Malena Zielske and Tobias Held

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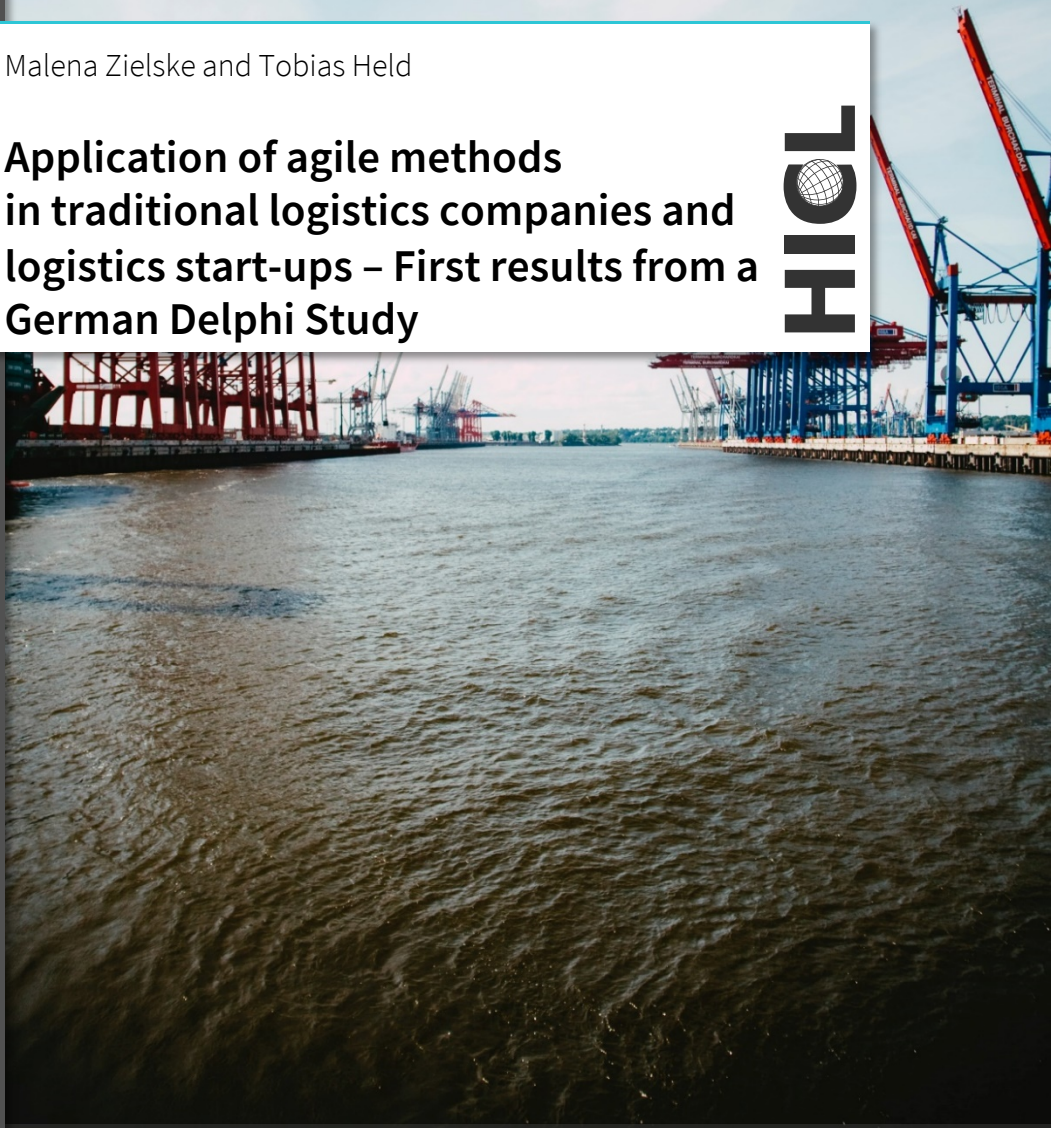

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Application of agile methods in traditional logistics companies and logistics start-ups – First results from a German Delphi Study

Malena Zielske [1] and Tobias Held [1]

1 – Hamburg University of Applied Sciences

Purpose: To meet rapidly changing requirements and increasing product complexity, a growing number of traditional companies and startups increases their agility by using agile methods. The logistics industry in particular is known to be a comparatively slow adapter to changes in general, but especially to new organizational innovations. The objective of the Delphi study conducted is to assess how traditional logistics companies and logistics startups use agile methods in their IT departments to deal with fast changing internal and external influences and how they respond to change.

Methodology: A Delphi study will be conducted over several complementary rounds as an iterative expert judgement process. After the analysis of the first results, insights can be gained on the following points covering traditional logistics companies and logistics startups: a) The selection of agile methods and practices, b) the benefits that these methods and practices offer and c) the challenges of applying these methods and practices.

Findings: The first results of the Delphi study show that traditional logistics companies as well as logistics startups use agile methods and practices to deal with a high degree of market uncertainty and change, and reveal what advantages and challenges they face.

Originality: This originality of the Delphi study presented lies in its contribution to the largely unexplored area of agility in traditional logistics companies and logistics startups.

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1 Introduction

Digitization raises the demand for software products such as platforms and (mobile) applications, also for sectors that have not (predominantly) made money with software products in the traditional sense. The aim is to look at how other industries, such as the logistics industry, deal with this demand for software products and whether logistics companies use agile methods originating from software development in order to digitize their products and align them in the best possible way with the customer.

In the last few years, the use of agile methods and practices has become increasingly popular not only for software companies (Laanti, Salo and Abrahamsson, 2011). Agile methods and practices such as Scrum and Kanban are used to deal with increasing product development and project complexity, evolving customer expectations, uncertainties in the business model, complex technological decisions, or other changing external influences, such as those that occur at a company's suppliers (Beck, 2000; Cockburn and Highsmith, 2001). Agile methods and practices promise to deliver business value in a timely manner and in short iterations. This is made possible by an incremental and empirical approach (Abbas, Gravell and Wills, 2008; Larman and Basili, 2003).

Since the 1980s, the concept of agility itself has evolved from a concept that encompasses flexibility and leanness to a value-based concept (Conboy, 2009). Agility focuses not only on customer value, but also on individuals, cooperation and interaction to achieve flexibility and leanness (Conboy, 2009) and depends strongly on the way all employees think (Beck et al., 2001). The concept of agility is still a complex concept today and is interpreted in many ways in research and practice (Conboy, 2009).

This study focuses on how the conservative logistics industry - known as a "slow adapter" (Kupp, Marval and Borchers, 2017) - deals with agility and how established logistics companies and logistics startups use agility to deliver innovative (software) products that are appreciated by customers (Vogel and Lasch, 2018). Many logistics companies seem to have difficulties in delivering the right customer value and this gives the impression that they cannot keep up with the startups or the speed of innovation within the industry (Beck et al., 2001; Delfmann et al., 2018; Newkirk, 2002). There is an increasing number of partnerships to promote the exchange between traditional logistics companies, logistics start-ups and also IT consultancies. One example is the Digital Logistics Hub, of which Lufthansa Industry Solutions GmbH & Co. KG is one of the partners.

The goal of this Delphi study is to identify agile methods and practices used in traditional logistics companies and logistics startups. The objective is to understand the advantages logistics companies gain from the use of agile methods, but also the difficulties they face when using them.

The research questions (RQ) asked are listed below:

- RQ1: Which agile methods and practices do traditional logistics companies and logistics startups use?
- RQ2: How do traditional logistics companies and logistics startups benefit from the use of agile methods?
- RQ3: What difficulties do traditional logistics companies and logistics startups face concerning the adoption of agile methods and practices?

The Delphi study is conducted based on established guidelines (Dalkey and Helmer, 1963; Linstone and Turoff, 2002; Diamond et al., 2014).

The paper is structured as follows: Section 2 gives a brief overview of the underlying definitions of agile methods and practices as well as an overview of related work. Section 3 presents the applied research method and describes the study design of the iterative judgement process. Section 4 summarizes the findings of the first round of the Delphi study and discusses both their meaning and limitations. Finally, Section 5 concludes this study and provides some perspective for future research.

2 Background

In the following the scientific background of agile methods as well as related Delphi studies are presented.

2.1 Agile methodologies

The concept of agility has developed from a concept of flexibility and leanness to a value-based concept since the 1980s (Conboy, 2009). Agility concentrates not only on customer value, but also on individuals, interaction and collaboration to achieve flexibility and leanness (Conboy, 2009). The term agility is a multifaceted concept and is still widely interpreted in research and practice (Conboy, 2009). Conboy and Fitzgerald offer a general definition of the term and characterize agility as "the ability of an entity to proactively, reactively or inherently embrace change in a timely manner, through its internal components and its relationships with its environment" (Conboy and Fitzgerald, 2004, p.39; Pikkarainen and Wang, 2011). They thus define the basic values of agile process models, especially the willingness to change and to cooperate (Cohn, 2009).
Agility is not limited to one functional area, but "can be addressed in different business competence areas" (see Figure I) (Kettunen, 2009).
The concept of agility was first established in organizational theory and the social sciences as corporate agility to effectively address change in an uncertain world. Brown and Agnew first described agility in 1982 as "the capacity to react quickly to changing circumstances" (Brown and Agnew, 1982). They not only mention flexibility, but also the commitment of essential resources, especially human resources, to output-oriented goals (Schirrmacher and Schoop, 2018). The use of agility was concretized in the

Lehigh Report, which was published in 1991 and describes agile manufacturing (Hooper, Steeple and Winters, 2001; Nagel and Dove, 1991). Hooper characterizes agile manufacturing as "manufacturing system with extraordinary capabilities (internal capabilities: hard and soft technologies, human resources, educated management, information) to meet the rapidly changing needs of the market […]" (Davarzani and Norrman, 2015; Yusuf, Sarhadi and Gunasekaran, 1999).

In 1995, Goldman et al. broadened the Lehigh Report and noted that agility

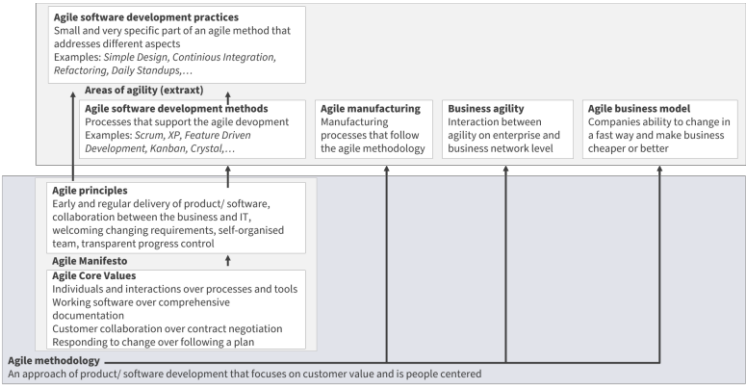

Figure 1: Agile business competence areas and their relationship (Own representation based on (Daniels, 2014; Helaakoski et al., 2006; Kettunen, 2009; van Oosterhout, Waarts and van Hillegersberg, 2005)

is also relevant for other organizational units such as marketing, production, design, organization and management (Goldman et al., 1995). The uncertainty of changing requirements also impacts IT and software development, where the need for agility is increasing as well due to the dynamic circumstances of the other business and technology areas mentioned

above. In 2001, the so-called "Agile Manifesto" of software development projects was first introduced (Beck et al., 2001), after agile and iterative process models such as Rational Unified Process and methods such as Scrum and Extreme Programming (XP), Feature Driven Development and Kanban had evolved since the 1980s (Anderson, 2004; Beck, 2000; Kruchten, 1998; Palmer and Felsing, 2002; Takeuchi and Nonaka, 1986; Schwaber, 1997).

The Agile Manifesto consists of four values and twelve principles and aims to optimize the software development process and collaboration with and within teams. With a focus on creating customer value, many agile methods and practices have also been designed that can be applied to other non-IT areas (Highsmith, 2010; Parente, 2015). Practices are linked to a method, but can also be used in combination with other methods. The most common agile methods are Scrum, Kanban, Extreme Programming (XP), Feature Driven Development (FDD) and Crystal (Abrahamsson et al., 2003; Beck, 2000; Schwaber, 2004; VersionOne CollabNet, 2019; Palmer and Felsing, 2002). Examples for agile practices are Daily Standups, Retrospectives, Visualization, Limit Work in Progress, Feedback Cycles, and Refactoring.

The use of agile methods is particularly suited for complex product development or project situations characterized by fast and frequent changes (Stacey and Mowles, 2015). Agile methods aim to decrease complexity by accelerating reaction time, improving collaboration (Kaim, Härting and Reichstein, 2019) and strengthening trust between team members as well as with the customer. Simpler processes, lower change costs and less time spent on changes also lead to increased productivity and a lower error rate (Prater, Biehl and Smith, 2001). This enhances product quality and minimizes complexity (Anwer et al., 2017).

The aim of this Delphi study is to assess the use of agile methods and practices in traditional logistics companies and logistics startups.

2.2 Related work

There are related studies in the literature that use the Delphi approach in the field of agility and in the field of logistics. Table I shows an overview of the reported benefits of the Delphi approach.

Table 1: Overview of Delphi studies in the field of agile methods and the field of logistics

Paper	Aim of the study	Reason for the selection of the Delphi approach
(Akkermans et al., 2003)	Identify supply chain management trends	Structured group communication process: Individuals express effectively views on complex issues Theory-building research method that allows receiving feedback on comments of other experts
(Conboy and Fitzgerald, 2007)	Review the current state of agile method tailoring.	Reliable consensus obtained from an expert group Combining the knowledge of a large expert group to have a better chance of getting closer to the truth Complex problems can often only be solved by pooling opinions
(von der Gracht, Kauschke and Ruske, 2009)	Energy efficiency and speed in the supply chain	Overcome the 'bandwagon' and 'halo' effect High inclusion of expertise to systematically develop a consensus of expert opinion on future trends Experts can look at the views of their colleagues (anonymously) and possibly rethink their own answers

Paper	Aim of the study	Reason for the selection of the Delphi approach
(Deschene, Don Gottwald and Clifford, 2016)	Identify agile methods to increase acceptance for software security considerations	Separate questioning of selected experts Segregation of experts to ensure anonymity, reduce the risk of group opinion and limit the influence of dominant experts Structured, guided, iterative approach that seeks to arrive at a consensus on a particular research topic.
(Schön et al., 2017)	Identify most important challenges in agile RE	Anonymity prevents the influence by other experts Iterative approach with controlled feedback Use learnings from previous rounds to carry out the following ones

Analyzing the related work, it can be stated that the Delphi approach is used in particular for anonymous, iterative research where complex problems are addressed.

Akkermans et al. use the Delphi approach in their study on future supply chain management, as it enables them to structure a group communication process, so that experts can give their assessments of complex problems and receive feedback from other experts during the study, for example via comments (Akkermans et al., 2003). It is also a theory-building research method.

Conboy and Fritzgerald want to benefit from the fact that the combination of the judgement gives a large number of people a better chance to come closer to the truth (Conboy and Fitzgerald, 2007).
Von der Gracht et al. have designed their Delphi study in such a way that surveyed experts can immediately identify data trends and thus take into account the views of their colleagues (anonymously) to possibly rethink their own answers (von der Gracht, Kauschke and Ruske, 2009).
Deschene has chosen the Delphi method for her study on agile methods in relation to software security policies because it offers a qualitative, guided and iterative approach to bring experts to a consensus (Deschene, Don Gottwald and Clifford, 2016).
Schön et al. have also chosen the Delphi approach in order to be able to proceed in an iterative way and to use the learnings from the previous rounds (Schön et al., 2017).
To this end, the aim of this study is to find out which agile methods and practices are used by traditional logistics companies and logistics startups, why they are used and what difficulties they encounter. To the best of our knowledge, there is currently no study that examines this by means of a qualitative study with practicing experts in agile methods in logistics.

3 Research methodology

Originally, the Delphi method was used to reach a consensus within the expert group on the research topic. Various metrics such as Fleiss' Kappa (Fleiss, 1971) or Kendall's concordance coefficient (Legendre, 2005) are used for this purpose. However, recent studies show that even the definition of consensus is ambiguous (Diamond et al., 2014). Therefore, the ultimate goal of this Delphi study is not to reach consensus but to find valuable insights on the current use of agile methods and practices. For this purpose, the questionnaire is adapted to the research questions between the individual rounds. Therefore the Delphi approach was modified (Dalkey and Helmer, 1963; Diamond et al., 2014; Linstone and Turoff, 2002) and used to carry out an iterative expert assessment process (Dalkey, 1969) to evaluate the use of agile methods and practices in traditional logistics companies and logistics startups in four stages (see Figure II).

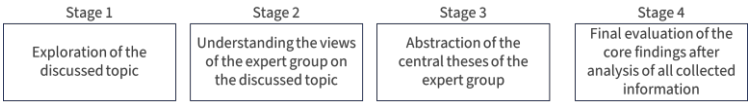

Figure 2: Stages of a Delphi study

Within the questionnaire, qualitative questions are combined with quantitative ones. In-depth insights can be gained through qualitative controlled opinion feedback (Dalkey and Helmer, 1963; Fletcher and Marchildon, 2014) which can be quantified in the following rounds of quantitative questions and evaluated without distortion. The feedback on the results of the preliminary round enables the experts' opinions to be sharpened (Vijayasarathy and Turk, 2012).

3.1 Description of the study design

The study will be conducted in several successive rounds. Figure III gives an overview of the procedure. In each round a questionnaire is created and optimized by several pretests. Afterwards, an e-mail with an invitation and link to the online questionnaire is sent to the participating experts. Results of the first round are used to develop the subsequent questionnaires. However, this paper considers only the results of the first round, as at the time of writing the second round had not yet been completed. The participants had two weeks to answer the questionnaire. Afterwards, the results were evaluated with two other researchers. The study was conducted with questionnaires in German and English. These were checked in advance for consistency.

Figure 3: Process of the Delphi study

We used Google forms for the first round of the Delphi study. In general, it was decided to use 7-point Likert items because it has been shown to be the best choice to avoid interpolation (Finstad, 2010). In some cases a 5-point Likert item was used to reduce complexity for the experts in the answer choices (Cummins and Gullone, 2000). In addition, the quality criteria proposed by Diamond et al. were considered (Diamond et al., 2014) to ensure the quality of this study.

In the first round, invitations were sent out to 37 experts. 29 experts participated in the study. For reliable results, the literature recommends a minimum number of 10-15 panelists (Lilja, Laakso and Palomäki. J., 2011; Dalkey, 1969). Accordingly, the first round met the requirement of reliability.

3.2 Selection of experts

For this Delphi study expert participants are expected to have a deep knowledge on the use of agile methods and practices in the IT departments of traditional logistics companies and logistics startups (Okoli and Pawlowski, 2004). As expertise is difficult to assess a systematic classification is conducted (Clayton, 1997; Sackman, 1975). Participants are selected based on their expertise in the specific field of logistics and more specifically, for their experience with agile methods and practices. The experts who participated in the Delphi study are practitioners in the areas of logistics and IT consultation in the area of logistics. In total the panel consisted of 29 experts working in 29 different companies with headquarters in Germany.

45% of the companies were founded within the last 10 years and are therefore classified as startups (see Figure IV). In total, 14 out of 29 participants were from logistics companies. More than 25% of all participating companies were founded within the last three years. On the other hand, about

55% of the companies were founded more than 10 years ago. The details can be found in the following diagram.

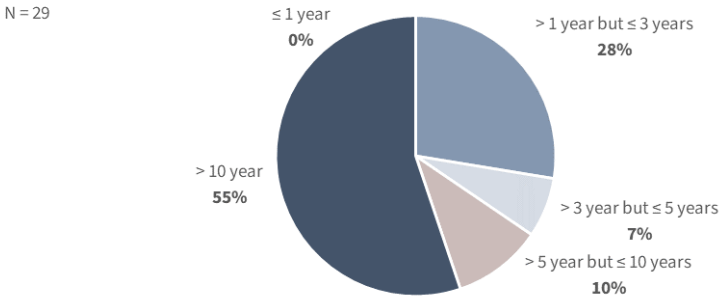

Figure 4: Age of the logistics companies

About 50% of the participants come from companies with more than 500 employees. In comparison, about 30% of the participants come from companies with less than 30 employees (see Figure V). There is only one logistics company younger than 10 years that has more than 500 employees. Conversely, all companies older than 10 years have more than 500 employees.

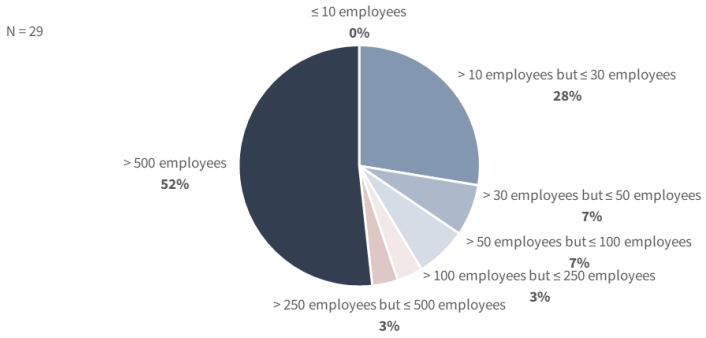

Figure 5: Number of employees

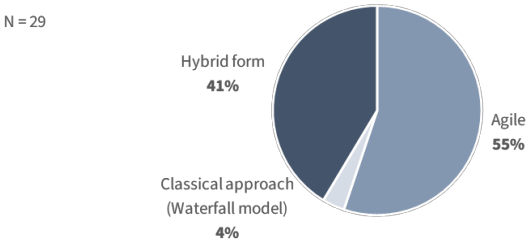

Figure 6: Team organization

Participants stated, that only little work is done purely according to the waterfall model, often the hybrid approach is followed or even worked completely agile.

Looking at the experience of the participants in the logistics industry, 45% have more than five years of experience in the logistics industry. Another 45% have between one and five years of experience.

In the first round of the Delphi study, mainly members of the top management (7 participants), project leaders (6 participants) and agile coaches/ scrum masters (5 participants) took part. Other participants work as head of department, software developer, product lead and business analyst. To

deepen the results of this study a broad selection of experts took place (Okoli and Pawlowski, 2004) so that a variety of different views can be included.

The participating experts were also asked to assess their prior knowledge with regard to agile methods. 20 out of 29 participants, close to 70%, rated their prior knowledge on a scale from one to seven as five or higher (see Table II). 16 of the 29 participants have three or more years of experience with the use of agile methods and practices.

Table 2: Expertise of experts (N = 29) in agile methods rated by themselves (1 = No know-how, 7 = Very extensive know-how)

Scale	1	2	3	4	5	6	7
Number of participants	0	1	2	6	6	13	1

Figure VII shows the type of process models that experts have worked with. It is worth mentioning that most experts have experience with both sequential, classical approaches and with agile approaches.

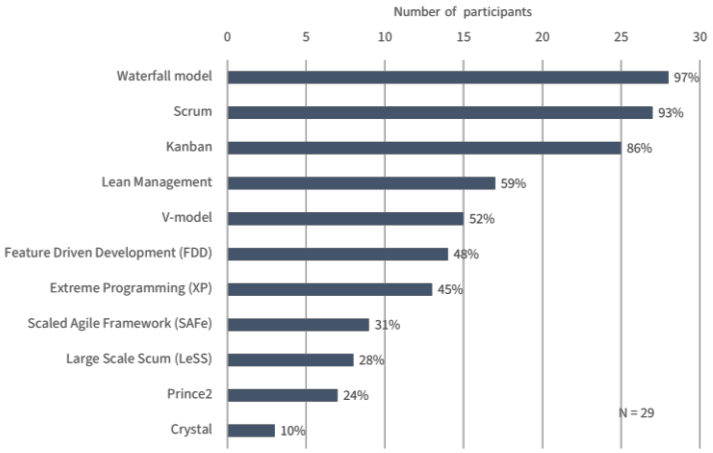

Figure 7: Process models used by percentual share of experts

Experts are aware of the membership of the expert panel. This is necessary to prevent that experts have the feeling that they can say anything as accountability is removed due to anonymity of experts in this study (Sackman, 1975).

4 Results and limitations

In the first round it was possible to find out which agile methods and practices are used in traditional logistics companies and logistics startups. In addition, participants were asked about the benefits of using agile methods and practices and the challenges applying them.

4.1 RQ1: Agile methods and practices used

To answer the first RQ, the study participants were asked which agile methods and practices are used.

The agile method Scrum is used most by traditional logistics companies as well as by logistics startups (see Figure VIII). This is followed by Kanban, Lean Startup, XP and FDD. It is noticeable that startups use the older agile methods such as XP and FDD more often than traditional logistics companies. More than 80% of the participants state that they want to use additional agile methods - especially methods for scaling Scrum such as Scaled Agile Framework (SAFe) and Large Scale Scrum (LeSS). Logistics companies, especially the logistics startups, seem to plan their scaling of their agile teams.

These results can be compared with the results of the 13th State of Agile Reports (VersionOne CollabNet, 2019). The State of Agile Report is conducted by CollabNet VersionOne and collects responses from more than 1000 participants worldwide from various industries and company sizes on the use of agile methods. Following the results of the State of Agile report, Scrum is also the most widely used methodology. However, this is followed

by Scrumban and mixtures of an agile and a waterfall approach. The methods Lean Startup and XP are only mentioned there in 2% and 1% respectively as the methods used.

For scaling agile teams the State of Agile report stated that most companies use SAFe, Scrum of Scrum or LeSS among others (VersionOne CollabNet, 2019).

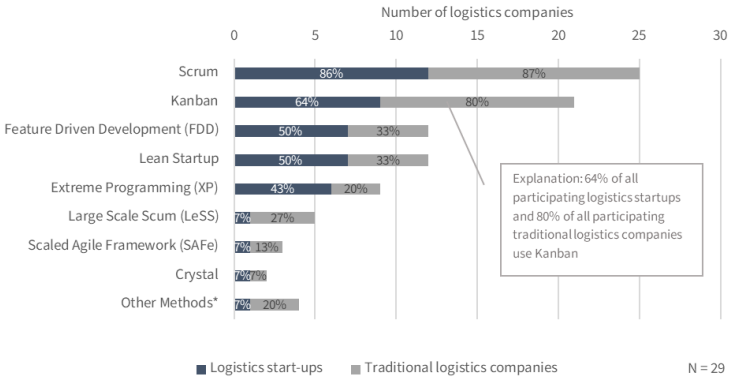

Figure 8: Overview of the agile methods used

Looking at the agile practices, Daily (Scrums) followed by a close exchange within the agile team and reviews and retrospectives are used most often (see Figure IX). Looking at logistics startups in more detail, based on the results of the first round, minimum viable products are especially important, as well as joint team planning through Daily (Scrums) and Sprint Planning sessions. For traditional logistics companies the use of task boards like Kanban boards, the close exchange within the team and the feedback from the customer are especially important.

Agile practices are in theory a subset of the complete agile method. The results of this Delphi study show that often single practices are used, but not the complete agile method. For example, in 100% of the cases Daily (Standups) are performed in logistics startups and traditional logistics companies. However, only 92% of logistics startups and 87% of traditional logistics companies use the associated agile method scrum. The effect is even stronger with more technical agile practices such as refactoring and pair programming. These are used individually much more often than the complete agile method Extreme Programming. Other studies have already discovered this finding (Diebold and Dahlem, 2014; Jalali and Wohlin, 2010; Pikkarainen et al., 2008).

Comparing this with the results of the 13th State of Agile Report, it is also evident that daily (standups), sprint planning, retrospectives and the iterative collection of customer feedback are the most important practices (VersionOne CollabNet, 2019). The logistics industry seems to behave similarly to other industries.

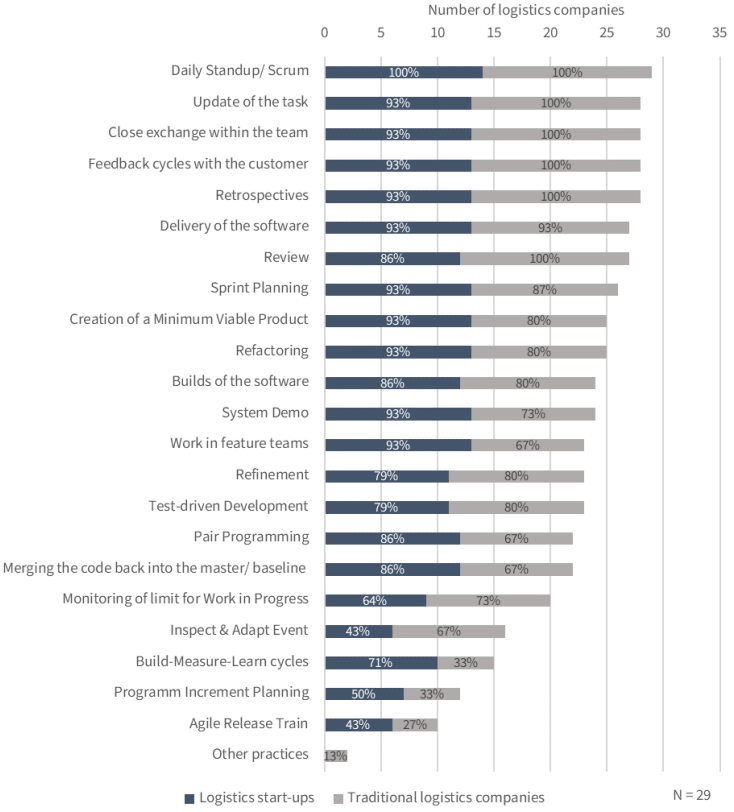

Figure 9: Overview of the agile practices used

4.2 RQ2: Benefits from the use of agile methods

The reasons why participants use agile methods are largely the same in logistics startups and traditional logistics companies. It is mainly about the responsiveness to changing priorities/ demands, the acceleration of (product) delivery and more intensive coordination between IT and business departments (see Figure X).

Regardless of the size of the company, very similar benefits seem to be sought through the use of agile methods. If you compare this with the 13th State of agile Report, you will see that this does not only apply to the logistics industry. Also in other industries, the most important advantages of the use of agile methods are the ability to react to changing requirements, fast product/software delivery, increased quality and improved coordination between IT and the business (VersionOne CollabNet, 2019).

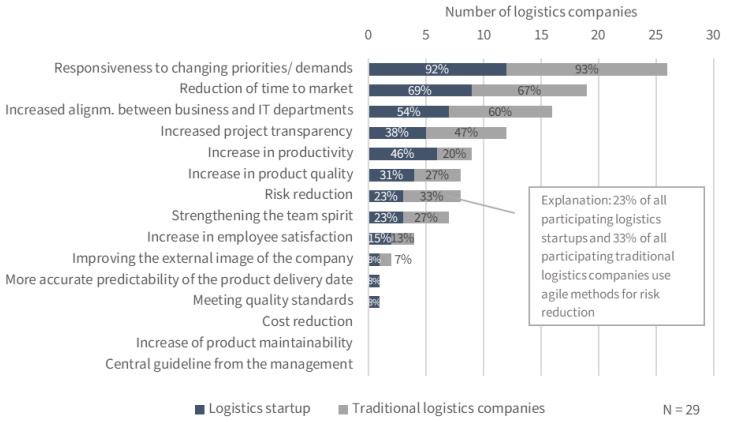

Figure 10: Reasons for the use of agile methods and practices

4.3 RQ3: Difficulties adopting agile methods and practices

Overall, there is a rather similar distribution between the challenges faced by logistics startups and traditional logistics companies when using agile methods. Looking at traditional logistics companies in more detail, they rather have a problem with the organizational culture and lack of willingness for change. Participants from logistics startups stated that their employees/ colleagues do not have so much of a problem with change but with the unbalanced distribution of knowledge in the agile teams. Both types of companies see the partial lack of knowledge about agile methods as a challenge.

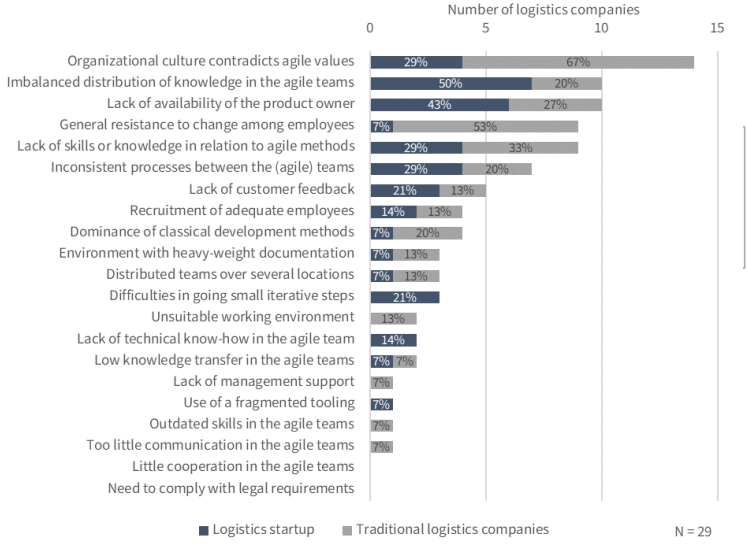

Figure 11: Challenges of startups and traditional logistics companies using agile methods and practices

Agile Coaches and Scrum Master see especially the organizational culture, the lack of knowledge about agile methods and resistance to change as challenges. In comparison, the unbalanced distribution of knowledge within teams, the lack of availability of product owners and the lack of commitment of the customer regarding feedback are challenges that top management and department heads see in the use of agile methods.

4.4 Limitations

As the design of a questionnaire is important for the data collection process, several pre-tests were conducted with participants who correspond

to the expert profile. Nevertheless, it cannot be ruled out that nuances in the answers may be lost through this type of online survey. Therefore, the participants had the possibility to complement their answers to closed questions in a free text field. Following the first round of questioning, a report on the results was prepared by the authors of this paper. Decisions were made on the selected points of interest. This may lead to distortions in the opinion-forming process of the panel in the following rounds. An attempt was made to minimize this effect by means of a very precise data analysis and the involvement of two additional researchers.

Finally, it should be mentioned that a survey can of course only be used to investigate whether logistics companies and logistics startups use agile methods. For a more detailed investigation of the manner of the application of agile methods, a case study may have to be conducted in the future.

5 Conclusion and implications for future research

This paper has focused on the identification of the agile methods and practices used by traditional logistics companies and logistics startups and has discussed the benefits and challenges of using agile methods. For this purpose an iterative expert assessment process was carried out. This process consists of several complementary rounds. This paper reflects the results of the first round. It was written during the realization of further rounds. Our panel consisted of 29 experts working in 15 traditional logistics companies and 14 logistics startups who are familiar with the use of agile methods and practices. By identifying the most important methods and practices as well as the benefits and challenges, we contributed to the body of knowledge in the field of logistics. Scrum and Kanban were identified as the most important methods, Daily (Standups), use of task boards such as Kanban boards and the close exchange within the team and with the customer were identified as the most important practices. The main goal of using agile methods is to be able to react to changes and reduce time to market. The biggest challenges are the organizational culture, which contradicts the agile values and an unbalanced distribution of knowledge in agile teams.

Future research can use a case study to find out how well the agile methods and practices are applied in logistics companies and startups. It could also be questioned to what extent the organizational culture of startups is more compatible with the use of agile methods than in traditional logistics companies. The organizational culture and the fear of change are the biggest challenges for traditional logistics companies.

References

Abbas, N., Gravell, A.M. and Wills, G.B., 2008. Historical Roots of Agile Methods: Where Did "Agile Thinking" Come From? In: Agile Processes in Software Engineering and Extreme Programming. Springer, Berlin, Heidelberg.pp.94–103.

Abrahamsson, P., Warsta, J., Siponen, M.T. and Ronkainen, J., 2003. New directions on agile methods: a comparative analysis. In: 25th International Conference on Software Engineering, 2003. Proceedings. Portland, OR, USA: IEEE.pp.244–254.

Akkermans, H.A., Bogerd, P., Yücesan, E. and Van Wassenhove, L.N., 2003. The impact of ERP on supply chain management: Exploratory findings from a European Delphi study. European Journal of Operational Research, 146(2), pp.284–301.

Anderson, D., 2004. Making the business case for agile management: Simplifying the complex system of software engineering. In: Motorola S3 Symposium. pp.1–13.

Anwer, F., Aftab, S., Waheed, U. and Muhammad, S.S., 2017. Agile Software Development Models TDD, FDD, DSDM, and Crystal Methods: A Survey. International Journal of Multidisciplinary Sciences and Engineering, 8(2), pp.1–10.

Beck, K., 2000. Extreme programming eXplained: embrace change. Boston, MA, USA: Addison-Wesley.

Beck, K., Beedle, M., Bennekum, A. van, Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R., Kern, J., Marick, B., Martin, R.C., Mellor, S., Schwaber, K., Sutherland, J. and Thomas, D., 2001. Agile Manifesto. [online] Available at: <https://agilemanifesto.org/>.

Brown, J. and Agnew, N., 1982. Corporate agility. Business Horizons, 25(2), pp.29–33.

Clayton, M.J., 1997. Delphi: A technique to harness expert opinion for critical decision-making tasks in education. Educational Psychology, 17(4), pp.373–386.

Cockburn, A. and Highsmith, J., 2001. Agile Software Development: The People Factor.

Cohn, M., 2009. Succeeding With Agile: Software Development Using Scrum. 1st ed. Boston, Massachusetts: Addison-Wesley Professional.

Conboy, K., 2009. Agility from first principles: Reconstructing the concept of agility in information systems development. Information Systems Research, 20(3), pp.329–354.

Conboy, K. and Fitzgerald, B., 2004. Toward a conceptual framework of agile methods. In: Proceedings of the 2004 ACM workshop on Interdisciplinary software engineering research. pp.37–44.

Conboy, K. and Fitzgerald, B., 2007. The views of experts on the current state of agile method tailoring. In: IFIP International Federation for Information Processing. pp.217–234.

Cummins, R. and Gullone, E., 2000. Why we should not use 5-point Likert scales: The case for subjective quality of life measurement. In: International Conference on Quality of Life in Cities. Singapore: National University of Singapore.pp.74–93.

Dalkey, N., 1969. An experimental study of group opinion: The Delphi method. Futures, 1(5), pp.408–426.

Dalkey, N. and Helmer, O., 1963. An Experimental Application of the Delphi Method to the Use of Experts. Management Science, 9(3), pp.458–467.

Daniels, K.E.S., 2014. The New Venture Manifesto: Redefining the Success Standards of New Ventures with the Agile Methodology. Florida State University.

Davarzani, H. and Norrman, A., 2015. Toward a relevant agenda for warehousing research: literature review and practitioners' input. Logistics Research, 8(1), pp.1–18.

Delfmann, W., Ten Hompel, M., Kersten, W., Schmidt, T. and Stölzle, W., 2018. Logistics as a Science - Central Research Questions in the Era of the Fourth Industrial Revolution. Logistics Research, 11(9), pp.1–13.

Deschene, M., Don Gottwald, W. and Clifford, C., 2016. Embracing security in all phases of the software development life cycle: A delphi study. Capella University.

Diamond, I.R., Grant, R.C., Feldman, B.M., Pencharz, P.B., Ling, S.C., Moore, A.M. and Wales, P.W., 2014. Defining consensus: A systematic review recommends methodologic criteria for reporting of Delphi studies. Journal of Clinical Epidemiology, 67(4), pp.401–409.

Diebold, P. and Dahlem, M., 2014. Agile practices in practice - A mapping study. In: ACM International Conference Proceeding Series. Association for Computing Machinery.

Finstad, K., 2010. Response Interpolation and Scale Sensitivity: Evidence Against 5-Point ScalesJUS. Journal of Usability Studies, 5(3), pp.104–110.

Fleiss, J.L., 1971. Measuring nominal scale agreement among many raters. Psychological Bulletin, 76(5), pp.378–382.

Fletcher, A.J. and Marchildon, G.P., 2014. Using the Delphi Method for Qualitative, Participatory Action Research in Health Leadership. International Journal of Qualitative Methods, 13(1), pp.1–18.

Goldman, S., Nagel, R., Preiss, K. and Iacocca, L., 1995. Agile competitors and virtual organizations: strategies for enriching the customer. Van Nostrand Reinhold. New York: Van Nostrand Reinhold.

von der Gracht, H., Kauschke, P. and Ruske, K.-D., 2009. How will supply chains evolve in an energy-constrained, low-carbon world?: Transportation & logistics 2030: Publications: Transportation & logistics: Industries: PwC. Wiesbaden.

Helaakoski, H., Iskanius, P., Peltomaa, I. and Kipina, J., 2006. Agile Business Model in the Steel Product Industry Sector. In: 2006 IEEE International Conference on Management of Innovation and Technology. IEEE.pp.1010–1014.

Highsmith, J.A., 2010. Agile project management: Creating innovative products. Boston: Addison-Wesley.

Hooper, M.J., Steeple, D. and Winters, C.N., 2001. Costing customer value: an approach for the agile enterprise. International Journal of Operations & Production Management, 21(5/6), pp.630–644.

Jalali, S. and Wohlin, C., 2010. Agile practices in global software engineering - A systematic map. In: Proceedings - 5th International Conference on Global Software Engineering, ICGSE 2010. IEEE Computer Society.pp.45–54.

Kaim, R., Härting, R.C. and Reichstein, C., 2019. Benefits of agile project management in an environment of increasing complexity—A transaction cost analysis. In: Smart Innovation, Systems and Technologies. Springer Science.pp.195–204.

Kettunen, P., 2009. Adopting key lessons from agile manufacturing to agile software product development—A comparative study. Technovation, 29(6–7), pp.408–422.

Kruchten, P., 1998. The rational unified process. Boston, Massachusetts, United States: Addison-Wesley.

Kupp, M., Marval, M. and Borchers, P., 2017. Corporate accelerators: fostering innovation while bringing together startups and large firms. Journal of Business Strategy, 38(6), pp.47–53.

Laanti, M., Salo, O. and Abrahamsson, P., 2011. Agile methods rapidly replacing traditional methods at Nokia: A survey of opinions on agile transformation. Information and Software Technology, 53(3), pp.276–290.

Larman, C. and Basili, V.R., 2003. Iterative and incremental developments. a brief history. Computer, 36(6), pp.47–56.

Legendre, P., 2005. Species associations: The Kendall coefficient of concordance revisited. Journal of Agricultural, Biological, and Environmental Statistics, 10(2), pp.226–245.

Lilja, K., Laakso, K. and Palomäki. J., 2011. Using the Delphi method. In: Technol. Technology Management in the Energy Smart World. Portland, OR, USA.pp.1–10.

Linstone, H.A. and Turoff, M., 2002. The Delphi Method: Techniques and Applications. Journal of Marketing Research, JSTOR.

Nagel, R. and Dove, R., 1991. 21st Century Manufacturing Enterprise Strategy-an Industry led View. Darby, PA, USA: DIANE Publishing.

Newkirk, J., 2002. Introduction to agile processes and extreme programming. In: Proceedings of the 24th international conference on Software engineering - ICSE '02. New York, New York, USA: ACM Press.p.695.

Okoli, C. and Pawlowski, S.D., 2004. The Delphi method as a research tool: An example, design considerations and applications. Information and Management, 42(1), pp.15–29.

van Oosterhout, M., Waarts, E. and van Hillegersberg, J., 2005. Assessing Business Agility: A Multi-Industry Study in The Netherlands. Springer, Boston, MA.pp.275–294.

Palmer, S. and Felsing, J., 2002. A practical guide to feature-driven development. Prentice Hall PTR.

Parente, S., 2015. Bridging the Gap: Traditional to Agile Project Management 1. PM World Journal, IV(IX), pp.1–12.

Pikkarainen, M., Haikara, J., Salo, O., Abrahamsson, P. and Still, J., 2008. The impact of agile practices on communication in software development. Empirical Software Engineering, 13(3), pp.303–337.

Pikkarainen, M. and Wang, X., 2011. An investigation of agility issues in scrum teams using agility indicators. In: Information Systems Development: Asian Experiences. pp.449–459.

Prater, E., Biehl, M. and Smith, M.A., 2001. International supply chain agility Tradeoffs between flexibility and uncertainty. International Journal of Operations and Production Management, 21(5–6), pp.823–839.

Sackman, H., 1975. Delphi Critique: Expert Opinion, Forecasting and Group Process. 1st ed. Lexington, MA, USA: DC Heath.

Schirrmacher, A. and Schoop, M., 2018. Agility in Information Systems - A Literature Review on Terms and Definitions: Lehrstuhl für Wirtschaftsinformatik 1.

Schön, E.M., Winter, D., Escalona, M.J. and Thomaschewski, J., 2017. Key challenges in agile requirements engineering. In: Lecture Notes in Business Information Processing. Springer Verlag.pp.37–51.

Schwaber, K., 1997. SCRUM Development Process. In: Business Object Design and Implementation. London: Springer.pp.117–134.

Schwaber, K., 2004. Agile Project Management with Scrum | Microsoft. Microsoft Press, (March), p.192.

Stacey, R.D. and Mowles, C., 2015. Strategic management and organisational dynamics: The challenge of complexity to ways of thinking about organisations.

Takeuchi, H. and Nonaka, I., 1986. The new new product development game: Stop running the relay race and take up rugby. Harvard Business Review, 64, pp.137–146.

VersionOne CollabNet, 2019. The 13th annual state of agile Report. CollabNet VersionOne, Alpharetta, GA, USA.

Vijayasarathy, L. and Turk, D., 2012. Drivers of agile software development use: Dialectic interplay between benefits and hindrances. Information and Software Technology, 54(2), pp.137–148.

Vogel, W. and Lasch, R., 2018. Complexity drivers in product development: A comparison between literature and empirical research. Logistics Research, 11(7), pp.1–42.

Yusuf, Y., Sarhadi, M. and Gunasekaran, A., 1999. Agile manufacturing: The drivers, concepts and attributes. International Journal of Production Economics, 62(1–2), pp.33–43.