ESTABLISHMENT OF A PRACTICAL STUDY REGARDING THE DIGITIZATION AND IT-READINESS OF GERMAN SMALL AND MEDIUM SIZED ENTERPRISES

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Abstract
This paper highlights the main elements of a doctoral research regarding the establishment of a practical study aiming to detect the most important obstacles and challenges of German Small and Medium Sized Enterprises (SMEs) concerning a well working IT-environment setting the backbone for Machine Learning (ML) and Artificial Intelligence (AI). In the last decade topics such as Digitization, ML, AI and Bots are in all people's minds and part of everybody's daily business. Thus, lots of studies were carried out in order to understand if companies have reached a level of automation and Digitization, elevated enough to compete against other market players or if they are ready to include AI in their business model.
However, all these studies do not show the operational/practical part of SMEs, such as issues with interfaces between internal IT-systems etc. Therefore, the results are far from giving a realistic picture about their IT-readiness.
We have established a more practical study focusing on the operational part of an SME, e.g. interfaces, department-based IT-readiness and system topographies of German SMEs. Finally, the outcome – the study itself – will mirror the actual situation of the queried companies' IT-readiness and thus, their ability to adapt and profit from issues as Digitization, ML and AI.

Keywords
Digitization, Small and Medium Sized Enterprizes, ERP-System, IT-Readyness, IT-Interfaces.

JEL Classification
G32, H20, H63, L10, M15, M16, M20, M40, O32, Y10.

Introduction

As all recent studies concerning the Digitization level (degree of Digitization) of German SMEs aim at providing an overall assessment on the estimation of the participants vis-à-vis their situation compared to the situation of other market participants, criteria such as their actual status and the operational situation is not being taken into consideration yet. Even the most recent study of IDB scrutinizing issues as ML and AI is only focusing on the impression the referring participants have regarding their position in the market (IDG Busines Media, 2019).

Thus, the outcomes are that ML has become an important issue for the majority of German SMEs or that more than half of all queried enterprises are already using at least one ML tool

in their daily business (Computerwoche, 2019). However, what is missing is a fact base argumentation regarding the degree of Digitization of the average German SME and a reasoning why today the majority of German SMEs still do not feel threatened by their low degree of Digitization (Bayer, M. 2019).

Thus, this article will provide an insight of the study undertaken, more precisely, will describe the assessment of the actual status of German SMEs regarding their degree of Digitization. In order to better understand the average level of Digitization of German SMEs deep digging questions regarding the status of the participating companies' IT- / ERP-Systems in each department had to be asked. Only if the outcome shows how far the implementation of ERP- or other IT-Systems in the queried companies is, a realistic guess regarding the readiness of German SMEs concerning Digitization can be made (Haisermann et al., 2019).

More precisely, it must be understood if each of the departments in the companies are using an ERP-System or not (Kuhlmann, 2018). In addition, it should be clarified that if an ERP-System is used in a certain department, and how far the system interacts with the systems of other departments (Hill, 2019). Last but not least, the survey should unveil if the enterprises are working with documented processes and – if this is the case – how are they being documented (Christensen, 2016).

If the above-mentioned contend is concealed we can get a realistic impression of how well German SMEs are prepared for Digitization, Big Data Analysis (BDA), ML and AI (Burkov, 2019). Thus, the results of the study, which will be published at the end of May 2019, will – for the first time – give a more practical insight into German SMEs and their IT- / ERP-Systems. We have already learned that German engineers do not seem to be ready for Digitization, ML and AI (F.A.Z., 2019) as shown by the majority of HR-Departments of German SMEs which still want applicants to complete their application offline (Bayer, 2019).

Research objectives and methodology

This research paper is founded on extensive review of existing studies from professional associations and recognized scholars. The main objective of this paper is to disclose why the study was compiled the way it was done by the authors, as it aims at pointing out the 'pain' points of German SMEs regarding their IT-readiness not based on comments and opinions but rather on a fact based scrutiny.

The study this paper refers to, aims at pointing out the degree of German SMEs' readiness regarding Digitization, ML and AI. The asked questions have therefore the ultimate purpose of unveiling the actual status of IT- / ERP-Systems in German SMEs. The study's main part is not compiled to understand what C-Level Managers of the participating companies think about their company's readiness or what opinion they have regarding their position in comparison to other German SMEs. It rather asks questions that give insights into each and every single department of the participating companies on how far processes are documented, what kind of IT-Systems are in place, and if interfaces between the different departments are present and how they are working.

To also give a slight insight into the participants' opinion regarding their IT-readiness and Digitization status, questions such as e.g. do you think your company is well prepared for the upcoming challenges regarding Digitization? were asked which aim at understanding the estimation of the interviewee. As the study should also expose the difference between the estimation of the interviewee and the actual degree of the queried company these results will also be compared to show if the interviewees' opinions are mirroring the actual situation or if their estimation is misleading.

Research results for the Establishment of a Practical Study. The result of the above-mentioned research was the establishment of a study which is able to show the practical

status quo of German SMEs regarding their IT-Readiness for Digitization, ML and AI. The results of the study itself are still being assessed and will be published at the end of May 2019, while this paper will already give an idea on how the study was structured, which questions were asked and what details were considered in order to have a better understanding how and if German SMEs are ready to fully implement tools such as AI and ML in their business models.

Cooperation Partners for the Study. The study was structured, compiled and created by GHK Management Consulting GmbH represented by Deniz Kerem Sargut, in cooperation with Prof. Dr. Wolfgang Jäger from Hochschule Rhein Main in Wiesbaden and Bundesverband Mittelständische Wirtschaft (BVMW), which supported the authors with the necessary database of potential participants.

Time Horizon for the Practical Research. The study was created at the end of February and the first invitations for a participation were sent out at the beginning of March, while the answering time for participants was set for six weeks.

Research Participants. The participants and interviewees were responsible representatives of German SMEs, such as:

- Owners
- Managing Directors
- Executive Board Members (CEO, CFO, CIO)
- Directors
- Division Managers and
- Other Managers.

The sectors included were:

- Production
- Construction
- Health- and Social Care
- Whole and Foreign Sale
- Services and
- others.

The size of the companies included companies with revenues of up to €200 m and a headcount of max. 1.000 people (Figure 1).

1. Einleitung

1.1 Welcher Branche gehört Ihr Unternehmen an?
- Produzierendes Gewerbe — o
- Bau — o
- Gesundheits- und Sozialwesen — o
- Groß- und Außenhandel — o
- Dienstleistungen — o
- Andere — o

1.2 Welche Position nehmen Sie in Ihrem Unternehmen ein?
- Inhaber — o
- Geschäftsführer — o
- Vorstand — o
- IT-Leiter bzw. IT-Verantwortlicher — o
- Kaufmännischer Leiter / Finanzdirektor — o
- Bereichsleiter-/Abteilungsleiter bzw. andere leitende Position — o

1.3 Wie viele Mitarbeiter beschäftigt Ihr Unternehmen?
- Unter 20 — o
- 20 - 100 — o
- 100 - 250 — o
- 250 - 1000 — o
- über 1000 — o

1.4 Welche Umsatzgröße hat Ihr Unternehmen in Millionen Euro?
- Unter 10 — o
- 10 - 25 — o
- 25 - 50 — o
- 50 - 100 — o
- 100 - 200 — o
- Über 200 — o

Fig. no. 1 The First Part of the Questionnaire (Self Edited Questionnaire)

Distribution of Questionnaires of the Research. In total about 3.500 potential participants were contacted. The distribution of the questionnaires was organized as follows:

- 2.500 e-mails including a direct link to the survey;
- 1.000 letters with an included QR-Code and a Link, as well as
- 50 direct calls for action via telephone and a follow-up e-mail incl. the link.

Research Structure and Content. The first part of the study provides an idea regarding the size of the participating companies and the sectors they are operating in. The second part of the study focuses on questions regarding the IT and Digitization related investments the companies have done during the last years, as well as their willingness to invest in IT and Digitization related subjects in the upcoming year. Moreover, it asks for obstacles for further investments in this area, such as missing IT-competencies, data security, high cots, etc. Finally, while it also asks for a short self-assessment regarding the companies' degree of Digitization compared to the market they activate in, it also tries to unveil the meaning of digital technologies for the companies and their business models.

Fig. no. 2 The Third Part of the Questionnaire, incl. the Different Departments and an Example of the Questions asked for each Division (Self Edited Questionnaire)

The structure of the study's main body was compiled based on Michael E. Porter's value chain (Porter, 1998). Thus, the questions which were structured in a way that they can be asked repetitively for each of the divisions written below, were asked in the order of Porter's value adding divisions of the value chain.

- Marketing
- Sales
- Purchase and Logistics
- Production
- Customer Services
- Finance / Controlling and
- Human Resources

In the beginning, the study moreover observes the importance of Digitization of the companies' commercial business processes for each department, while the interviewees were provided with the ability of classifying the importance from 1 (not important at all) to

5 (very important). In the main part of the study, three main questions are asked repetitively regarding each company division. The most important intention of this exercise is to understand the importance, as well as the degree of realization of

- the documentation of business processes
- the system-based support of each of the processes and
- how the interfaces – if present – between the different departments are working.

As in many German SMEs this part is one of the most important parts to understand, as this is also related to risk management, internal revisions and auditing (Verbano et al., 2013). More precisely the first of the three main questions ask the participants to classify the importance of having documented processes. After classifying the importance of documenting processes, the study then asks in which format the regarding processes (e.g. in the Marketing department) are documented:

- paper-based (e.g. on paper at each working place);
- proprietary digitized (e.g. pdf) or
- in a completely digitized from (e.g. Document Management System (DMS)).

While answering the above-mentioned question, also the degree of completion (where 1 was defined as *not at all* and 5 was equal to *a 100 % completion* of the documentation procedure) has to be filled out as to understand how far the procedures have been realized or if they are still at ground zero.

The second continuously repeated question is how important system-based processes are for the respective department and to which degree the implementation of system-based processes is already realized. The question hereby focuses on the intention to understand if the system-based processes are supported by

- Self-programmed / Self-developed IT-Systems
- Standardized IT- / ERP-Systems (e.g. SAP, SAGE, Oracle, etc.) or
- Integrated, trans-divisional IT- /ERP-Systems.

For this question the participants have to classify again from one to five stating the degree of completion.

The third question which is posed to understand the degree of Digitization in each department of the participating companies, aims to examine the status of the available IT- and System-interfaces between certain departments. These certain departments always include the Finance / Controlling department and a second department usually chosen based on the order of Porter's Value Chain Model, mentioned earlier in this article.

The scrutiny of interfaces is introduced by the question *are the interfaces between the following departments (e.g. Finance / Controlling and Sales etc.) important for you or not?* The answers again had to be classified from one to five, while the second part then asks if

- Interfaces between the related departments are handled manually;
- Interfaces between the related departments are self-programmed / self-developed or
- Interfaces between the related departments are standardized.

For this question, too, the interviewee has the option to classify from one to five, since it might be that in some companies the interfaces are administered in two or three different ways (Lopes de Prado, 2018). Thus, it can be that a certain portion of the data is transferred via standardized interfaces, while another part is still interacted manually or with a self-programmed software. This way, the answers can be given very precisely and therefore, help us receive results that realistically represent the status-quo of German SMEs IT-Readiness for the ongoing Digitization and the following steps in the direction of ML and AI.

The last section of the study focuses on questions which are trying to illustrate if the interviewee is satisfied with the recent status of the IT- / ERP-System they are recently using, if she / he thinks that the present IT- / ERP-System gives them the feeling to be well

prepared for the future challenges which come along with Digitization and, in certain cases ML and AI (Olson & Nestell, 2017). The last two questions then ask to what extent the IT- / ERP-System in use is supporting the company sufficiently and to what extent the system really does what the user wants it to do. These questions are also very important to ask, as a lot of German SMEs completely fail while classifying their situation compared to other SMEs (Schöpper et al., 2018). In total the study is prepared to take about 15 to 20 minutes to complete it without leaving no one question unanswered.

Conclusion

The overall purpose of the study's result, its structure and – most importantly – its content is to have one of the first studies regarding Digitization which will not focus on the interviewees' opinions but rather the intention to mirror the actual situation of the queried company. The study will therefore give a valuable insight into the real situation of German SMEs regarding their state-of-the-art IT-structure, ERP-Systems incl. interfaces, which is one of the most complicated issues and lastly, the status of the companies' status of their process documentation. Thus, the outcome will not mirror a theoretical idea of C-Level Management but will rather unveil certain 'pain' points and challenges that German SMEs currently have.

As a second step, the results could then be compared to markets outside of Germany to see if these problems are only subject of prime importance for German SMEs or if it is also true for companies abroad and then further classify if Germany is well ahead, on the wave or far behind international standards.

Nevertheless, to remain on point, the result of the study will be that – with its results at the end of May 2019 – it will help understand German SMEs real degree of IT-readiness and Digitization and it will provide a thorough understanding of the most important practical issues regarding Digitization incl. thrilling subjects such as process documentation, ERP-Systems, as well as system and inter department interfaces.

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