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Critical Success Factors for the Development and Adoption of Mobile Applications in Logistics

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Abstract

Scrum and agile working techniques are currently used in many types of software development, as well as in the development of mobile applications. These techniques and processes can influence the success of the project as a whole as well as the work of the agile project team. On the basis of a single-case study in the logistic sector with eight conducted interviews, these influences and critical success factors were investigated. The method of Grounded Theory was used to gain new insights and connections of critical success factors from the findings and results. It can be assumed that there is a general potential for digital transformation of the logistics sector that leads to the need of mobile applications. Through the agile development of these applications, employee motivation can increase and ultimately result in higher quality applications.

Keywords

Mobile Applications, Scrum, Agile Project Management, Logistic Sector, Digital Transformation

1. Introduction

Software development in modern companies is a practice, which depends on many different variables. Constantly changing requirements lead to a change in the applied project management methodology. Project management models, which are usually the basis for software development, are in transition and the agile approach is gaining importance (Lison & Hartel, 2016). The focus of this study is on the development and adoption of mobile applications in logistics, which play a central role in the economy as a whole through the connecting function of different companies (Zanker, 2018). In Germany, the sector acts as the third largest economic sector in terms of the number of employees (Grotemeier, 2018) and serves as an important basis for globalisation (Zanker, 2018).

Similar contexts were explored in prior research and examined project success. In these contexts, a need for agile project management is needed through (Komus & Kuberg, 2017). Agile project management is by no means a guarantee for a successful project. It is not applicable in every project type and the application must be evaluated before every possible project (Coram & Bohner, 2005). The spread of agile methods is increasing and it is important to convince the employees of its advantages. Otherwise, the application of Scrum, as an agile practice, results in a challenge because an agile corporate culture is missing (Cristal et al., 2008). In the logistics sector, an increase in the use of mobile applications, related to the increasing use of mobile devices, can be observed (Speranza, 2018). According to past research, mobile applications are a decisive competitive factor in logistics and foreign trade and are used in 54.6 percent of the cases (Lison & Hartel, 2017). A survey with a wide variety of companies, among others from logistics, examines the use of agile project management for logistical issues. For a large proportion, the agile approach is a faster way of implementing projects and can lead to an increasing motivation of employees. In 75 percent of cases, the agile corporate culture is also an important factor for success (Lison & Hartel, 2016).

The use of Scrum has already been investigated in different industries by examining case studies, for example in the pharmaceutical industry (Azanha et el., 2017), but a case study in the field of logistics is missing so far. By working with an agile approach, customers in this industry can get a usable product faster and the project team is more

motivated and satisfied (Azanha et el., 2017). Further research with industrial setting points out that the motivation for change to agile must be found and that the entire company must be involved and a successful project can result (Könnölä et al., 2016). On the basis of the increasing use of agile working methods and the previous research in different industries, this research is carried out with the logistics industry in the focus. The following study examines how the success factors of agile project management, and of the agile project team, affects the success of the development and adoption of mobile applications. From this, the following research question can be derived:

How does critical success factors affect the development and adoption of mobile applications in logistics?

For answering this question, the methodology of a single-case study design with multiple units of analysis, two investigated projects, was chosen (Yin, 2018). Both projects dealt with the development and adoption of a mobile application. The case study was conducted in an international logistics company, which uses Scrum as agile project management method. Data were collected in a qualitative examination of eight interviews with employees from the projects. A Grounded Theory was derived from the case study results in the last step. Due to the lack of consideration of the logistics sector in the setting of a case study, this approach is appropriate to derive fundamental new and generalizable results.

The paper is structures as follows: Section 2 contains the most important foundations in the context of an agile project management and digital transformation in logistics. Section 3 shows the explanations of the research approach and design. In section 4, the presentation of research findings takes place and the derived Grounded Theory is explained in section 5. Implications for theory and practice are presented in section 6 and the conclusion follows in the last section.

2. Theoretical Background

2.1. Agile Project Management Approach and the Agile Manifest

In contrast to the classical project management approach, the agile project management approach is characterized by a weak degree of formalization and an iterative nature of tasks. The basis for agile procedures is the agile manifest, which was prepared in 2001, as the result of the agile movement. It unifies the common

values, present characteristics of agile procedure models and consists out of four following guiding principles (Wintersteiger, 2015). The first principle says that individuals and interactions must be preferred over processes and tools. Further, working software is preferred over comprehensive documentation and customer collaboration over contract negotiations. The last principle aims that responding to change is preferred over following a plan (Hartel, 2019).

These principles are supplemented and supported by 12 agile principles (Wintersteiger, 2015). Generally, agile software development is based on the assumption if it is possible to specify software correctly at all (Goll & Hommel, 2015). Additionally it is characterized by different features. The work in short cycles is one of it that aims for getting a quickly feedback from the customer. In comparison to this, in the classical approach comes the feedback only after passing through many phases. In addition, an agile project management approach is working with an incremental methodology. A detailed planning takes only place for the next short cycles and not for the whole project. With an incremental methodology, a vertical cross section is delivered thorough the system architecture (Wintersteiger, 2015). This allows faster results to be delivered and customer value to be increased. After each cycle, a usable product for the customer already emerges (Wintersteiger, 2015).

Scrum is a manifestation of an agile procedure model (Heinrich & Stelzer, 2011). It serves as a framework for teams to act with complex tasks and is preferably used in small projects teams. Unknown requirements have to determine in cooperation with the customer. Hence, it is possible to deliver the highest possible customer benefit (Goll & Hommel, 2015).

The model has the goal to develop an information system or software not in one piece. Due to the rapidly changing customer requirements, the system may already be obsolete at the time of implementation. In the use of agile procedure models and especially in the use of Scrum, it is therefore the case that at the beginning of the development project not all requirements can be known. The requirements must be developed together with the customer during the course of the project. By the use of Scrum, requirements of the customers can be broken down into fragments and a conversion in small parts is possible. The project team and the customer work together in the Scrum model. Therefore, the customer has always influence on the development

of the system. In addition, each new fragment gives a growth to the system, whereby at the end of the project the sum of the fragments results in the completed developed system (Goll & Hommel, 2015). Historically, Jeff Sutherland and Ken Schwaber played an important role in the development of Scrum. Based on the article of Hirotaka Tekeuchi and Ikujiro Nonaka (1986), which have studies the evolution of the approach to the development of new products, Sutherland and Schwaber developed the Scrum approach (Takeuchi & Nonaka, 1986 Racke, 2017).

2.2. Current Trends of Digital Transformation in Logistics

Digital transformation is a keyword, which has arrived in many industries and can essentially be described as the change of a process for value creation. It results from the further development of existing and the implementation of new digital technologies (Kersten et al., 2017). In the context of this definition, the potential for digital transformation lies not only in the use of technologies but also in the development of new digital business models. The logistic industry is characterized by a large number of newcomers, which are using digital and automatized business models of established market players. For example, their aim is to automate the booking and documentation of transports. Furthermore, the optimisation of utilisation of transport capacity or routing is possible with the support of Predictive Analytic Tools, which represents another field of innovation (Helmke, 2019).

Generalised, the digital transformation potential of the industry can be divided into various areas. A huge area of it is the automation of disposition, bookings or routing. In the case of transport logistics, the supply chain is usually highly fragmented and has efficiency problems. For example, the search for a transport provider for road freight still works via a manual price query. Logistic providers have no incentive to change the current situation because they can profit from this non-transparent price building procedures. Newcomers on this market want to make the booking process of transports more transparent (Helmke, 2019). Another example of the digital transformation potential can be seen in the documentation of waybills. This document is usually sent in manual form to the drivers. It would bring with it possibilities of digital transformation of the transport processes and lead to real-time information. However, the legal design is still difficult at the moment (Helmke, 2019). In addition, the automation of means of transport is a further example in this context. The focus here

is on the automation of means of transport, especially the vision that means of transport can make their way autonomously and without human drivers (Helmke, 2019). In this way, the problem of the lack of drivers can be alleviated (Helmke, 2019). Digital transformation in logistics is connected with chances and risks. A huge opportunity is to be seen in the efficiency potential of autonomous dispositions and bookings. In this way it is possible to save employees by taking over the tasks of IT-systems. Furthermore, the integration of already existing tracking solutions into cross-company platform represents a great potential. Even outside company boundaries, flows of goods can be detected and counteracted in the event of delays. On the other hand, the greatest risk lies in the area of business models, where new market participants with their IT-background can become competitor for classical logistics services. These companies are targeting price transparency, which would increase pressure on established companies (Helmke, 2019). Other risks, which are associated with the digital transformation of this area, are investments. In this area, they are expensive and there is no guarantee for success. The integration of different IT-systems is also a huge challenge (Helmke, 2019). The whole context of Digital transformation in logistics is influenced by the success factors. One example is the willingness to share data with external stakeholders, so that the entire supply chain can be optimized. However, the desire to protect business secrets faces this fact (Helmke, 2019). Until now, the Digital transformation potential has mostly realized in classical IT-projects. Due to the scope and complexity of the projects, there is a need to achieve results that can be quickly exploited. This is why the use of agile methods is increasing (Helmke, 2019).

3. Case Study Design and General Research Procedure

3.1. Design of the Case Study

This study deals with a global logistics company that introduced the agile framework of Scrum for the development of mobile applications. The aim of this research is to find out how and why the two success factors of the agile project management and the project team, influence the development and adoption of mobile applications. Case studies are an appropriate research tool for these purposes they are are focused on exploring the "Why" and "How". In a general definition, case studies are used "as empirical evidence to convince other researchers of the applicability (or inapplicability)

of a particular theory or proposition" (Myers, 2013: p. 74). Case studies in information system research are, similar to other discipline, a very diverse research approach. There is not only one research design, but also a multitude of different possibilities (Cavaye, 1996). By using case study research, new theoretical knowledge can be gained, but existing theory can also be tested. From these facts, the use of case studies in information system research is mostly appropriate (Cavaye, 1996). Another point for the use in this research field is the rapid technological change in practice. At first, this leads to numerous new questions that need to be investigated; secondly the science is often behind the practice. A case study is appropriate here again, because no studies have been carried out in the logistical context so far. This is followed by the shifting of relevant questions in this field. There is a shift away from technology to business issues, but there is also an increased interest in understanding the interaction of interrelations and innovation. It also justifies the use of case studies in this area (Bebasat et al., 1987).

Case studies can be divided into different philosophical assumptions. In general there are with the positivist, interpretive and critical assumption three different assumptions (Myers, 2013). This research is based on the positivist assumption. A general goal of the positivist approach and this study is to test a theory while increasing the understanding for a phenomenon. This research method is appropriate for organizational and social topics (Myers, 2013). It tries to explain social topics through the identification of individual components or phenomena (Cavaye, 1996). Furthermore, the positivism approach has four criteria to judge research which are summarized in one sentence: "good research should make controlled observations, should be able to be replicated, should be generalizable and use formal logic" (Cavaye, 1996: p. 233). These criteria say that in case study research no manipulation of variables is possible to make a controlled observation. Additional, this research methodology does not provide an exact replication of the case and the given circumstances. But it is possible to reply the results followed by a theoretical and logical replication. The description that case study results should be generalizable means that it is not generalizable on a statistical way in relation to a population, but it is generalizable in a theoretical way with the use of commonly used data (Cavaye, 1996). From the theoretical point of view, this philosophical assumption describes in an

appropriate way the circumstances of the case study. Here it was also the case that the investigation aims to point out, with the use of an agile project management method, a social topic in a business context. Otherwise, the named content of the named quote above was in the foreground of the investigation, because it is possible to replicate it in a similar way. Out of these reasons, the positivist assumption was appropriate for this case study.

For a logical course of the case study, it is necessary to come to conclusions, from the set of different initial questions. A logical research design is necessary to get from the data collection and the analysis of data to the results and the Grounded Theory (Yin, 2018). For designing a case study it is crucial to distinguish between a single and a multiple case study and a holistic or an embedded design (Yin, 2018). This conducted case study is designed as a single case study with an embedded design. A general difference between a single and a multiple case study are the units of analysis. In a holistic case study, one "big" case is the unit of analysis. Contrary to this, an embedded design separated into at least two embedded units of analysis (Yin, 2018). An embedded design of the case study was chosen here because of the fact that the projects for the development and adoption of two different applications are investigated. However, they are embedded in the entirety of the big case; the logistics company (Yin, 2018). In the context of this study, there are several reasons for designing a single case study. One of these reasons is that the case study should be a revelatory case. A case is therefore considered informative if a researcher can look at a case which has not previously been accessible for a scientific investigation (Yin, 2018). The logistic company has not yet been scientifically investigated in this research context, whereby this characteristic can be regarded as fulfilled. A previously undiscovered phenomenon could be uncovered in this way, because there was no access to it in the past (Yin, 2018).

In the design of the case study played the data collection with interviews an important role. Only through the interviews, it is possible to get reliable data. For the data collection process, a semi-structured interview was applied. This kind of interview works with some pre-formulated questions. It is also possible to ask some new questions and the interview combines the approaches of a structured and an unstructured interview. On this way the interview got a certain amount of structure

with simultaneous improvisation (Myers, 2013). An important fact of the qualitative interview is the characteristic of flexibility, which is considered the most important characteristic of qualitative research. The interview should not be predetermined and the course of the interview depends on the interviewee. Flexibility is necessary to guarantee an appropriate and successful research. Only in this way it was possible for the researcher to react flexibly and adapt to the course of the conversations (Lamnek & Krell, 2010). The conducted interviews are focused on generalizations and routines of everyday life. In the everyday situation, the interviewee should answer the questions with the same meaning as is the interviewee would do in everyday life (Lamnek & Krell, 2010). This kind of interview has the advantage that the experience is not only reduced to a narrative basis (Lamnek & Krell, 2010). All interviews contained questions about the general experiences in IT-Project Management, the assessment of the suitability of Scrum for the investigated projects or the application of the Scrum process from the point of view of the interviewees.

In preparation of the case study it was also important to find an appropriate research setting for getting the best possible findings. This contains possible projects in which the agile procedure of Scrum was applied. As described in section 5.1, the research design is built up as a single case study with an embedded design. It is characterized by multiple units of analysis (Yin, 2018), which are the two projects in the case study setting. One project is called "CD Project", where the CD application was developed. The second project is called "ES Project", where the ES application was developed. Both projects had the scope of the development and adoption of mobile applications for the logistic company. The developed content in the "CD Project" was the "CD application". It is a mobile application that is used by truck drivers when they are driving cargo for the logistic company. It provides them an overview of their daily work, information about the tour to be driven or the type of cargo to be transported. Special in this project is that the application is currently in the rollout phase. Hence it was difficult to get reliable qualitative data from users in particular. In the "ES project", the "ES application" was developed, an application for tracking shipments. It has the function of informing customers of a status change of their shipments. Also, the application is connected with the online portal of the logistic company and acts as the mobile version of it. In both projects the mobile applications were developed with the

agile project management approach of Scrum. Besides the involved Scrum teams, the department of Demand Management, which was also involved in the development and implementation, and a dispatcher of the truck drivers were interviewed. A detailed process about the participation of the individual persons is shown in Figure 1. This process applies for both projects and developed applications.

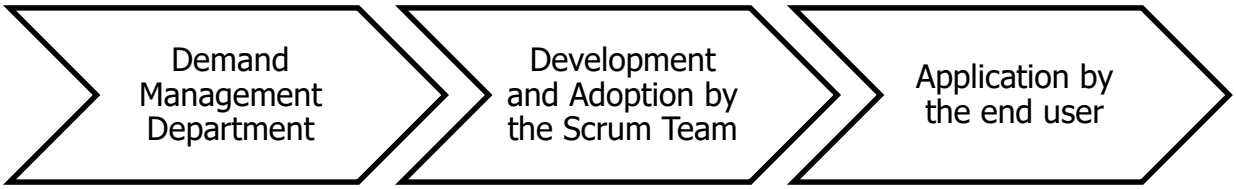

Figure 1. Procedure of the Development and Adoption of Mobile Applications in the Case Study Company (Own Presentation)

The Demand Management has the goal to record the requirements of the user or requester and to prepare them for the developers. After the successful development and adoption, the application is made available for the users. For the CD Project it was possible to interview a possible user in person of the dispatcher.

The case study data were conducted in eight interviews with participants of both projects. Both interviewed Demand Managers, were not directly involved in the projects, but have contributed their general experience with Scrum in the setting of mobile application development. All interviews were conducted as semi structured telephone interviews and they usually had a duration of 1-2 hours. The interview partners were selected due to their suitability and personal willingness for the case study. Table 1 shows an overview of all interview partners and their participation in the projects.

No. of Interview	CD Project	ES Project	General experience in development of mobile applications	Position and tasks in the logistic company	Comment

No. 1			x	Demand Manager	Only marginally involved in both projects but has general project experience
No. 2			x	Demand Manager	Only marginally involved in both projects but has general project experience
No. 3	x			Project Owner	Project Owner in the CD Project
No. 4	x			Mobile Solution Architect	Technical director of the CD project
No. 5	x			Long-distance dispatcher	No use of the application at the moment, but is a possible user of the CD application
No. 6		x		Strategic Portfolio Management	Initial project Manager and Adoption of the mobile application
No. 7		x		Demand Manager	Post-introduction support
No. 8		x		Engineering & Technology	Technical director of the ES Project

Table 1. Overview of all Interview Partners and their Participation in the Projects (Own Presentation)

3.2. Data Analysis Approach

Qualitative research is characterized by a large amount of data. This data needs to be transformed into results and statements. The case study analysis is based on a bottom up approach and it follows after an extensive collection of data (Myers, 2013). Grounded Theory provides the theoretical framework for the analysis of the case study results (Myers, 2013). It is described as "an inductive, theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observation or data" (Martin & Turner, 1986, p. 141). This methodology aims at developing a theory, which is based on the gained data of case study research (Myers, 2013). In the case of business and information system research, grounded theory follows the development of concepts and theories of relevant phenomena, which are based on concepts and theories of qualitative data (Hesse-Biber & Leavy, 2006).

A prerequisite to gain new insights by using the grounded theory approach is coding data. It includes the permanent comparison between phenomena and cases and the formulation of questions to the text. Theoretical coding has the goal of developing theory. It takes place the form of the open coding, axial coding and selective coding. So there are three different coding procedures within the interpretation process (Flick, 2017). Open coding is the first step of analysing data in this procedure. Strauss and Corbin (1990) describe this type of coding as a "Process of breaking down, examining, comparing, conceptualizing and categorizing data" (Strauss & Corbin, 1990: p. 61). In the context of the case study, it describes the first step of analysing a huge amount of data. All qualitative data from the conducted interviews were considered and first commonalities and differences of the statements were identified. Axial coding followed open coding. The procedure aims to refine the categories created in open coding. From the amount of the resulting coding categories, the categories that provide the best insights for further development of theory should be selected (Flick, 2017). In the concrete setting, the investigation pointed out five major categories, which were a part of all interviews and being the basis for arranging the statements and deriving the results. Selective coding was the last step of the coding procedure. It connects to the axial coding and sets it to a higher level of abstraction (Flick, 2017).

Out of this process resulted Figure 2. It pointed out the selected results to a higher level of abstraction and shows the interactions between the five categories. A network of separated categories should show the categories between them and serves to clarify the findings (Flandorfer, 2018). Case study findings are focussed on the influence of the agile project management procedure and the agile project team on the development and adoption of mobile applications in logistics. In Figure 2 the dotted arrows illustrate that the respective points are mutually dependent on each other. The potential for digital transformation is at the centre of the findings and interacts with the challenges of subcontracting and the challenges of identifying the requirements for a mobile application. Furthermore, the challenges posed by subcontracting interact with the difficulty of taking up the requirements and the agile project management with the agile project team. In contrast to this shows a normal arrow that this category depends on the other one. It is obvious that the categories of the agile project management and the agile project team are influenced by the three other categories

and that there are interactions and dependencies between all results. The factors of an agile project management and the agile project team have a significant influence on the success of the development and adoption of mobile applications in logistics. But between these two factors are also interdependencies. In general Figure 2 is a major one for the understanding of case study results because it shows the different kinds of relationships between the different categories. The following presentation of case study findings starts with the potential of digital transformation as category. It is in the focus of the investigation from which the other categories result. Directly after that follow the challenges through subcontracting and in the recording of the requirements, as can be seen in the Figure 2. These results serve as a preliminary stage of the two examined success factors, which show interdependencies with these results, as illustrated by the arrows.

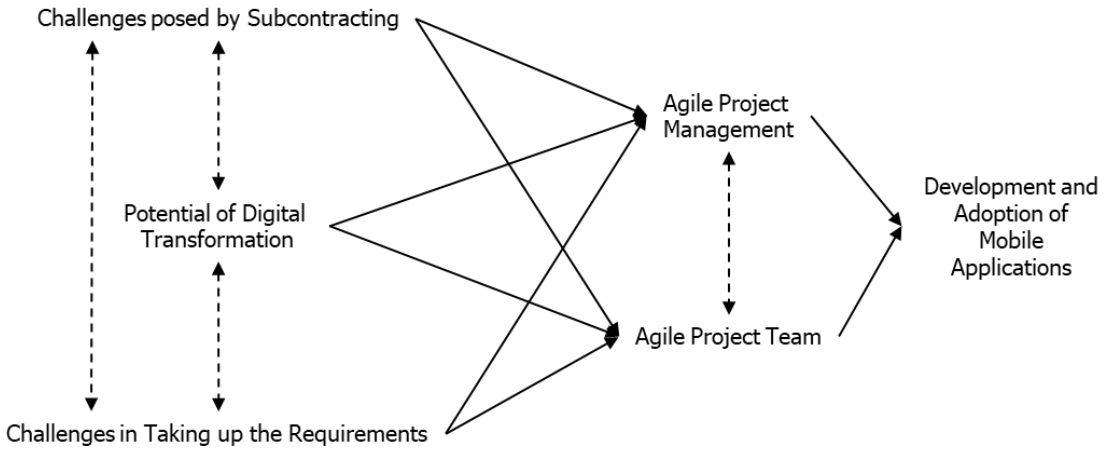

Figure 2. Network of Categories from the Selective Coding (Own Presentation)

5. Presentation and Discussion of Case Study Findings

5.1. Digital Transformation in Logistics

Due to the research object with the logistic industry, the associated potential for digital transformation of this industry emerges. It is the reason for the usage and the development of mobile applications in this area. All presented finding are structured through the developed coding's.

Digital transformation in logistics: In order to be able to classify the potential for digital transformation and to derive the right actions, a clear strategy for it is necessary. In the case study a top-down view is applied by the management board (Dunz Interview 6, 2019f). The assessment of this potential of this industry must be seen in comparison

to other industries, is noted in the CD project (Dunz Interview 3, 2019c). In consideration this project, the logistics industry would have a comparatively high potential for digital transformation, in the opinion of the Product Owner. Currently, most companies are not working digitally and most of the processes in the work of the truck drivers are analogous. This is the deciding factor for the use of digital solutions such as mobile applications (Dunz Interview 3, 2019c). The current way of working in the tour planning of the dispatcher, supports the opinion from the Product Owner with a high potential to digitize the business processes. In the moment, the dispatcher works analogously in the process of tour planning and cannot use a digital solution. Certainly, the lack of a meaningful IT solution can also be attributed to many variable influence factors of the industry, but it also shows the potential for digital transformation. Additionally, in using the CD application, it is important to be able to react to those variable factors (Dunz Interview 5, 2019e).

Due to the variable factors of the industry and the old IT-systems there, the potential for digital transformation can also be recognised in the ES project (Dunz Interview 8, 2019h). The mobile application allows a quicker access to information, for example for tracking and tracing shipments (Dunz Interview 7, 2019g). Due to the use of this application, it is possible to collect and evaluate data more easily (Dunz Interview 8, 2019h).

These points of view are supported by the general experiences of the Demand Management, where a high demand for digital processes is also recognized. A general impact of mobile applications in logistics is the chance for a higher customer satisfaction and taking over manual operations by applications (Dunz Interview 2, 2019b).

Challenges of digital transformation in logistics: In addition to the advantages and opportunities mentioned above, the development and adoption of mobile applications is also subject to challenges which must be taken into account. A general challenge in the digital transformation of the logistic service provider is an increasing competition with Start-Ups (Dunz Interview 1, 2019a). Because classic logistic companies are confronted with many old systems (Dunz Interview 8, 2019h), this competition can result. Another general challenge of transformation process in this sector is the required level of communication and corporation. Many different parties are involved

in a delivery, for example subcontractors. It may happen that those involved parties do not want to use new applications because they are driving for lots of different other logistic companies. Therefore, the willingness to use an application from a particular client is low (Dunz Interview 1, 2019a).

On examination of the CD application, it refers again to the analogue processes in the logistics sector. Usually the company acts in corporation with subcontractors, whereby the resulting implications are addressed here for the first time. Mostly, applications that are developed for the use in the own company, are used by the company's own employees. In this case, the Scrum Team develops the CD application also for the use by subcontractors that can drive cargo for other suppliers. This results in the challenge of convincing and satisfying the truck drivers as users, with the quality of the CD application. In this way, they should be bound to the logistic service provider and a turnover of drivers to competing companies should be avoided (Dunz Interview 3, 2019c). At the moment the CD application is still in the rollout phase (Dunz Interview 2, 2019b), so it is not used at all locations of the logistic service provider currently.

Current communication: The described fact about the rollout phase leads to the current communication between the dispatcher and truck drivers (Dunz Interview 5, 2019e). Currently it is mostly done via the Instant Messenger "WhatsApp" and not via the CD application. WhatsApp is, especially in business context, a controversial medium where the data exchange is probably not secure (Frechner, 2018). The risk of data security also arises for the dispatcher (Dunz Interview 5, 2019e). For the interview partner, the communication with the truck drivers can be read, which can lead to cargo theft. A reason for it is that in normal everyday working life, drivers and dispatchers usually do not see each other for a long period. The drivers want this kind of communication and it results in a stabile amount of drivers with a low turnover rate (Dunz Interview 5, 2019e), which is also the goal of the adoption of the CD application (Dunz Interview 3, 2019c).

Based on these findings, the general digitization potential of the industry was described. It can be seen that mobile applications can be a big chance here, because many processes are still analogous. They have to satisfy and convince the users, whereby the current communication in operational business processes by Instant Messengers, can be replaced. Additionally, the case study company facing the

challenge of Start-Up companies pushing into the market. This will further increase the pressure on digital business processes.

5.2. Challenges in the Use of Mobile Applications in Logistics

Challenges posed by subcontracting in logistics: The second factor that influences the agile project management procedure and the agile project team in the case study setting is the challenge arising through subcontracting. In connection with the potential of digital transformation of the industry, a wide variety of effects are arising. Some of these challenges are the current communication between dispatchers and truck drivers, the rejection of mobile applications by subcontractors and the necessary conviction of drivers for the use of the CD application with the aim of preventing fluctuation to competing companies. In the subsection above, these challenges are explained in detail. Furthermore it is necessary to emphasize that many truck drivers are from Eastern Europe and this leads to communication problems with the German dispatchers. For this reason, communication via an Instant Messenger offers the described advantages. The use of eastern European drivers is to be justified thereby due to the lack of German drivers. In the future, the logistic service provider will endeavor to further increase the proportion of its own drivers, what could become more difficult in the future because of the mentioned reasons. Possibly this problem can be alleviated by autonomous driving (Dunz Interview 5, 2019e).

Challenges in taking up the requirements: The implemented points are often not properly known for the project team in the necessary form. One example of this is the attempt of the logistic company to set up his own freight exchange platform. Currently, the situation with subcontractors is characterized by the fact that subcontractors can also transport cargo for other clients. Their own platform aimed that the previous market leader in this field should no longer earn money with the exchange of cargo on the leading platform. However, the design of this platform did not take into sufficient consideration that entrepreneurs in the industry are not only focused themselves towards the logistic company, they are targeting the highest possible revenues and best conditions. The possible success of the platform has not been sufficiently questioned, which probably resulted in the loss of millions of Euros (Dunz Interview 5, 2019e).

A further challenge results if a user of the CD application wants to pass on a new idea or feedback because there are several management levels between the user and the Demand Management or a possible project team. Hence, there is a lack of a concrete reference to the user for the project team (Dunz Interview 4, 2019d). They do not know their everyday working life concretely enough, so the requirements cannot be understood correctly.

In the case of the ES application there would be often a new idea for improving the application, but its requirement would not be known yet. For this application, it is also important to have conversations and interviews with potential users. This allows insights into different perspectives (Dunz Interview 6, 2019f).

Scrum and the functionality are characterized by the development of increments and working in Sprints. At the beginning of the project for developing a new application, the concrete goal of it is therefore not exactly known (Dunz Interview 8, 2019h; Dunz Interview 2, 2019b), also because the applications are developed based on business requirements. The result in development of applications is a constant approximation of the required functions (Dunz Interview 2, 2019b).

Challenges of the integration into the existing IT portfolio: Before an improvement through a mobile application can occur, it is necessary to recognize the actual situation from which possible improvements can be derived (Dunz Interview 1, 2019a). In the Company ABC this is the task of the Demand Managers that are responsible for the acceptance of new requirements (Dunz Interview 1, 2019a). From the requirements included, it is necessary to develop solution concepts in which the original goal must be pursued further. It must be kept in mind that a new mobile application must be integrated into an existing IT portfolio. Hence, it is important to check the portfolio for existing applications that may already offer similar functionalities before developing the application. When developing and integrating an application into an existing IT portfolio, dependencies with other systems have to be considered and a close look at the process flows has to be taken. However, the prerequisite for this is that the Demand Managers are familiar with the IT portfolio in order to classify the integration possibilities. As a result, it can also be used to extend an existing solution and avoids a new development (Dunz Interview 7, 2019g).

These results show that subcontractors play an important role in the logistics industry. It is important to convince them of the use of the CD application and to give them an understanding of the advantages. In the agile development of the application it has to be considered that subcontractors are not employed in the own company, so the CD application has to offer a special quality and functionality to convince the truck drivers. Especially through the role of subcontractors, it can be difficult for the project team to know the exact requirements for a new application. Nevertheless, it is highly necessary for the project team to know the requirements for a new application in a sufficient degree for developing a useful application. Without it, it is therefore more difficult to understand the work processes of the users and to adapt the application to these processes.

5.3. Impact of the Agile Project Management Setting

The results described above, have an influence on the focused success factors of the investigation. Based on these factors there is an attempt to respond better to the particularities of logistics.

Development of an agile project methodology in the company ABC: Scrum is used in the case study company as an agile project management methodology. The introduction of Scrum thus has a direct impact on the development of applications. In the Company ABC started the first agile project for the development of a mobile application in 2015 (Dunz Interview 6, 2019f), on the initiative of the developers who were in favor of the introduction of an agile methodology (Dunz Interview 1, 2019a; Dunz Interview 6, 2019f). It generally results in faster overall development, as requirements are implemented more quickly, as the case of the CD project shows (Dunz Interview 1, 2019a; Dunz Interview 4, 2019d).

Application of the Scrum methodology as agile project management: In the investigated case, the interviewees were asked about the way in which the prescribed Scrum methodology was used and which implications results. It is therefore generally applied in some projects of the company, but it is not implemented in its complete prescribed methodology (Dunz Interview 1, 2019a). The procedure used is based on Scrum, whereby only meaningful aspects of the methodology are implemented, like working in Sprints, using a ticket system, Daily Stand Up meetings (Dunz Interview 4, 2019d) or User Stories (Dunz Interview 7, 2017g). Retrospective Meetings are an

aspect that is not held after every single Sprint as planned, but rather at longer intervals (Dunz Interview 2, 2019b).

In the current use of the Scrum methodology, disadvantages are also possible for the interviewees (Dunz Interview 8, 2019h). A full application of the model would allow a better timing and deviations can be detected earlier (Dunz Interview 4, 2019d).

Effects of the Scrum meetings: The use of the selected agile principles, like the Scrum meetings, has an impact on the investigated projects, as the interviews revealed. Daily Stand Up Meetings are generally helpful to address the most important questions because there are no details discussed (Dunz Interview 2, 2019b). But it results chances and challenges in logistics from the Daily and other meetings. A general example of it is that members of the project team always want to show a good performance. Daily meetings can help to keep up the performance of the employees, because they are obliged to give feedback about their work (Dunz Interview 2, 2019b). In the investigation of the CD project, these meetings are mentioned as the most important point of the Scrum methodology in which the three classical Scrum questions are answered (Dunz Interview 4, 2019d). A chance of daily meetings is it to keep up the performance of the employees because they are obliged to give feedback about their work and want to show a good performance (Dunz Interview 2, 2019b). At the beginning of a new project, there is the possibility of a kickoff meeting. It is emphasized as another positive aspect for meetings in this project. In this way, new colleagues and architects can be integrated at the beginning of a new project (Dunz Interview 4, 2019d). The advantages of getting to know other team members, is added in the context of the ES project (Dunz Interview 6, 2019f; Dunz Interview 7, 2019g).

From the opposite point of view, meetings of the Scrum methodology also have challenges. All daily meetings have a duration of 15 minutes, which means that no complete problem solution can be found. The lack of time is also a general challenge of a project. As already mentioned, Sprint Retrospective Meetings are only held irregularly, so that a comprehensive evaluation of a sprint is not possible (Dunz Interview 2, 2019b).

Effects of working in Sprints: Furthermore, the development of mobile applications in logistics is effected by the use of Sprints. In the CD project, Sprints have a positive impact trough more controllable project management. This allows requirements to be

implemented and feedback to be gained through users' exchange (Dunz Interview 3, 2019c). With regard to the technical point of view, Sprints are helpful to implement technical requirements of the application (Dunz Interview 4, 2019d).

In the analysis of the ES project, Sprints have a similar effect and are helpful for making specifications for the next steps in development. But the effects of the daily meetings are particularly emphasized here (Dunz Interview 6, 2019f). These are helpful to focus the team on a specific problem and for giving it a structure (Dunz Interview 7, 2019g). In sum, a more positive team feeling can arise as a result (Dunz Interview 6, 2019f).

Advantages and Disadvantages of Scrum for the Company ABC: The effects of the agile way of working in this case study have to be considered from two different points of view. Working with Scrum has advantages and disadvantages for the interviewees. One general advantage of Scrum lies in customer orientation in the development of applications. Scrum allows a rough cost estimate for the customer that can result in a faster product delivery due to the fast implementation of requirements (Dunz Interview 2, 2019b). Nevertheless, budget deviations may occur even in an agile project through this kind of cost estimation. The involvement of a customer in a Scrum project could increase their readiness for a higher project budget (Dunz Interview 4, 2019d).

The advantages of short-term decisions and flexible adaptation are not only seen in the CD project, but also in the ES project (Dunz Interview 6, 2019f). In this project the focus is on the continuous progress of development, so that the scope of an application always remains in focus (Dunz Interview 7, 2019g).

The interviewees expressed also disadvantages: In the CD project there is a disadvantage due to missing concrete requirements or the late knowledge of it. This can lead to the fact that the overall view of the project is missing, whereby the maintainability of the application can suffer (Dunz Interview 4, 2014d).

Similar concerns were expressed by the respondents to the ES project, whereby the application could not be completed on time can due to unconsidered requirements. Overall, the time schedule is not always adhered to, but the overall project could always be delivered within the scheduled time. If time pressure is to be built up on the employees in the project, it would result in a decreased employee motivation (Dunz Interview 8, 2019h).

Challenges and chances of Scrum for the Company ABC: In comparison to the codings above, these two codings are focussed on future effects. The advantages and disadvantages show only a current effect. For the employees of the company, Scrum also has some challenges. They must be able to implement the specifications of the model, for which training is the basis. This coding shows that not all employees were involved in the same project. Therefore it is difficult to work purposefully, which had a negative effect on the projects, because the procedure was not known (Dunz Interview 1, 2019a).

Some interviewees from the ES project gave a contrary statement. Here the Company ABC promotes sufficient training courses and the coordination in the self-directed project team was shown (Dunz Interview 7, 2019g; Dunz Interview 8, 2019h). Therefore, the company prepared the employees of this project optimally for working with Scrum.

Another challenge in the usage of Scrum became clear in the investigation of the CD project. In this project, there are many management levels between the project team and the users. Furthermore, it may happen that the company deviates from Scrum in case of higher time pressure. This may lead to a decrease in quality, as the probability of errors increase (Dunz Interview 4, 2019d).

On the other point of view, the agile methodology has chances for the company. All interview partners with general project experiences or with the experiences of the two investigated projects assessed the use of Scrum positively for various reasons. Examples for this are the opportunity for the team members to contribute ideas to the project team (Dunz Interview 3, 2019c), the contact with other team members through daily meetings (Dunz Interview 4, 2019d) and working more purposefully through an agile way of thinking (Dunz Interview 6, 2019f).

Support of Scrum by the management board: In order to be successful for an agile project management in the development of mobile applications, it needs to be supported by the management board. The corporate culture has to be aligned accordingly. In the case of the company ABC, the management thinks innovatively, offers a lot of freedom and does not manage the company rigidly. Thus the project teams feel the support of the management for an agile way of working (Dunz Interview 2, 2019b).

Concretely related to the projects, the CD project shows a hierarchical structure between the project team and the management board (Dunz Interview 3, 2019c). In comparison to this, one of the interviews reveals flat hierarchies within the project team, which promotes the maintenance of a clear common goal (Dunz Interview 3, 2019c).

For the ES project, the cooperative style is confirmed in the project team. Preliminary studies must convince the board of directors of the quality of a project, which also shows the influence of the board of directors (Dunz Interview 6, 2019f). Based on these named facts in both projects, the support of the board of directors for an agile approach can be derived.

Comparison to classical project management approach: A significant disadvantage of the agile approach becomes clear in the ES project. Logistics companies are working with a Transport Management System (TMS) (Dunz Interview 6, 2019f). This system is a part of the Supply Chain Management and serves to control and optimise the transport fleet (Rouse, 2019). For the logistics industry it is a system with very high relevance because problems there would have an impact on the entire business activity. In the development of a TMS, a waterfall model is often used. So, the implementation of all necessary requirements can be ensured (Dunz Interview 6, 2019f). An obvious disadvantage of Scrum can be seen here because, differently to the waterfall model, detailed process descriptions are missing here (Dunz Interview 6, 2019f). A failure of this system would therefore have an impact on the entire organisation.

Retrospective effects on the case study company through Scrum: Overall, the use of an agile process methodology has a multiple influence of the Company ABC, as the interviews have shown.

When considering the CD project, it is made clear that digital transformation is the foundation for an agile approach. This leads to frequent and rapid changes in this industry's projects. By using an agile approach, it is possible to react flexibly to these changes, which would not be possible in a waterfall model (Dunz Interview 3, 2019c). Thus the requirements at the beginning of a project may not yet be known or may change in the course of the project. By using sprints, this fact is counteracted by the logistic company (Dunz Interview 4, 2019d).

In comparison to this is the ES Project with its special features for creating a mobile solution for shipment tracking, by using the application. Similar to the CD application with the associated project, there are constantly changing processes and customer requirements here as well (Dunz Interview 8, 2019h). Through the use of Scrum, these changing requirements can be quickly responded to the development of digital solutions. A quick reaction is an advantage in logistics, because a fast access to information is in general necessary in this industry (Dunz Interview 7, 2017g).

The composition of the project teams: For the following it is important to know how the project teams are staffed and how they work together.
In the case of the ES application, it has been essential to put the project team together in the right way. The project team was put together with the focus on the topics that the project dealt with. On the basis of the employee's experience, it was tested the suitability for the project (Dunz Interview 6, 2019f; Dunz Interview 7, 2019g). The employees had to match the requirements of the projects and not all team members had to pursue the same interests. Thus, an exchange on topics could take place from several perspectives (Dunz Interview 6, 2019f).
For the CD project a positive atmosphere in the project team is emphasized. Important here is an open feedback for employees and team members. This should avoid problems with employees and give them the opportunity to contribute. Similarly to the ES project, the employees for the project were assigned (Dunz Interview 3, 2019c). It can be seen by the fact that the composition of the project teams is targeted and value is placed on a cross-functional composition. However, budget targets still have a high importance in the staffing of teams.
Role of the Product Owner and its effects: Another important feature in the analysis of the agile project team is the separation of the positions of Product Owner and Scrum Master, which was not always the case in the past. According to the Scrum theory, staffing by different people is dictated because otherwise a conflict of interest can result (Markgraf, 2017).
A filling of the positions of the Scrum Master and the Product Owner by the same person had mostly a negative effect in the past CD project. Problems resulted out of the lack of time of the Product Owner, because the position of the Scrum Master had

to be executed at the same time. As a result, the meetings could not be optimally prepared and this led to a lack of structure in the meetings (Dunz Interview 3, 2019c). The importance of the Product Owner in the ES project is also emphasized, whereby this role is described as overriding over the tasks of the project team. This position must ensure a suitable composition of the team; having methodological competence and being able to lead the team autonomously (Dunz Interview 6, 2019f). So, the role of the Product Owner can be described as a superior role, which is oriented towards the pursuit of the project goal. An assignment for the right tasks of the team must be found. The negative effects of a missing separation with the position of the Scrum Master must also not be ignored.

The influence of Scrum on motivation of project members: The most important influence that an agile project team in the case study has is on the motivation of employees. In the case of working at one company location, Scrum leads to a general increase of employee motivation. An easier and faster decision-making process justifies this for one of the interviews. Due to working in smaller sections, Scrum leads to faster delivery of products for users, which has a positive impact on team's motivation. The motivation of the employees can thus be maintained over a longer period of time than in projects before the use of Scrum (Dunz Interview 2, 2019b).

Also in the investigation of the projects an increasing motivation of team members is recognizable due to the use of agile project management principles. Again, the importance of the Product Owner is obvious in the CD project. In corporation with the architects and technical colleagues, it is important to show a technical understanding and interest for those topics by the Product Owner (Dunz Interview 3, 2019c). Usually, the Product Owner has no technical knowledge about the concrete technical issues and thus tries to gain the trust of the team members (Dunz Interview 3, 2019c; Dunz Interview 4, 2019d).

In the context of the ES project, Scrum leads to a more improved team spirit than was the case in earlier projects (Dunz Interview 7, 2017g).

Scrum influences the development of mobile applications in a variety of ways. First, employees need training to understand the model and apply it correctly. Second, the support of the management for an agile way of working is necessary for the success of this method and projects. The fact that Scrum is regarded as positive by all

interviewees can be regarded as a chance. In the review of the agile project team, the results show that the Product Owner contributed to the success of the product to a large extent through his availability and working methods. Ultimately, the application of Scrum for developing mobile applications has a positive effect on the project team in terms of an increasing motivation.

5.4. Summary of Case Study

Overall, it can be summarized that in Company ABC are many different influences of the agile project management and the agile project team with regard to the development of mobile applications. These include the need for management support, the significant influence of the Product Owner on the success of the projects and the overall increase in employee motivation.

Furthermore, the different types of relationships between the individual categories become obvious. The potential for digital transformation interacts with the challenges of subcontracting and tacking up the requirements. This potential should facilitate the work processes of subcontractors with the help of mobile applications, but at the same time the implemented solution must deliver high quality and subcontractors must be convinced of the applications. In order to realize this potential, a basis overview about the requirements is necessary, for which the project teams try to gain an insight into the operational workflows. However, this can cause problems that some employees do not understand these problems to a sufficient extent, as it has already been mentioned. Through the insight into the work processes of the users prior to the development of a new application, it can also be used to explain the interaction between the challenges posed by subcontracting and the challenges posed by tacking up the requirements. All of these three factors have an influence on the agile project management and the agile project team. Using Scrum, the case study company tries to respond to the frequently changing requirements of digital transformation, which are also determined by the subcontractors. The agile project team tries to determine the concrete needs of an application. It can be seen that both factors have a critical influence on the success of the development and adoption of mobile applications in logistics.

Network category	Findings
1.) Potential of digital transformation	• High potential of digital transformation and need for a clear strategy of it

2.) Challenges posed by Subcontracting	• In the case of the CD application, subcontractors have a direct influence on the potential of digital transformation in the form of taking up the requirements of the application and the agile project management • Logistics sector becomes complex through the role of subcontractors
3.) Challenges in Taking up the Requirements	• Requirements are mostly unknown and have to specified
4.) Impact of the Agile Project Management	• Scrum is only used fragmentary and not in the full extent • Working in Sprints has a positive effect • **Advantages:** Flexibility and short-term decisions • **Disadvantages:** Decreasing employee motivation under time pressure • **Chance:** Positive opinion of all interviewees about Scrum • **Challenge:** Training of all employees in the use of Scrum • Management support is crucial for a successful project
5.) Impact of the Agile Project Team	• The role of the Product Owner is crucial for a successful project • Increasing employee motivation

Table 2. Presentation of Case Study Findings (own presentation)

All case study findings of the five subcategories are shown in table 4. In the case study, Scrum serves as the basis for implementing the strategy of digital transformation and for developing mobile applications, although it was not fully applied. Generally the management should support the implementation of an agile approach and align the corporate culture accordingly. For this, it is necessary to discard old ways of thinking, because otherwise the success of the projects is not guaranteed. The support of the management is also reflected in sufficient training for employees. They must have an appropriate knowledge and understanding of the methodology. Otherwise, negative effects on the success of the project are possible, as the case study findings have shown. Overall, the use of Scrum has a positive effect on employee motivation, which in the case study is due to the faster and more consistent delivery of products and increments. All results are summarized in Table 2.

5.5. Presentation of the Developed Grounded Theory

Figure 3 presents a model that shows the occurring grounded theory of this case study. The model is divided into four parts that shows the potential of digital transformation in the logistics sector, the necessity for management support and an agile corporate culture, the use of Scrum and the resulting increase in the motivation of the employees. It is indicated with the arrows at the top of the boxes that the box has an influence on the following levels. The model summarizes the success factors of the influence of the

agile project management and the agile project team. Arrows in the lower boxes illustrate the direct effects from the respective level. It is obvious that level 1 has a direct effect on the special role of subcontractors, as the investigation of the CD application has shown. The potential for digital transformation influence the role of subcontractors, as this application is developed for this target group among other things. They have to be provided and won for digital business processes. Level 2 and the management support make it possible to meet the requirements of the industry faster. Through an agile alignment of the corporate culture, the principles to be applied are directly applicable by the employees, ensuring a quick response to market demand. In level 3 and the application of Scrum by the project team, the suitability in a new project must be assessed as it is not applicable to all types of projects. Scrum is usually not used to its full extent, but often misses a higher chance of success. Finally, level 4 shows the increasing employee motivation. This is due to the constant supply of product increment, where all involved employees can see a steady progress in success. In addition, the arrows in the upper boxes illustrate the interactions between the four levels. Through interactions the different levels influence each other with the adjacent levels. The fact of the general potential for a digital transformation in logistics leads to necessity for management support and an agile corporate culture. In this way, the products can be implemented that are necessary for the use of this potential. This point of support and corporate culture is the necessary condition for the application of Scrum in a project. Only by using this method it is possible that an increasing employee motivation results.

In sum all four levels influence the successful development and adoption of mobile applications in logistics. A new aspect of this Grounded Theory research is the investigation of a logistic company in general, but especially the first level of Figure 3. It shows the high potential of digital transformation, which is the basis of the derived grounded theory.

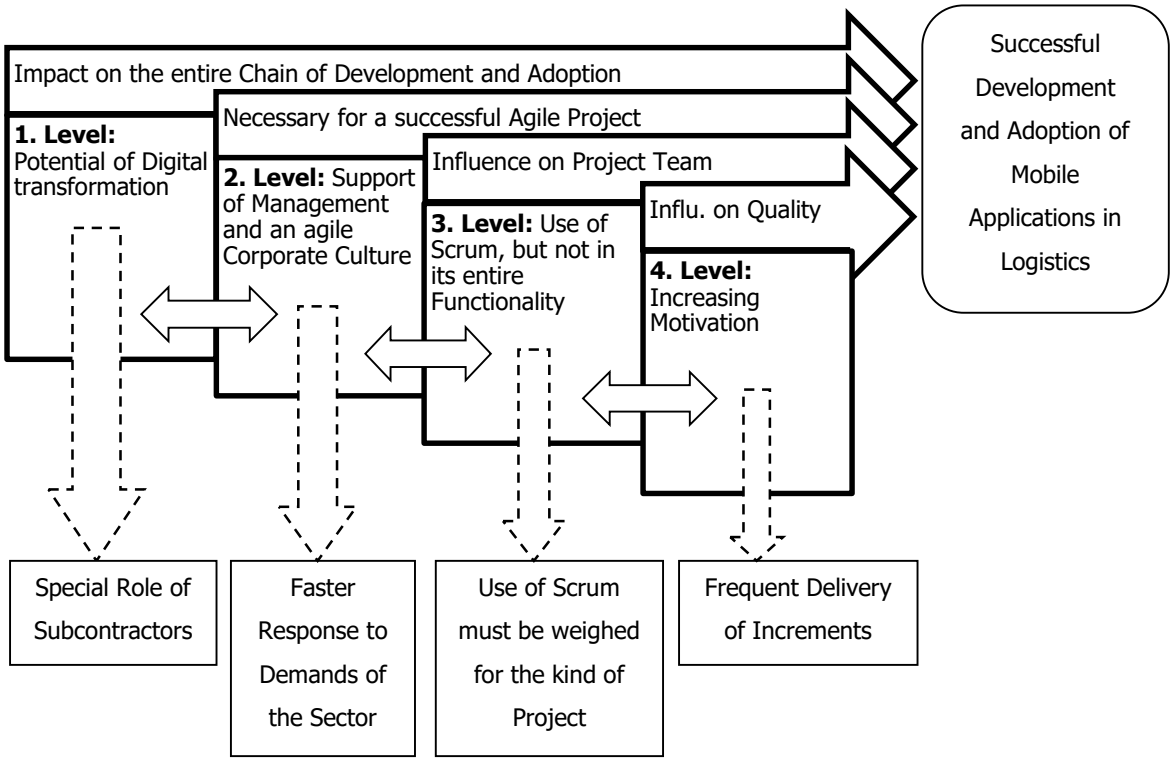

Figure 3. Grounded Theory of Case Study Findings (Own Presentation)

6. Implications for Theory and Practice

This case study aimed to analyse the impact of the two named success factors on the development and adoption of mobile applications in logistics. Out of this investigation, Grounded Theory was used to derive new insights from this research. It was demonstrated with this research that Scrum has arrived in logistics and has already taken on an important function. Here it made sense to set up a new model by this approach and not check with an existing one, since there is no comparable model of a similar research context. Grounded Theory is more suitable for the development of new hypotheses than for the development of hypotheses from the data (Myers, 2013). Due to the developed model in the setting of grounded theory, this study is helpful for theoretical aspects. It can serve as a starting point for future information systems research in the field of logistics. Out of the two investigated success factors, it can result general theoretical implications. In a similar context, it is possible that the results of the model can also be confirmed there. Nevertheless, on the other point of view, further research can also lead to deviating results. Therefore, it is necessary to change the framework of research in future. Because of the fact that the model considers only

the case with one logistic company, it is difficult to generalize the findings with the presented Grounded Theory (Lee & Bakersville, 2003; Yin, 2018).

According to the model, the potential for digital transformation in logistics and working with Scrum leads to an increasing employee motivation in the agile project. However, it is dependent on management support and the agile corporate culture. Implications for future research are, for example, to check the message of the model. This can happen in a qualitative context, but with a larger population through more interview partners. A quantitative framework will also be possible. It is particularly important to pay attention to the research design there and to note that even more respondents would be necessary there. However, for a case study, this could present itself as a problem to get such a large amount of data. It is also possible to extend the case study in the frame of a multiple case study. Several companies from the logistics sector can be interviewed there. For example, the case study can be limited to German companies or a global analysis can be carried out.

This case study has some implications for practice. The investigation has provided an exclusive practical insight into a logistic company. Currently this insight is unique because there are no comparable studies so far. For the company ABC, this study has the advantage of an independent examination and assessment in the sense of a retrospective. Since Retrospective Meetings do not take place regularly, a retrospective and independent assessment of the project's success is possible. The point of an independent investigation must be particularly emphasized, since the case study results out of a personal contact between the researcher and the company, but the Company ABC has not commissioned the investigation. In a case of a mandatory or an investigation commissioned, other results could be possible. The result could be a less critical investigation, which do not shows the problems of the logistic sector, like subcontracting and only shows the advantages of Scrum in this setting. This could be explained by the fact that in this context the company would have paid money for the investigation. The researcher could have a lower incentive for a critical investigation. In conclusion, this investigation would not have revealed the results it so discovered. Furthermore, the case study gives an insight into the practical suitability of Scrum for the logistics sector. Companies of the sector can recognize that Scrum is highly relevant and suitable for the logistics industry. Under certain circumstances, a practical

rethink is possible in the industry sector, moving away from the classic approach of a waterfall model to an agile approach. In this way, companies can succeed in reacting faster and more flexibly to constantly customer requirements, thus creating benefit for customers.

The combination of practical and theoretical knowledge can also be applied in practice because the developed model can be used by the Company ABC or other companies from this sector, as a framework in the use of Scrum. It can serve as a scientific support to gain managements support and convince it of the advantages of Scrum. At the same time, management support would have been gained, which would have fulfilled a necessary factor of the model for the success of the project. So it could lead to a more successful project than would have been the case without considering the model.

7. Limitations and Future Research Directions

As is usual in scientific work, this case study also has limitations and does not consider all possible aspects of research. For the case study is the most important limitation a missing interview with the Scrum Master of the CD or the ES project. A possible reason for it can be that for possible interviewees, the daily work has priority over qualitative research, which meant that interview partners were not always available. In a Scrum project the Scrum Master takes on a superior mentoring function. As a result, the Scrum Master has gathered many different experiences and views that could have been included in an interview. The interview with the Product Owner of the CD project showed that an interview with a superior person in the project can provide a valuable insight. The importance of a superior person for research on the highest number of coding's, but also the many valuable aspects of content is clearly demonstrated. Due to the missing interview with the Scrum Master, one member of the Scrum team was missing in the interview set.

Another limitation of the case study is the conduction and transcription of interviews. Qualitative interviews can be an "artificial situation" (Myers & Newman, 2007: p. 3) where strangers talk to each other and this kind of situation can arise. There may also be a lack of trust between both parties possible (Myers & Newman, 2007). All interviews of the case study were conducted without any audio or video recording. In this case study, the interviews were mainly conducted by telephone, whereby the statements of the interview partners were noted down. This type of transcription can

result in a loss of information but this approach is also supported by the fact that the case study company was not allowed to record interviews. For reasons of data protection, this was forbidden.

In this case study eight interviews were conducted. For future research, an extension of the amount of interviews could be a possible idea, since in comparable studies about 20 interviews have been conducted (Moe et al., 2010; Hoda & Latha, 2016).

In a future investigation, a comparison of industries in the design of a multiple case study can also make sense. For example, the peculiarities of the logistics industry could be examined in comparison to other industries and the meaningfulness of the results could be tested.

Another weakness of the case study is the missing interview with end users in both projects. An important point of view was no part of the data collection. Potential respondents of this target group could have given an interesting insight into the research, as it would have been possible to assess the quality and user-friendliness of the developed mobile applications. Thus, the success of the projects and the suitability of Scrum for the development of the applications could have been judged retrospectively. Due to the missing interview with the Scrum Masters in both projects and the users of both applications, it was not possible to build up a comprehensive data chain with lots of different perspectives. The research view is restricted by the case study design.

In addition to the limitations already mentioned, which have resulted from the context of the specific case study, there are also limitations and disadvantages that result from the methodology itself. The generalizability of the case study is a general difficulty in this context (Yin, 2018; Lee & Baskerville, 2003). Hence, it can be regarded as a disadvantage of a case study that it cannot be evaluated with statistical methods, because sample logic is not applicable (Myers, 2013). A generalization is not statistically supported but must be carried out argumentatively (Yin, 2018). Especially the single case study has the weakness that only a single case is considered, which would allow only a minor analytical conclusion compared to two or more considered cases. More than two cases would reduce doubts about the reliability of empirical work (Yin, 2018). Thus, only results can be derived, which are mainly only applicable to the

case study company. However, since this was the focus of the investigation, the results still make a valuable contribution (Myers, 2000).

In retrospect, the case study leaves scope for further research. The developed Grounded Theory can serve as a basis for this research. By future investigations, it should be examined whether this model can remain in its dimensions, or whether an extension respectively an amendment must take place. In this context, it is possible and target-oriented to expand the population to about 20 respondents, as is the case in comparable studies in other industries. It can be extended in the investigated logistic company, but also the possibility of a multiple case study can be chosen. Here the research design can be built up over several global logistic companies in order to create a better comparability and a higher generalizability.

8. Conclusion

The decision to conduct a case study in the logistics industry is to be justified by the lack of previous comparable research in this field of logistics. At the same time, the need for research in this field is clearly illustrated by the potential for digital transformation in logistics. The development of mobile applications with the help of Scrum, as an agile procedure model, contributes to the realization of the potential for digital transformation. It can be seen that the agile development has long arrived in this industry, but in the case of the investigated company, it is not yet applied to the full extent because only sensible aspects are implemented. A special focus must be placed on the role of subcontractors in one of the investigated applications, as it is designed for people who only have an indirect relationship with the company. In comparison to other industries, this characteristic leads to additional complexity in the development and introduction of mobile applications. Finally, the agile development of mobile application has resulted in increased employee motivation. An agile development and adoption of applications can be seen as a clear advantage in logistics as the findings shows. The research question posed at the beginning aimed at the investigation of the influence of the highlighted success factors on the development and adoption of mobile application. It can be seen that these success factors influence a project for an application in a variety of ways. Starting from a basic potential to digitise the industry, there are interdependencies to the challenge of taking up the requirements of new applications and the challenge of subcontracting. Essentially, the

results of the investigation of this sector are consistent with those of the other sectors mentioned above, although it is important to bear in mind the specific features of the sector. However, waterfall models are still important and are not completely detached by Scrum in this context, as they result in advantages for projects and software that have a significant influence on the IT infrastructure. Scrum is an advantageous method for the development of mobile applications in logistics. Due to the constantly changing processes caused by digital transformation, the influence of the agile project management in this sector will continue to increase in order to counteract the resulting challenges.

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