees) within the sample use an agile approach. A distinction between It and other industries reveals that out of 14 IT firms surveyed, a majority of eleven are using agile process models, while three IT firms use only traditional process models. The remaining 37 firms from all the non-IT industries do not indicate any tendency. Nineteen of them already use agile models, while 18 are still working in traditional organisation models only. The data also reveals that the IT firms that do not use an agile approach are much larger (500-999 employees on average) than the IT firms that already use agile processes (10-99 employees on average).

Table 2 | Overview of firms in the data sample

Number of firms	Industry
14	from Information Technology
37	from non-IT industries:
13	Manufacturing
7	Provision of professional, scientific, and technical services
7	Other industries
3	Health and social services
2	Provision of financial and insurance services
2	Provision of other economic services
1	Power supply
1	Trade; maintenance and repair of vehicles
1	Public administration; defense; social insurance

Source: own representation

Figure 1 | Usage of agile process models: Industry & company size



Source: own calculation

3.2 Regression results

Following the results of the binary logistic regression analysis are presented. Goodness-of-fit was assessed using the Hosmer-Lemeshow-Test, indicating a good model fit, $\chi^2 = 5.574$, $p = 0.695$ ($p > 0.5$). The classification summary in Table 3 reveals that 74.5 % of observations were classified correctly by the suggested model.

Table 3 | Classification summary of the logistic regression model

		Predicted		
		Agile		
Observed		**0**	**1**	**Percentage Correct**
Agile	**0**	15	6	71.4
	1	7	23	76.7
Overall Percentage				74.5

Source: own calculation

In the next step, the hypothesised effects of the individual independent variables are analysed. Table 4 presents the variables of the binary logistic regression along with their logistic coefficients, the respective p-values which were derived from the Wald statistics and

the odds ratios. Significant correlations ($p < 0.05$) are shown by the independent variables time saving ($p_1 = 0.0129$), project comparability ($p_5 = 0.029$) and function as a knowledge base ($p_6 = 0.029$). The correlation coefficient of the variable time saving has a positive value ($ß_1 = 1.265$), which implies that time-saving as a decision criterion has a positive effect on the usage of agile process models, supporting hypothesis 1. The variables project comparability ($ß_5 = -1.086$) and function as a knowledge base ($ß_6 = -1.077$) show negative correlations, which suggests that project comparability as a decision criterion and function as a knowledge base as a decision criterion have a negative effect on the usage of agile process models, supporting hypotheses 5 and 6. With an odds ratio of $Exp(ß_1) = 3.543$, the variable time saving has a relatively strong effect on the probability of the usage of agile process models compared to the variables project comparability ($Exp(ß_5) = 0.337$) and functions as a knowledge base ($Exp(ß_6) = 0.0340$). The positive correlation coefficient of the decision criterion increased efficiency ($ß_2 = 0.279$) corresponds to hypothesis 2, that increased efficiency as a decision criterion has a positive effect on the usage of agile process models. However, with a p-value of $p_2 = 0.608$ (> 0.05), this correlation is not significant. Similarly, the negative coefficients of the decision criteria availability of qualified personnel ($ß_3 = -0.109$) and uniform terminology ($ß_4 = -0.393$) are in line with our hypothesised effects. However, with p-values of $p_3 = 0.750$ and $p_4 = 0.460$, these correlations are also not significant, and the null hypothesis cannot be rejected. Furthermore, neither of the two control variables company size and industry are significant ($p_7 = 0.169$, $p_8 = 0.455$).

Table 4 | Variables of the BLR model and their coefficients

Variables	$ß_i$	SE	Wald	Sig.	$Exp(ß_i)$
Time saving	1.265	0.537	5.544	0.019*	3.543
Increased efficiency	0.279	0.543	0.263	0.608	1.321
Availability of qualified personnel	-0.109	0.341	0.102	0.750	0.897
Uniform terminology	-0.393	0.532	0.547	0.460	0.675
Project comparability	-1.086	0.498	4.760	0.029*	0.337
Function as a knowledge base	-1.077	0.493	4.770	0.029*	0.340
Industry	1.408	1.025	1.890	0.169	4.089
Company size	-0.236	0.316	0.559	0.455	0.790
Constant	4.948	3.104	2.541	0.111	140.833

Note: * indicates a p-value < 0.05 calculate with SPSS V.27

Source: own calculation

In summary, the results suggest that saving time is an important decision criterion for companies to decide for the deployment of an agile process model, while project comparability and the function of the process model as a knowledge base seem to explain why firms refrain from the application of agile process models. Further effects of the decision

criteria increased efficiency, availability of skilled workers or uniform terminology on the usage of agile process models could not be supported. In addition, there is no significant correlation with the use of agile process models for either company size or industry despite the descriptive data indicating a tendency for IT firms to use agile models. The positive correlation between the decision criterion time saving and the use of agile process models revealed corresponds to the hypothesised effects.

4 Discussion

Following, we are discussing our findings, summarised in Table 5, considering the literature.

Table 5 | Evaluation summary of the hypotheses

Hypothesis		Evaluation
H1:	Time saving as a decision criterion has a positive effect on the use of agile process models.	Accepted
H2:	Increased efficiency as a decision criterion has a positive effect on the use of agile process models.	Rejected
H3:	Availability of qualified personnel as a decision criterion has a negative effect on the usage of agile process models.	Rejected
H4:	Uniform terminology as a decision criterion has a negative effect on the use of agile process models.	Rejected
H5:	Project comparability as a decision criterion has a negative effect on the use of agile process models.	Accepted
H6:	Function as a knowledge base as a decision criterion has a negative effect on the use of agile process models.	Accepted

Source: own representation

Hypothesis 1: This study confirms that agile approaches are particularly used among firms with high ratings on time-saving as a criterion, supporting the argument that project time constraints are the main reason to deploy agile processes as a faster alternative compared to traditional process models (Salameh, 2014; Williams, 2005).

Hypothesis 2: Increased efficiency did not turn out to be decisive for the choice of agile process models. Despite the faster implementation of features and content, it is also more likely that already created content is dropped and removed from the overall project scope (Munassar & Govardhan, 2010). However, in environments with fast-changing requirements, following an iterative agile approach is said to be more efficient because in traditional, fully pre-planned project implementation, the completed phases are not expected to be revisited, and changes in requirements come at a much higher cost (Salameh, 2014). Following, the efficiency of a project's process organisation might depend more on the suitability of the process model for the respective project and its environment.

Hypothesis 3: Despite literature highlighting finding the right personnel as a critical challenge to achieve agility (Storme et al., 2020; Catalant, 2018), the availability of qualified personnel has not been found to be a decisive criterion when it comes to the use of agile process models. There are various possible explanations. One is that companies are willing to take

the risk of hiring inexperienced staff to benefit from the advantages of agile project management. Another is that there is already a sufficient supply of qualified personnel. Advocates of the agile approach even argue that agile is a simpler process compared to traditional project management and easier to learn (Schwaber, 2004).

Hypothesis 4: There was no support for the hypothesis that uniform terminology has a negative effect on the use of agile process models. The descriptive analysis (Table 2) of our data sample reveals that more than half of the surveyed firms in the collected sample already use agile process models. This could also be interpreted as an indicator that knowledge about agile terminology is already widely spread. Another reason could be that uniform terminology is not seen as decisive for communication and project success. Despite the frequent mentioning of communication breakdowns as a reason for project failure, a uniform language might not be that decisive overall. It is also suggested that practitioners make more use of metaphors and informal stories to avoid misunderstandings instead of using complex or fuzzy terminology (Delisle & Olson, 2004).

Hypothesis 5: The negative effect of the decision criterion project comparability confirms the assumption that companies refrain from implementing agile process models due to the complexity of their integration on a project portfolio level. This is in line with scholars stressing that more research on the agile organisation in a broader organisational context beyond individual projects and teams is needed because the introduction of agile processes introduces new challenges to project portfolio management established in the traditional project management literature (Stettina & Hörz, 2015).

Hypothesis 6: The negative effect of function as a knowledge on the use of agile process models supports our hypothesis that traditional process models are favoured because of their dominance in the Bodies of knowledge and more detailed documentation among the project phases that can provide valuable insights enabling project centred learning (Schindler & Eppler, 2003).

Project comparability (H5) and function as a knowledge base (H6) can also be interpreted as a proxy for project management maturity. Pennypacker & Grant (2002) argues that in mature project environments, the management is not only focusing on effectively managing projects but also on continuous improvement, with lessons learned being regularly examined to improve project management processes, standards, and documentation. Subsequently, with higher project management maturity, the function as a knowledge base of the applied project management methodologies increases. Furthermore, it is argued that increased project comparability helps if each project is evaluated in the light of other projects, as is supposed to be the case in more mature project environments (Pennypacker & Grant, 2002).

Control variables: None of our controls company size and industry revealed significant effects on the use of agile process models. The descriptive results show that larger companies (≥ 100 employees) show no clear tendency towards agile or purely traditional process models in use. However, the slight tendency of smaller firms (<100 employees) to use an agile approach corresponds with the assumption that the lower complexity of integration of agile process models in small firms compared to large firms suggested by Barlow et al. (2011).

4.1 Implications

Testing a broad range of decision criteria, hypothesised to predict the use of agile process models, the findings of this study suggest that time-saving, function as a knowledge base and project comparability are key factors determining whether an organisation decides to use agile process models. In practice, the lack of function as a knowledge base of the rather new agile process models seems to be a reason against them. However, offers for agile methodologies and frameworks have increased. In recent years and with SCRUM (Scrum.org, 2019) and the Scaled Agile Framework (scaledagileframework.com) first internationally standardised process models have already been introduced and are being further developed. Literature suggests addressing this issue with additional knowledge management frameworks (Khalil & Khalil, 2020; Rubin & Rubin, 2011). They can function as the initial starting point and seem to become more comprehensive based on the increasing experience and feedback from practitioners. To avoid project comparability as a reason to hinder the use of agile process models, we suggest training regular project managers but also portfolio managers in the integration of agile process models into project portfolios and the creation of hybrid project environments.

4.2 Limitations and Avenues for Future Research

Although this study exploited a sufficient dataset assessing various criteria influencing the use of agile process models with binary logistic regression analysis, it has notable limitations. We analysed a mix of firms of various industries in the DACH region by following a convenience sampling approach. However, for an analysis representing the population of the DACH region, a much bigger sample size, with sufficient data sets representing each industry, is needed. Considering the rather small sample size and disproportional representation of different industries, the findings and interpretation of our results should be considered with caution. A more fine-grained analysis for industry-specific requirements on process models and decision criteria is desirable. Furthermore, the decision criteria tested in this study are by no means exhaustive. Our findings suggest project comparability as one of the reasons for predicting the absence of agile process models. This is in line with literature highlighting the complexity of integrating agile processes into the governance of larger enterprises. More research on mixed project portfolios that require comparability in terms of progress, structure, and costs among agile and traditional projects is suggested.

Conclusion

Whilst many studies in agile management address individual motivations such as corporate culture, various mentalities of employees and project members or the actual implementation of agile organisation models (Barlow, 2011; Ciric et al., 2019; DeCarlo, 2004; Shenhar & Dvir, 2007). This study provides insights on decision criteria for the use of agile process models in practice to understand motivations at the firm level. Our findings suggest that next to time-saving aspects, which favour the implementation of agile process models, the function as a knowledge base and the project comparability are important factors predicting the absence of agile process models. To address these barriers, practitioners are suggested to educate project and portfolio managers in both agile and traditional process models. Furthermore, a special emphasis on the integration of agile projects in traditional project portfolios or the creation of hybrid project environments is recommended.

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References

Alvarez-Dionisi, L. E., Turner, R., & Mittra, M. (2016). Global Project Management Trends. *International Journal of Technology Project Management*, 7(3), 54-73. https://doi.org/10.4018/IJITPM.2016070104.

Barlow, J. B., Giboney, J., Keith, M. J., Wilson, D., Schueztler, R., Lowry, P. B., & Vance, A. (2011). Overview and Guidance on Agile Development in Large Organisations. *Communications of the Association for Information Systems*, 29(2), 25-44. https://doi.org/10.2139/ssrn.1909431.

Boehm, B. (2002). Get ready for agile methods, with care. *Computer,* 35(1), 64-69. https://doi.org/10.1109/2.976920.

Chin, C. M. M., & Spowage, A. C. (2010). Defining & Classifying Project Management Methodologies. *PM World Today,* 7(5), 1-9.

Chin, G. L. (2004). *Agile Project Management: How to Succeed in the Face of Changing Project Requirements*. New York: AMACOM.

Ciric, D., Lalic, B., Gracanin, D., Tasic, N., Delic, M., & Medic, N. (2019). Agile vs. Traditional Approach in Project Management: Strategies, Challenges and Reasons to Introduce Agile. *Procedia Manufacturing*, 39, 1407-1414. https://doi.org/10.1016/j.promfg.2020.01.314.

Collyer, S., Warren, C., Hemsley, B., & Stevens, C. (2010). Aim, fire, aim – Project planning styles in dynamic environments. *Project Management Journal*, 41(4), 108-121. https://doi.org/10.1002/pmj.20199.

Cooper, R. G., Edgett, S. J., & Kleinschmidt, E. J. (1997). Portfolio Management in New Product Development: Lessons from the Leaders – I. *Research-Technology Management*, 40(5), 16-28. https://doi.org/10.1080/08956308.1997.11671152.

DeCarlo, D. (2004). *eXtreme Project Management*. San Francisco: Jossey-Bass.

Delisle, C. L., & Olson, D. (2004). Would the real project management language please stand up? *International Journal of Project Management*, 22(4), 327-337. https://doi.org/10.1016/S0263-7863(03)00072-3.

Digital.ai. (2020). *14th Annual State of Agile™ Report*. Retrieved June 10, 2021, from https://explore.digital.ai/state-of-agile/14th-annual-state-of-agile-report.

Habermann, F. (2013). Hybrides Projektmanagement – agile und klassische Vorgehensmodelle im Zusammenspiel. *HMD* Praxis der Wirtschaftsinformatik (50), 93-102. https://doi.org/10.1007/BF03340857.

Hass, K. B. (2007). The blending of traditional and agile project management. *PM World Today*, 9(5), 1-6.

Hobbs, B., & Petit, Y. (2017). Agile Methods on Large Projects in Large Organisations. *Project Management Journal*, 48(3), 3-19. https://doi.org/10.1177/875697281704800301.

Hoda, R., Kruchten, P., Noble, J., & Marshall, S. (2010). Agility in context. *Association for Computing Machinery*, 45(10), 74-88. https://doi.org/10.1145/1932682.1869467.

Khalil, C., & Khalil, S. (2020). Exploring knowledge management in agile software development organisations. *International Entrepreneurship and Management Journal*, 16(2), 555-569. https://doi.org/10.1007/s11365-019-00582-9.

Klotz, M., & Marx, S. (2018). Projektmanagement-Normen und -Standards. *SIMAT Arbeitspapiere, No. 10-18-033. Fachhochschule Stralsund.* https://www.econstor.eu/bitstream/10419/189826/1/104115237X.pdf

Kononenko, I., & Lutsenko, S. (2018). The Project Management Methodology and Guide Formation's Method. *IEEE 13th International Scientific and Technical Conference on Computer Sciences and Information Technologies* (pp.156-159). https://doi.org/10.1109/STC-CSIT.2018.8526621.

Leffingwell, D. (2007). *Scaling software agility: Best practices for large enterprises*. Boston, MA: Addison-Wesley Professional.

Manifesto for Agile Software Development (2001). Retrieved June 2, from https://agilemanifesto.org/.

Matos, S., & Lopes, E. (2013). Prince2 or PMBOK – A Question of Choice. *Procedia Technology*, 9, 787-794. https://doi.org/10.1016/j.protcy.2013.12.087.

Morris, P. W. G. (2001). Updating the Project Management Bodies of Knowledge. *Project Management Journal*, 32(3), 21-30. https://doi.org/10.1177/875697280103200304.

Morris, P. W. G., Crawford, L., Hodgson, D., Sheperd, M. M., & Thomas, J. (2006). Exploring the role of formal bodies of knowledge in defining a profession – The case of project management. *International Journal of Project Management*, 24(8), 710-721. https://doi.org/10.1016/j.ijproman.2006.09.012.

Müller, R., & Turner, R. (2007). Matching the project manager's leadership style to project type. *International Journal of Project Management*, 25(1), 21-32. https://doi.org/10.1016/j.ijproman.2006.04.003

Munassar, N. M. A., & Govardhan, A. (2010). A comparison between five models of software engineering. *International Journal of Computer Science Issues*, 7(5), 94-101.

Olsson, N. O. E. (2006). Management of flexibility in projects. *International Journal of Project Management*, 24(1), 66-74. https://doi.org/10.1016/j.ijproman.2005.06.010.

Owen, R., Koskela, L., Henrich, G., & Codinhoto, R. (2006). Is agile project management applicable to construction? In R. Sacks, & S. Bertelsen (Eds.), *Proceedings of the 14th Annual Conference of the International Group for Lean Construction* (pp. 51-66). Santiago, Chile: Ponteficia Universidad Católica de Chile.

Pennypacker, J. S. & Grant, K. P. (2002). Project management maturity: an industry-wide assessment. Paper presented at PMI® Research Conference 2002: Frontiers of Project Management Research and Applications, Seattle, Washington. Newtown Square, PA: Project Management Institute.

Radujcović, M., & Sjekavica, M. (2017). Project Management Success Factors. *Procedia Engineering*, 196, 607-615. https://doi.org/10.1016/j.proeng.2017.08.048.

Rubin, E., & Rubin, H. (2011). Supporting agile software development through active documentation. *Requirements Engineering*, 16(2), 117-132. https://doi.org/10.1007/s00766-010-0113-9.

Salameh, H. (2014). What, When, Why, and How? A Comparison between Agile Project Management and Traditional Project Management Methods. *International Journal of Business and Management Review*, 2(5), 52-74.

Schindler, M., & Eppler, M. J. (2003). Harvesting project knowledge: a review of project learning methods and success factors. *International Journal of Project Management*, 21(3), 219-228. https://doi.org/10.1016/S0263-7863(02)00096-0.

Schwaber, K. (2004). Agile project management with Scrum. Washington: Microsoft press.

Scrum.org, & Berlin People GmbH. (2019). *2019 Scrum Master Trends*. Retrieved June 10, 2021, from https://scrumorg-website-prod.s3.amazonaws.com/drupal/2019-02/2019%20Scrum%20Master%20Trends%20%282019-02-06%29.pdf.

Shenhar, A. J., & Dvir, D. (2007). *Reinventing project management: The diamond approach to successful growth and innovation*. Boston, MA: Harvard Business Press.

Špundak, M. (2014). Mixed Agile/Traditional Project Management Methodology – Reality or Illusion? *Procedia - Social and Behavioral Sciences*, 119, 939-948. https://doi.org/10.1016/j.sbspro.2014.03.105.

Starkweather, J. A. (2011). PMP® Certification as a Core Competency: Necessary but Not Sufficient. *Project Management Journal*, 42(1), 31-41. https://doi.org/10.1002/pmj.20174.

Statistisches Bundesamt. (2007). *Klassifikation der Wirtschaftszweige. Ausgabe 2008*. Wiesbaden.

Stettina, C. J., & Heijstek, W. (2011). Five agile factors: helping self-management to self-reflect. In: O'Connor, R.V., Pries-Heje J., & Messnarz, R. (Eds.), Systems, Software and Service Process Improvement. EuroSPI 2011. *Communications in Computer and Information Science*, 172 (pp. 84-96). Springer. https://doi.org/10.1007/978-3-642-22206-1_8.

Stettina, C. J., Heijstek, W., & Fægri, T. E. (2012). Documentation Work in Agile Teams: The Role of Documentation Formalism in Achieving a Sustainable Practice. *2012 Agile Conference*, (pp. 31-40). IEEE. https://doi.org/10.1109/Agile.2012.7.

Stettina, C. J., & Hörz, J. (2015). Agile portfolio management: An empirical perspective on the practice in use. *International Journal of Project Management*, 33(1), 140-152. https://doi.org/10.1016/j.ijproman.2014.03.008.

Storme, M., Suleyman, O., Gotlib, M., & Lubart, T. (2020). Who is agile? An investigation of the psychological antecedents of workforce agility. *Global Business and Organizational Excellence*, 39(6), 28-38. https://doi.org/10.1002/joe.22055.

Sundqvist, E., Backlund, E., & Chronéer, D. (2014). What is Project Efficiency and Effectiveness? *Procedia – Social and Behavioral Sciences*, 119, 278-287. https://doi.org/10.1016/j.sbspro.2014.03.032.

Thamhain, H. J. (2014). Can We Manage Agile in Traditional Project Environments? *Proceedings of PICMET '14 Conference: Portland International Center for Management of Engineering and Technology; Infrastructure and Service Integration*, (pp. 2497-2505).

Thesing, T., Feldmann, C., & Burchardt, M. (2021). Agile versus Waterfall Project Management: Decision Model for Selecting the Appropriate Approach to a Project. *Procedia Computer Science*, 181, 746-756. https://doi.org/10.1016/j.procs.2021.01.227.

Timinger, H. (2017). *Modernes Projektmanagement. Mit traditionellem, agilem und hybridem Vorgehen zum Erfolg.* Weinheim: Wiley.

Williams, T. (2005). Assessing and moving on from the dominant project management discourse in the light of project overruns. *IEEE Transactions on Engineering Management*, 52(4), 497-508. https://doi.org/10.1109/TEM.2005.856572.

Wysocki, R. K. (2007). *Effective project management*. Indianapolis: Wiley.

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