

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

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## **1. Introduction**

Software development in modern companies is a practice, which depends on a lot of 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 (cf. Lison / Hartel 2016: p. 3). 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 (cf. Zanker 2018: p. 20). In Germany, the sector acts as the third largest economic sector in terms of the number of employees (cf. Grotemeier 2018) and serves globally as an important basis for globalisation (cf. Zanker 2018: p. 20).

This research aims to investigate the use of an agile project management approach in this context. Similar contexts were investigated in prior research and examined their project success. There it is seen in the constant change through globalisation, a need for agile project management (cf. Komus / Kuberg 2017: pp. 7 and 26). But 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 (cf. Coram / Bohner 2005: p. 8). The spread of agile methods is increasing overall 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 (cf. Cristal et al. 2008: p. 226). But also the logistics area continued to be a part of research. There it is seen an increase in the use of mobile applications, related to the increasing use of mobile devices (cf. Speranza 2018: p. 831). According to research, mobile applications are a decisive competitive factor in logistics and foreign trade and are used in 54.6 percent of the cases (cf. Lison / Hartel 2017: pp. 4 and 14). 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 (cf. Lison / Hartel 2016: pp. 9 and 23). The use of Scrum has already been investigated in different industries by using a case study, but a case study in the field of logistics is missing so far. An example of previous research in other industries is the pharmaceutical industry. This investigation should analyse the advantages of and the reasons for the agile project management in a selected company (cf. Azanha et al. 2017: pp. 121 and 131). 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 (cf. Azanha et al. 2017: p. 139). 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. In this way a successful project can result (cf. Könnölä et al. 2016: pp. 134 and 148). An agile way of working is characterized by

a self-organizing team. In the software industry, it can result in challenges on the individual project, team or task level, which have to be considered (cf. Hoda / Latha 2016: pp. 245 and 256).

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?*

This question is supported by the hypothesis that agile project management in logistics will have a positive effect on the success of the projects. In this research, it should be discovered how the factors in the projects affect each other and why they influence the success of the projects. For answering this question, the methodology of a single-case study design with multiple units of analysis, two investigated projects, was chosen (cf. Yin 2018: p. 48). 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 framework of eight interviews with employees. All employees were either involved in one of the investigated projects or had general project experiences with Scrum. The interviews gave different perspectives on both considered projects. 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. These results can lead to practical and theoretical implications.

The investigation is organized as follows: Chapter 2 contains the most important foundations in the context of an agile project management and digitisation in logistics. Chapter 3 shows the literature review about previous research work in the field of the investigation of Scrum, the logistic sector and case study research in the field of information systems. The explanations of the research approach and design follow in Chapters 4 and 5. In Chapter 6, the presentation of research findings takes place and their classification in existing literature and the derived Grounded Theory are explained in Chapter 7. Implications for theory and practice are presented in Chapter 8 and the conclusion follows in the last chapter.

possible. 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. Thus 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 (cf. Yin 2018: p. 20; Lee / Baskerville 2003: p. 221). 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 (cf. Myers 2013: p. 84). A generalization is not statistically supported but must be carried out argumentatively (cf. Yin 2018: p. 41). 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 (cf. Yin 2018: pp. 61f.). 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 (cf. Myers 2000).

## **9. 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 digitisation potential in logistics. Similar case studies have already been carried out with focusing the industrial sector (cf. Könnölä et al. 2016), the pharmaceutical sector (cf. Azanha et al. 2017) and software developing companies (cf. Moe et al. 2010; Hoda / Murugesan 2016).

This study puts the general potential of digitisation in logistics in the centre of analysis. The development of mobile applications with the help of Scrum, as an agile procedure model, contributes to the realization of the digitisation potential. 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. Scrum helps to provide a faster response to the frequently changing requirements of this industry. 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. It can probably be regarded as irrelevant in this research context whether the development of a mobile application or other software is investigated in the study. For the case study company

and the logistics industry, this case study and the results of Grounded Theory, provide a framework for the use of agile project management. In the application of the resulted model, the interactions between the individual levels cannot be disregarded here and so it can help to implement and use Scrum in the logistical context.

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. These three factors are influence the two investigated success factors and consequently have an influence on a successful development and adoption of mobile applications. Also the hypothesis mentioned at the beginning, according to which agile project management has a positive effect on logistics, can be verified by the faster delivery of product increments and the increasing motivation of employees.

An additional practical and theoretical value is shown in this case study. For the practical point of view, and especially for the investigated logistic company, the case study results in a retrospective evaluation. It shows that the use of Scrum in the investigated projects has created some challenges. Examples are the lack of digital business processes, the influence of subcontractors and the difficulty for the project team to determine the requirements for an application. Furthermore the management must support the agile way of working and the importance of the Product Owner must not be neglected. At the same time, there are also great opportunities, which lead to more successful projects through higher employee motivation. But also from the practical point of view there is an additional value. The Grounded Theory can not only be used as a support for a practical introduction of Scrum in logistics, but also as basic research in this field. 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.

When looking at the logistics industry, it is also noticeable that the topic of agility has arrived in this industry. 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.

Despite all new findings, the case study has also been limited in its design. An example for it is small population of conducted interviews. Case studies continue to have the problem of generalizability, as is the case here. It is difficult to draw general conclusions from only one examined case. But it is mitigated in this study by the design with two embedded units of analysis.

In retrospect, the case study leaves scope for further research. The developed Grounded Theory can serve as a basis for this research. By future investigation 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.

All in all, the investigation has given a far-reaching insight into the company and the logistics sector. In the future, this insight may become even more valuable due to the overarching function of logistics in the global economy. Due to the constantly changing processes caused by digitisation, the influence of the agile project management in this sector will continue to increase in order to counteract the resulting challenges. The developed Grounded Theory can make a valuable and decisive contribution in this regard.