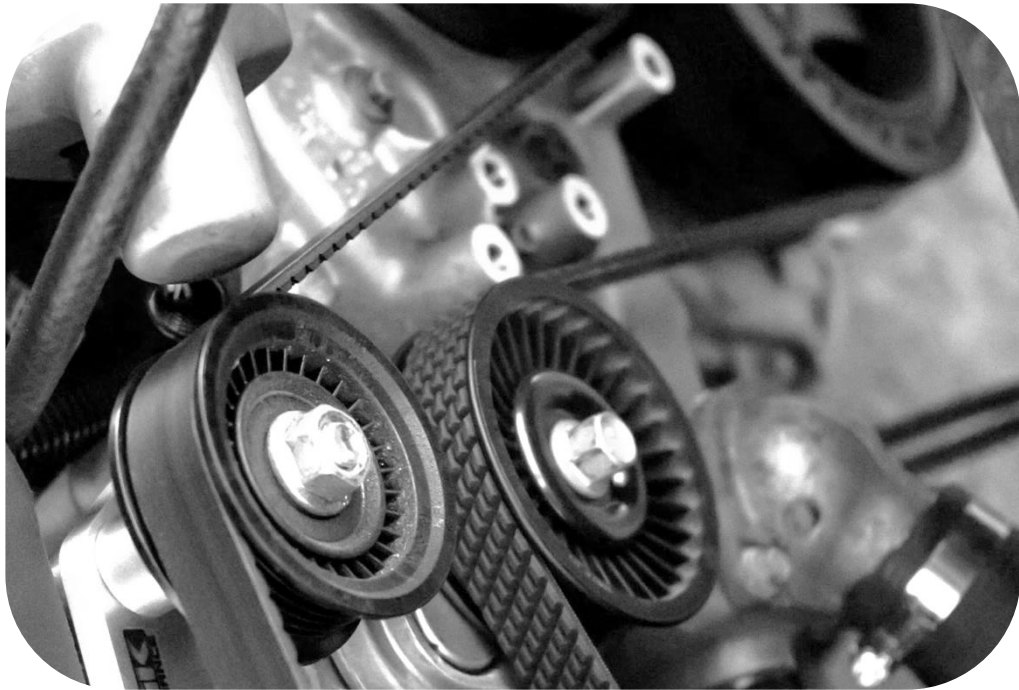


Equipment-as-a-Service Market Study 2021

*Prerequisites, barriers and success factors for EaaS –
an international and industry-wide study in the capital goods segment.*



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List of abbreviations

AI	Artificial Intelligence
DACH	Germany (D), Austria (A), Switzerland (CH)
EaaS	Equipment-as-a-Service
IoT	Internet of Things
SME	Small and Medium Enterprises
PaaS	Product-as-a-Service
SaaS	Software-as-a-Service

Executive Summary

This empirical study on the prerequisites, barriers, and success factors of equipment-as-a-service (EaaS) business models is based on numerous qualitative expert interviews, primarily from the mechanical and plant engineering sector, and the response to an online survey of 322 participants from various international companies in the capital goods segment. In the evaluation and analysis of the results, a distinction was made according to the factors SME (57.1%) vs. large companies (42.9%), DACH region (16.8%) vs. non-DACH region (83.2%), management subgroup (5.9%), industries (e.g., IT and mechanical/plant engineering) and age of the participants, among others. The participants in the DACH region are largely from the mechanical and plant engineering sector (46.3%), whereas the participants in the non-DACH region (primarily the USA) are largely from the IT sector (43.7%).

80.1% of the participants estimate that the **use and offering of EaaS models will increase** in their companies in the next 2-3 years. The core benefits (> 75% agreement) of EaaS business models are **cost optimization of maintenance, promotion of innovative products and technologies** (e.g. IoT, remote services), and **planning security in the financing of capital goods. Closer customer ties through EaaS** are the greatest advantage among participants in the DACH region (96.3% agreement) and the management subgroup (agreement of 94.7%). In contrast, there are no significant differences between large enterprises and SMEs in knowledge or understanding of EaaS or its benefits and barriers. Furthermore, there are no significant differences regarding the age of the participants and their assessments of the success of EaaS business models.

84.5% of participants believe that **digitization** will further **accelerate** the application and success of **EaaS business models**. The management subgroup agrees with this statement almost unreservedly at 94.7%. However, the survey results show that among participants from the DACH region, digitization with the possibilities for remote monitoring & service as well as predictive maintenance (Seebacher 2021) is seen less strongly as a driver of EaaS business models than in the non-DACH region. It is also evident that participants from companies that already offer EaaS models rate the current level of digitization in their company as "better" than participants from companies that do not yet use EaaS models.

Over 70% of participants believe that EaaS promotes **environmental sustainability** through the efficient use of maintenance and service (73%) and the longer life cycle of machines and equipment (71.1%). EaaS business models are thus also crucial in order to realize measures such as the EU Green Deal.

Resulting from the various advantages, **75% of the participants** from the non-DACH region predict that **EaaS will replace the model of fixed purchase of** a capital good to a large extent. In the DACH region, on the other hand, only 46.3% of participants agree with this statement.

The **core success factors for** EaaS business models cited by participants are more information, references, and education (1), more industry-specific providers and offerings (2), and more know-how and technologies around predictive maintenance and remote services (3). Within the DACH region, the desire for exit options from EaaS contracts in case of dissatisfaction is the most important success factor with 88.9% agreement. **Core barriers to** EaaS business models cited by participants include concern about data security (1), lack of knowledge about EaaS application and implementation (2), and lack of EaaS offerings and vendors (3). In contrast, possible system or product-related requirements or barriers such as high complexity and immobility of products and systems are less highly prioritized.

Accordingly, there is a great **desire** and thus great potential for **more offerings** and **providers of** EaaS services. In summary, the present results show that EaaS is a promising and important business model across companies and industries - especially regarding digitization and environmental sustainability - and that its importance will continue to grow.

Future model Equipment-as-a-Service

Renting, leasing, pay-per-use - an economy of use instead of ownership is increasingly unfolding (Bundesnetzagentur 2017). The music and film industries are successfully demonstrating this: Here, people subscribe instead of buy - see Spotify and Netflix (Arnold & Schneider 2019). Software companies such as Adobe, which made the switch from perpetual licenses to subscriptions, also experienced a sharp increase in their market value (Westdeutsche Zeitung 2012). These examples show that consumers do not necessarily want to own, but that the results achieved with them are important. This is also true in B2B (Schlipf et al. 2019; Leismann et al. 2012) - due to the rational purchase decision process, the focus should not be on owning, but on the effective and efficient use of the investment good. The equipment-as-a-service (EaaS) business model has the characteristics mentioned and is expected to offer new opportunities for both manufacturers and customers (Wopata 2020).

In contrast to a classic sale, in the EaaS model the manufacturing company provides the user with a machine for a fee, for example. The manufacturer is responsible for maintenance, service, consumables, and spare parts. In addition, the availability and output of the machine can be guaranteed. The user saves the high one-off capital expenditure and passes on some of the operational risk to the manufacturing company (Wopata 2020). Both the output and the usage fee can be defined individually, for example with monthly billing or according to the pay-per-use model, i.e., only according to the actual number of units produced (Fraunhofer-Gesellschaft 2020).

According to the Market Report of the IOT Analytics Institute, the global EaaS market is expected to show a growth rate of 35% by 2025. In the machinery and plant engineering sector alone, an increase of 54% is expected by 2025 (Fraunhofer-Gesellschaft 2020).

Due to the increasing relevance of EaaS, the present study uses an international and industry-wide empirical survey to take a closer look at the drivers and barriers of the EaaS business model, to capture the sentiment in the capital goods market, and to identify a possible consensus regarding prerequisites, success factors, and potentials in its implementation.

1 Research hypotheses and methodology

In the run-up to the empirical study, a comprehensive literature review, benchmark analyses and numerous expert interviews were conducted primarily with representatives from companies in the mechanical and plant engineering sector, some of which already offer or use the EaaS model. On this basis, both the hypotheses to be tested were formulated and the quantitative questionnaire on which this study is based was developed. The hypotheses, the research design and the sample of the study are presented and explained below.

1.1 Hypotheses

Derived from the preliminary investigations, ten hypotheses were formed which are to be used in the present study to obtain an overview of the market situation of EaaS. The hypotheses described will be analyzed and tested in the further course of the study using suitable methods.

- H1** There is no single definition or understanding of as-a-service business models in the industry.
- H2** As company size decreases, so does knowledge and awareness of as-a-service business models.
- H3** Participants from countries outside the DACH region are more likely to agree with the benefits of EaaS than participants from the DACH region.
- H4** Large enterprises are more likely to agree with the benefits of EaaS than SMEs.
- H5** SMEs are more likely to agree with the inhibitors of EaaS than large enterprises.
- H6** The older the decision-makers in the companies, the less attractive Equipment-as-a-Service appears.
- H7** Digitization enables the holistic realization of EaaS business models.
- H8** Equipment-as-a-service business models favor the environmentally sustainable use and service of the respective machinery and equipment.
- H9** Lack of knowledge is a major barrier to a positive as-a-service purchase decision.
- H10** A major challenge of EaaS lies in the clarification about storage and use of machine data and thus internal company data.

1.2 Study Design

To test the hypotheses, data was collected from December 07, 2020 to January 07, 2021 using a fully standardized questionnaire. This was prepared as an online/mobile survey via the SoSci Survey tool and could be completed electronically. The questionnaire was divided into the following areas

- demographic and company characterizing factors,
- Conceptualization and application of EaaS,
- Benefits and barriers of EaaS deployment,
- Digitalization and Environmental Sustainability in Relation to EaaS
- as well as market, company situation and future of EaaS business models.

on. Except for the demographic and company characterization factors, the statements were predominantly examined using a 5-point Likert scale from "strongly disagree" to "strongly agree" (see appendix).

1.3 Sample description

A total of 322 persons or valid cases were evaluated, which were divided into seven groups for more detailed analysis. The DACH region (n=54) and the countries outside the DACH region (n=268) were considered separately. Likewise, the IT industry (n=126) - due to its size - was examined separately from the other industries (n=196). In addition to the distinction between SMEs (n=184) and large companies (n=138), the management subgroup (n=19) was also considered separately.

47.2% of participants hold executive or management positions. The remaining 52.8% are evenly divided between executives and clerks/officers. Accordingly, 74.5% of the participants perform a managerial function, whose opinion is particularly important in the topic of EaaS and its implementation.

Most of the participants in the survey work in the areas of IT (26.3%) and finance (17.1%) in their company. These results can be observed in the IT industry groups,

excluding the DACH region, and among SMEs and large companies. In the DACH region, the sales division is also comparatively well represented at 24.1%.

Looking at the industries, as in the corporate sector, the IT industry (39.1%) is particularly well represented, followed by the financial sector (13.4%) and mechanical and plant engineering (12.1%). The other industries are evenly distributed. In the DACH region, mechanical and plant engineering takes up a high proportion of the data at 46.3% (see Figure 1).

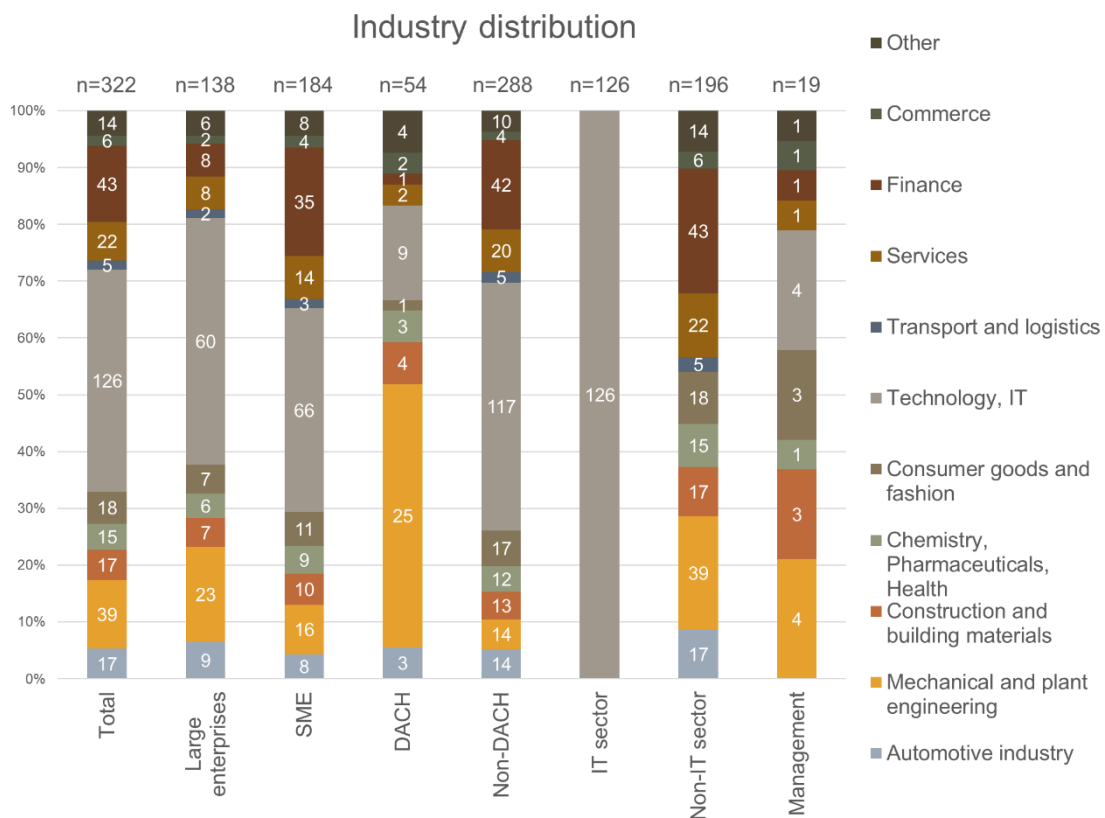


Figure 1: Industry distribution of participants

In the overall view, 71.7% of participants are under 39 years of age. Exclusively in the management group and the DACH region are more than half of the participants over 39 years old, which in the case of the latter is due to the high proportion of participants in

management functions. Conversely, the IT sector and SMEs have the highest number of young participants (34.9% and 32.1% respectively)

The country distribution of the participants can be seen in Figure 2. The most frequently represented country is the USA (59.3%). 88.9% of the participants from the DACH region come from Germany. Also, in the group of the management 31.6%, as well as in the consideration without the IT industry 53.6% of the participants come from Germany.

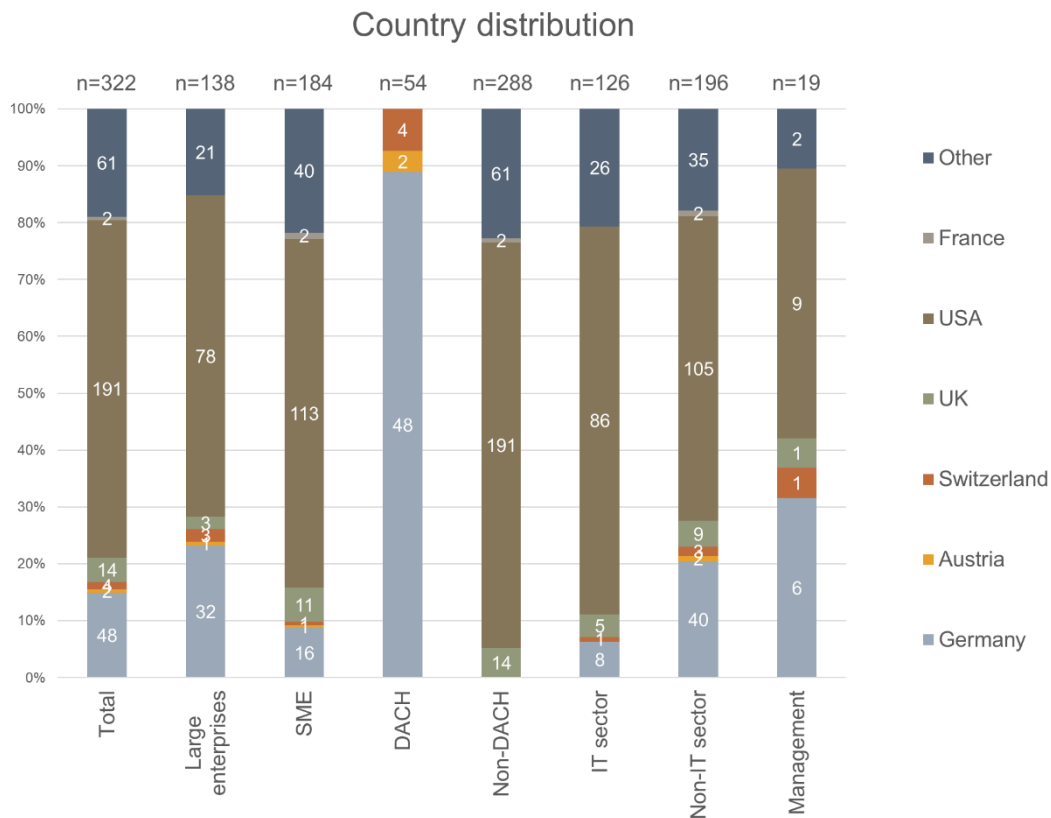


Figure 2: Country distribution of participants

The number of employees was categorized according to the EU Commission's classification of company size (IfM Bonn 2005). Accordingly, all companies with up to 249 employees are considered SMEs, while companies with 250 or more employees are defined as large enterprises.

In all groups except the DACH region, more SMEs can consequently be observed than large companies, as can be seen in Figure 3 example, 73.7% of the managing

participants are from SMEs. In the DACH region, on the other hand, 66.7% are large companies. In the overall view, the distribution between SMEs and large companies is balanced.

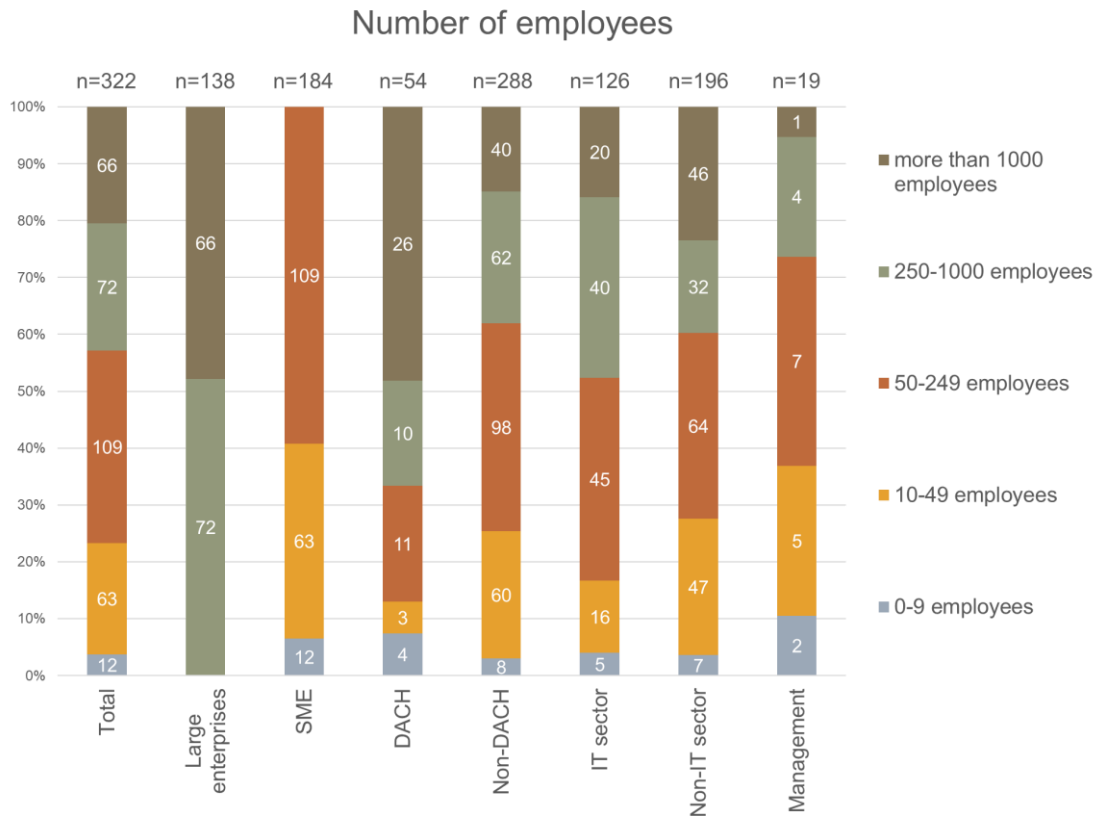


Figure 3: Number of employees

The distribution of the size of the companies is also reflected in the revenue figures (see Figure 4). In the IT sector (92.1%) and in the group outside the DACH region (94.8%), almost all companies surveyed generated sales of less than €50 million. By contrast, in the sample of the DACH region - in which a high number of large companies are represented - only 27.8% of the companies generated sales of less than €50 million.

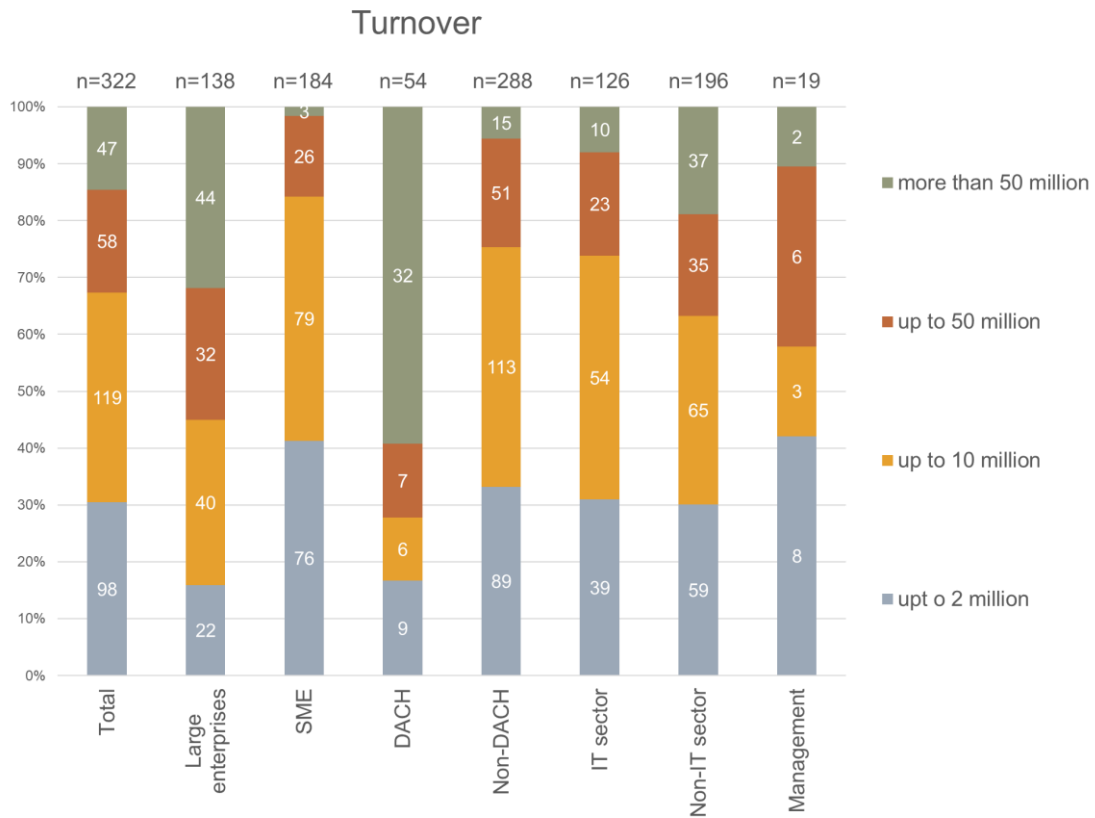


Figure 4: Turnover

In summary, it can be said that the sociodemographic data of the various groups is basically in line with the overall sample and that there are no major discrepancies. In the following, we will focus primarily on possible anomalies in the DACH region compared with the rest of the sample.

2 Data analysis

The hypotheses derived from the qualitative interviews were examined both descriptively and inferentially using the survey results. The results are presented below.

2.1 Terminology and application

The questions in as-a-service terminology and application deal on the one hand with statements about the understanding of the equipment-as-a-service (EaaS) business model and possible confusion of terms in this area, and on the other hand with the classification of the respondents as users or providers of EaaS, their formats of use and offerings, and their assessment of their medium-term use of EaaS.

2.1.1 Overall view of terminology and application of EaaS

Figure 5 shows whether there is a uniform understanding of the EaaS business model in the respondents' companies. It should be noted here that most respondents (54.7%) tend to agree with this statement. Only a small proportion of respondents (3.7%) are of the opposite opinion and do not agree with the statement at all. It can be concluded from this that there is a uniform understanding of EaaS within the companies.

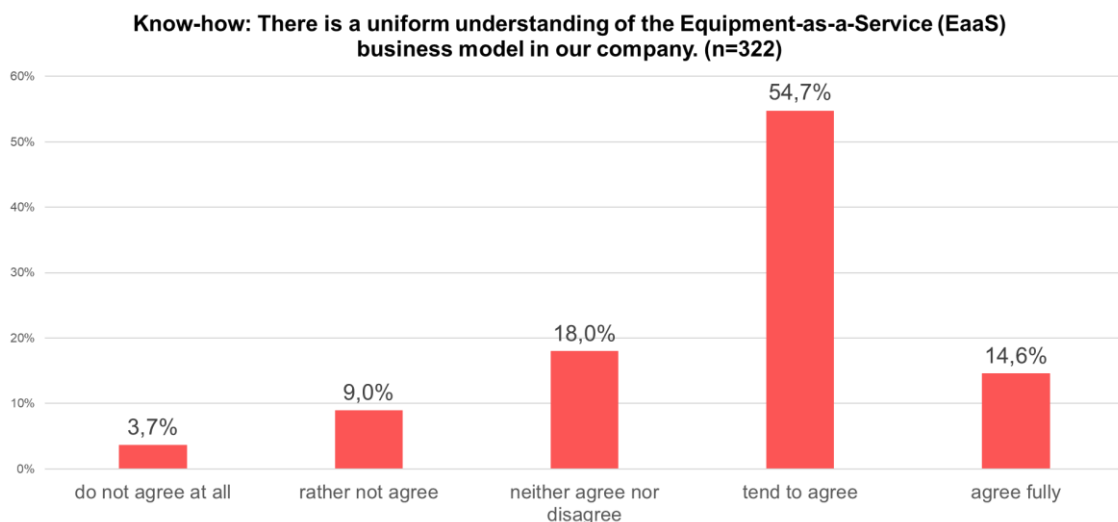


Figure 5: Understanding about EaaS in companies

Figure 6 shows the extent to which there is a uniform understanding of the equipment-as-a-service business model in the respondents' industries. Here it can be seen that most respondents (37.9%) tend to agree with the statement and only a few (3.4%) do not agree at all. Compared to the previous question, however, the results differ because, among other things, agreement is not as strong here. Overall, this means that the understanding of EaaS is more uniform within the individual companies than within the industry.

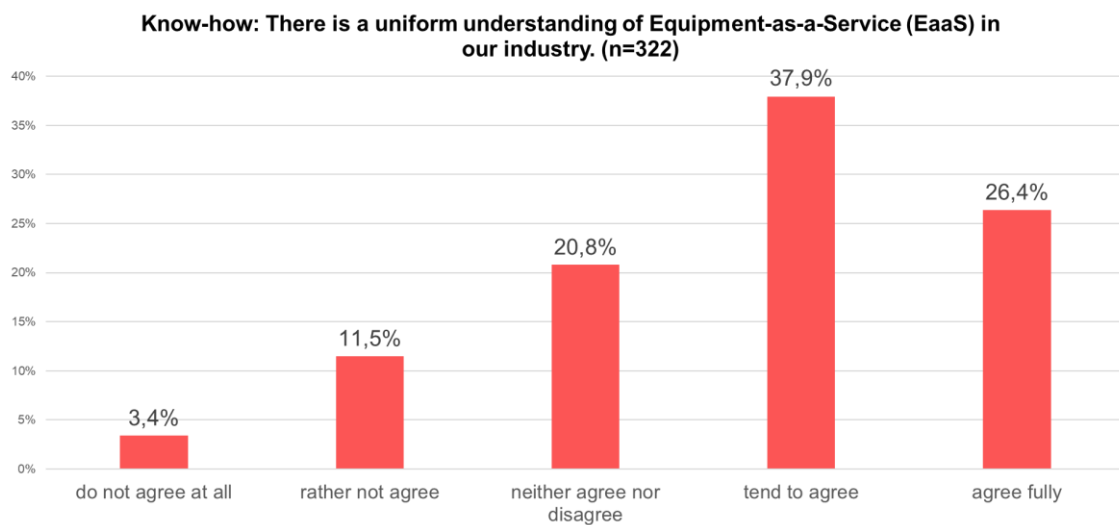


Figure 6: Understanding about EaaS in industries

Figure 7 shows whether there is often confusion of terms EaaS etc. in conversations inside or outside the respondents' companies. Here we can see that most respondents (41.9%) tend to agree with this statement. Only a small number of respondents (3.1%) disagree at all. The present results are remarkable, because although according to the previous questions there is a uniform understanding of EaaS, the respondents are of the opinion that individual terms around the topic EaaS are defined and used differently.

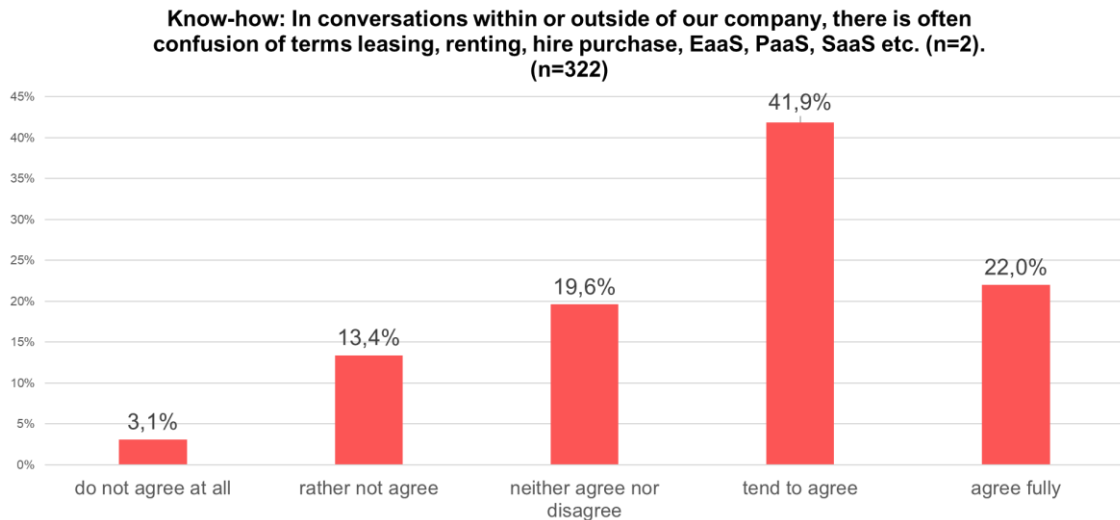


Figure 78: Possible confusion of terms EaaS etc.

Figure 9 shows what percentage of respondents are EaaS users or providers. The results are very close here: 29.5% of participants are users, 28.6% providers and 28.0% both users and providers. Only 14.0% of respondents say they are neither providers nor users of EaaS.

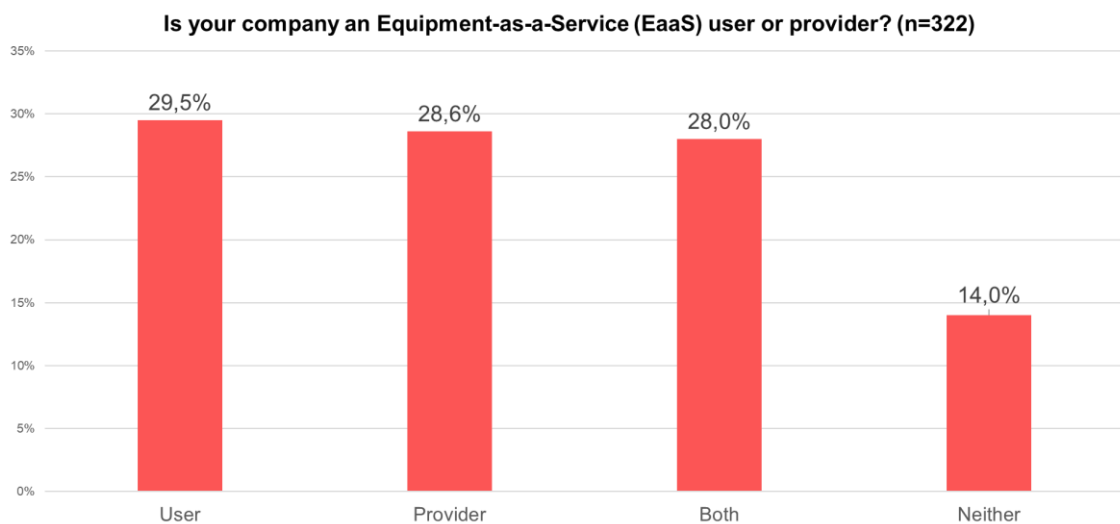


Figure 9: EaaS user or provider

Figure 10 illustrates whether respondents use EaaS directly from the manufacturer or via an external partner. Most participants (35.5%) state that they use EaaS directly from the manufacturer. This is followed immediately using EaaS with a bank or financial

services provider (31.1%). Not strongly represented, on the other hand, are the selection options via a subsidiary of the manufacturer with 20.3% and via an independent third party with 12.0%. 1.2% of respondents made no statement in this regard. The results show that, from the user's point of view, EaaS is preferably used directly by the manufacturing company.

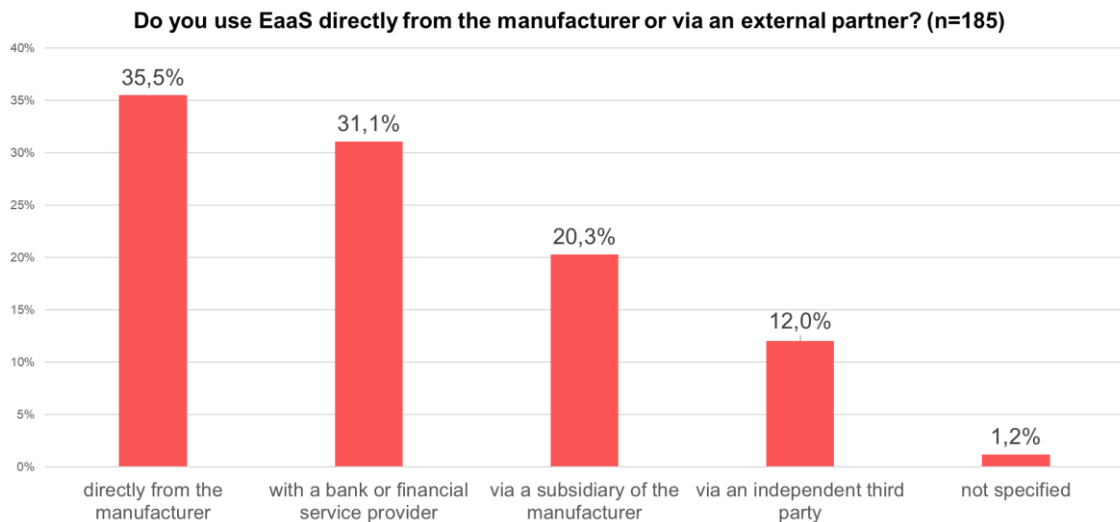


Figure 10: Formats of EaaS usage

Figure 11 shows whether the respondents offer EaaS themselves or with an external partner. Most respondents (42.6%) indicated here that they offer EaaS themselves, but the option with a bank or financial services provider was also frequently selected (35.3%). Rarely, on the other hand, were the formats via a subsidiary (14.9%) and EaaS is carried out entirely by an independent third party (7.2%), selected. If the forms of use or supply of EaaS are compared, it is noticeable that EaaS is rarely completely outsourced.

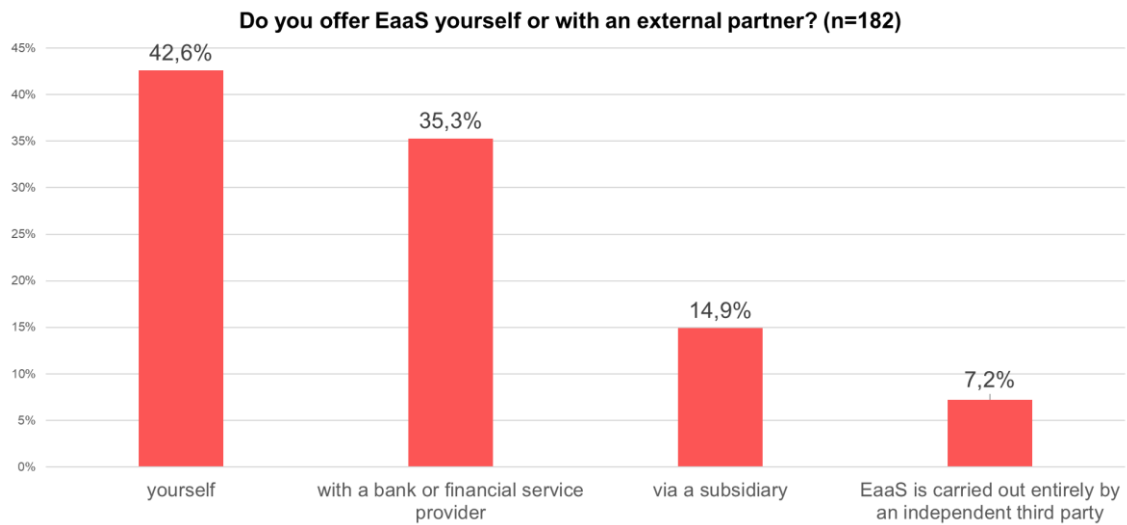


Figure 11: Formats of the EaaS offering

Figure 11 shows how the respondents assess the medium-term use or offering of EaaS services for their companies. A clear majority of 58.7% expect a slight increase in the next two to three years. Only 2.8% of respondents expect a slight decrease and 0.9% a strong decrease.

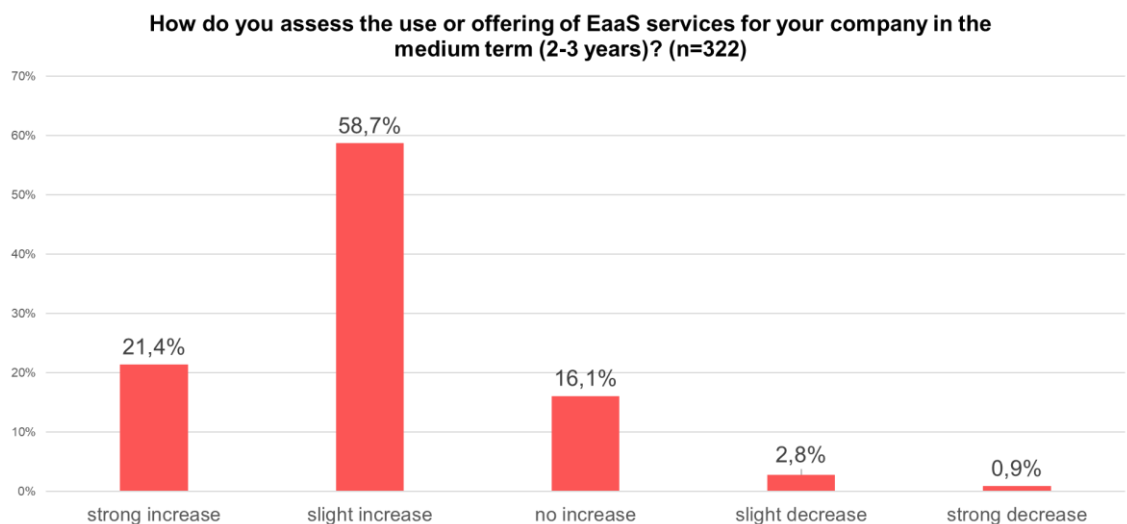


Figure 12: Medium-term use or offer of EaaS

2.1.2 Group comparison of terminology and understanding of EaaS

In the following, the different results of the individual survey groups (DACH vs. non-DACH region, management view) are compared in as-a-service terminology and application.

Differences regarding the understanding of EaaS both in the company and in the industry are evident between the DACH data set and the non-DACH data set. A uniform understanding of EaaS in the company and in the industry is less agreed upon in the DACH region (company: 40.7% and industry: 35.2%) than in the non-DACH region (company: 75.0% and industry: 70.2%). It can be concluded from this that the EaaS business model is less well known in the DACH region or that there is less understanding there than in the non-DACH region.

In addition, the results differ in management or the entire data set regarding the question of term confusion within or outside the companies. The agreement of the management to the existence of term confusions is larger with a height of 79.0% than with all participants with 64.0%. It is noteworthy that among the management there is no disagreement at all regarding this question - but among all respondents there is a disagreement of 16.5%. Therefore, it can be assumed that in top management, confusion of terms is more frequently addressed than generally among all participants.

Both *hypothesis 1* and *hypothesis 2*, which will be analyzed in the following, fall into the area of conceptualization and application.

Hypothesis 1: There is no uniform definition and understanding of as-a-service business models in the industry.

As already listed in the presentation of the results of the entire data set, most participants (64.3%) agreed with the statement that there is a uniform understanding of the EaaS business model in the respective industry. Furthermore, to be able to finally verify or falsify the hypothesis, the uniform understanding in the companies and the existence of term confusion were considered. Also, from the viewpoint of the enterprise's agreement exists with most of the asked persons (69,3%) over a uniform understanding of EaaS. Despite a uniform understanding, however, there is still

confusion of terms for leasing, rental, installment plan, EaaS, PaaS, SaaS, etc. in discussions within or outside the respective company (agreement by 63.9%).

This leads to the assumption that there is a conviction both in the respective companies and in the industry that the understanding of EaaS is uniform. However, confusion still occurs regarding terms around EaaS. For this reason, *hypothesis 1* cannot be conclusively verified, despite agreement on the existence of a uniform understanding of EaaS.

Hypothesis 1 cannot be conclusively verified despite agreement on the existence of a common understanding of EaaS.

Hypothesis 2: As company size decreases, so does knowledge and awareness of as-a-service business models.

Hypothesis 2 tests a positive relationship between company size and knowledge and awareness of as-a-service business models.

First, a possible correlation between the number of employees and the knowledge of EaaS within the company was investigated. Here, the number of employees is the independent variable, while the dependent variable is the uniform understanding of EaaS within the company. The analysis of the significance shows that there is no correlation between the two variables. At the defined significance level of 1% or less, the result is not significant at $p = .049$. In the scatter diagram considered for this purpose, no correlation was discernible either. If the significance level is extended to 5%, the result is significant, which is why the R^2 of the hypothesis test was considered for further investigation. This is .012, which makes it clear that knowledge of EaaS within the company cannot be explained by the size of the company.

In addition, it was analyzed whether there is a correlation between the independent variable number of employees and the uniform understanding of EaaS within the industry as the dependent variable. With a significance level of 1%, this is a significant result, which means that a correlation between the independent and dependent variables can be concluded. In the following, it is necessary to check whether the correlation is positive,

as assumed in the hypothesis. The regression equation is $y(x) = 4.186 - 0.138x$, which means that the lower the number of employees in the company, the higher the agreement with the statement "In our industry, there is a uniform understanding of Equipment-as-a-Service (EaaS)". In this respect, there is a negative correlation. From the point of view of knowledge and awareness of as-a-service business models within the industry, *hypothesis 2* must be rejected, as it suggests a positive correlation between company size and knowledge of EaaS.

As a final step in the investigations of *hypothesis 2*, a possible correlation between the size of the company and the presence of term confusion of EaaS was examined. Here, too, the independent variable is the number of employees, and the occurrence of term confusion forms the dependent variable. As in the first step of the study, there is no significant result ($p > .01$). It can be concluded from this that there is no correlation between the size of the company and the presence of term confusion of EaaS.

Hypothesis 2 is falsified.

Based on the previous research, it can be concluded that there is no positive correlation between company size and knowledge and awareness of as-a-service business models.

2.2 Advantages and obstacles with EaaS

Equipment-as-a-Service (EaaS) brings numerous advantages and yet some companies are holding back on implementation. In addition to closer customer relationships between the user and provider sides of as-a-service services, planning security is created in many cases for the financing of capital goods. As a result, new, innovative products and technologies can be promoted with less risk, creating an opportunity for many companies to differentiate themselves from competitors (Brunner & Waschbusch 2018). The list of potential benefits of EaaS is long, but what about in practice? Are these supposed benefits recognized as such by companies? What are the barriers to EaaS deployment? Are the benefits offset by more difficult application due to a high degree of customization, increased complexity, and immobility of goods?

To evaluate *hypotheses 3-5* regarding the benefits and barriers to EaaS deployment, the following procedure was followed: The items corresponding to the advantages of EaaS were combined into one construct by calculating the mean value. An equivalent procedure took place for the construct formation of the statements corresponding to the inhibiting factors of an EaaS business model. The prerequisites for construct formation were statistically tested and confirmed using a reliability analysis procedure. *Hypotheses 3-5* are each evaluated by performing a T-test on independent samples. This test procedure is particularly suitable because significant mean differences can be detected (Janssen & Laatz 2005). Before performing the tests, the corresponding samples were tested for normal distribution. These results were visualized in the form of histograms and statistically evaluated using the Shapiro-Wilk test.

2.2.1 Overall view of advantages and obstacles with EaaS

The results of the evaluation of the entire data set can be seen in figureFigure 13. Here, the proportion of agreement, a neutral attitude and rejection can be read.

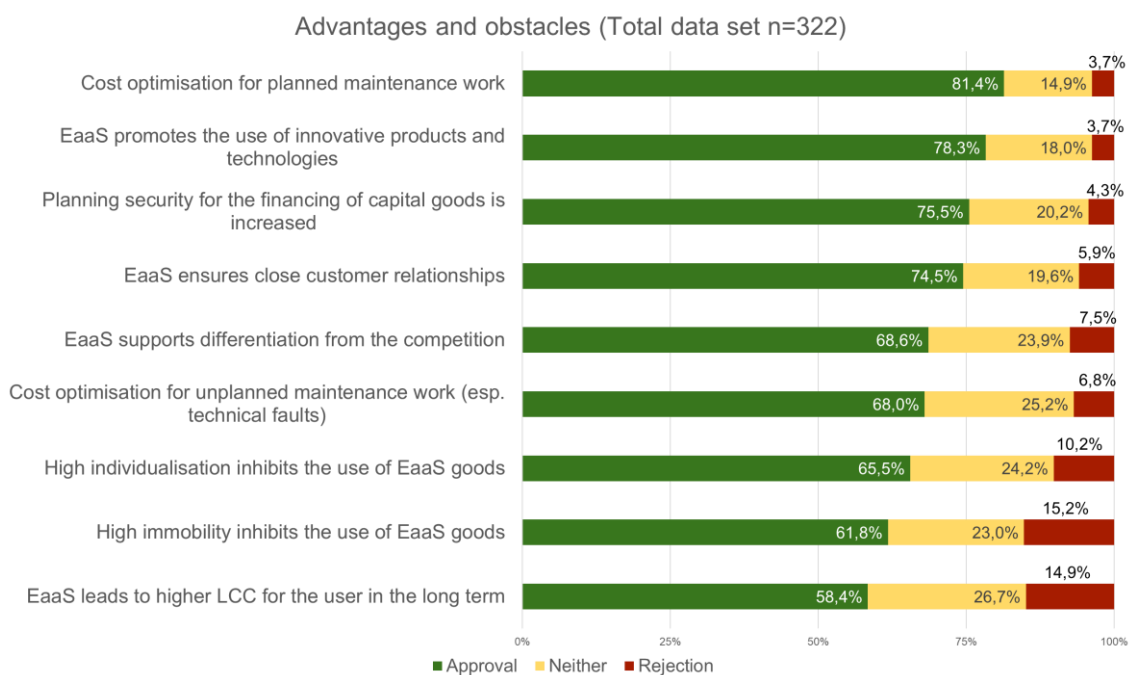


Figure 1314: Total data set Advantages and obstacles

The highest level of agreement is found in the statement: "The use of EaaS can optimize costs and efforts for planned maintenance work on EaaS-relevant machines," with a mean value of 2.78. The higher the mean value, the higher the level of agreement (*Min* = 1; *Max* = 3). The 2nd statement: "The use of EaaS supports differentiation from the competition." was agreed to by 68.6% of respondents.

The statement "By using EaaS, costs and efforts for unplanned maintenance work and, above all, downtimes due to technical faults on EaaS-relevant machines can be optimized or eliminated" received 68.0% agreement from the 322 respondents.

More than three quarters of respondents also agree with the statement "The use of EaaS promotes the use of innovative products and technologies" and "Increased planning security for the financing of capital goods". The latter can be explained based on monthly or annual constant leasing rates (pay per use).

The next statement deals with the closer customer relationship between user and provider using EaaS services. Here, 74.5% of respondents agreed, 19.6% selected "neither" and 5.9% rejected the statement. Thus, the mean value of 2.69 was the third highest value. EaaS thus supports differentiation from the competition.

Cost optimization is based on real-time service information such as operational data and predictive maintenance; this information can be used to predict potential failures as well as repair expenses.

The statement "A high degree of individualization and a high complexity of the EaaS good (= e.g., the machines and systems) inhibits the use of EaaS goods." shows a mean value of 2.55. Here, the agreement amounted to 65.5%, the "neither" statements to 24.2% and the rejection to 10.2%.

The statement "The immobility of goods/machinery/equipment (e.g., high weight, installation in the user's production system) inhibits the use of EaaS goods." was rejected by most with a share of 15.2%. However, it was also accepted and agreed to by 61.8%. This results in a mean value of 2.47.

The lowest mean value of 2.43 is identified for "The use of EaaS leads to higher lifecycle costs for the user of the EaaS services in the long term than in the status quo." This was the least agreed upon within the entire sample. A good half (58.4%) of the respondents agreed with this statement, while 14.8% disagreed.

2.2.2 Group comparisons Advantages and obstacles with EaaS

In this subchapter, relevant insights regarding the perception of benefits and barriers of EaaS are obtained by comparing different extractions from the data set. In doing so, the values of the DACH region, without DACH region, large enterprises and SMEs are analyzed in detail for testing the hypotheses.

Comparison of DACH and non-DACH regions

Figure 15 shows the approval ratings for the advantages and obstacles in the countries Germany, Austria, and Switzerland.

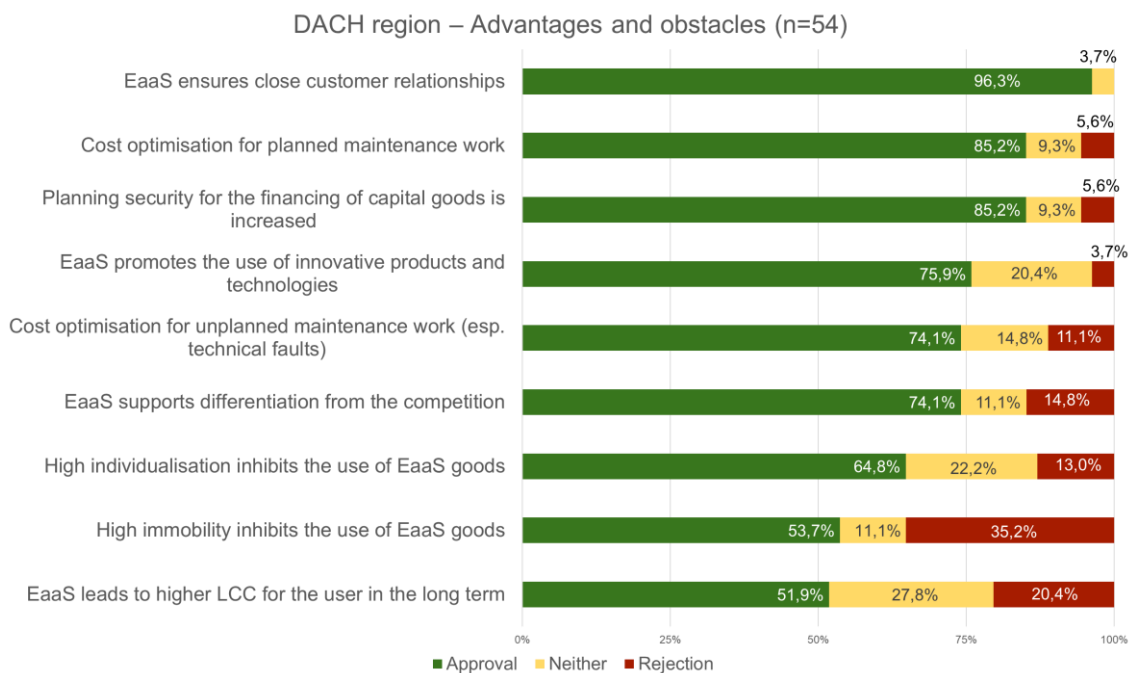


Figure 15: DACH region advantages and obstacles

In general, there are high approval ratings in the DACH region, especially for the benefits of EaaS. It is striking that with 96.3% almost all respondents agree that EaaS leads to a closer customer relationship. 85.2% find that cost optimization for planned maintenance can be optimized through EaaS. Similarly, most see EaaS as providing an opportunity to better plan the financing of capital equipment. The largest areas of rejection are found in the last three statements, which relate to possible inhibiting factors of EaaS. Only about half of all respondents in the DACH region see a high immobility of EaaS goods as an inhibiting factor. In addition, 35.2% do not agree with the thesis that high individualization inhibits the use of EaaS goods. In contrast, Figure 16 shows the assessments of companies from the rest of the world.

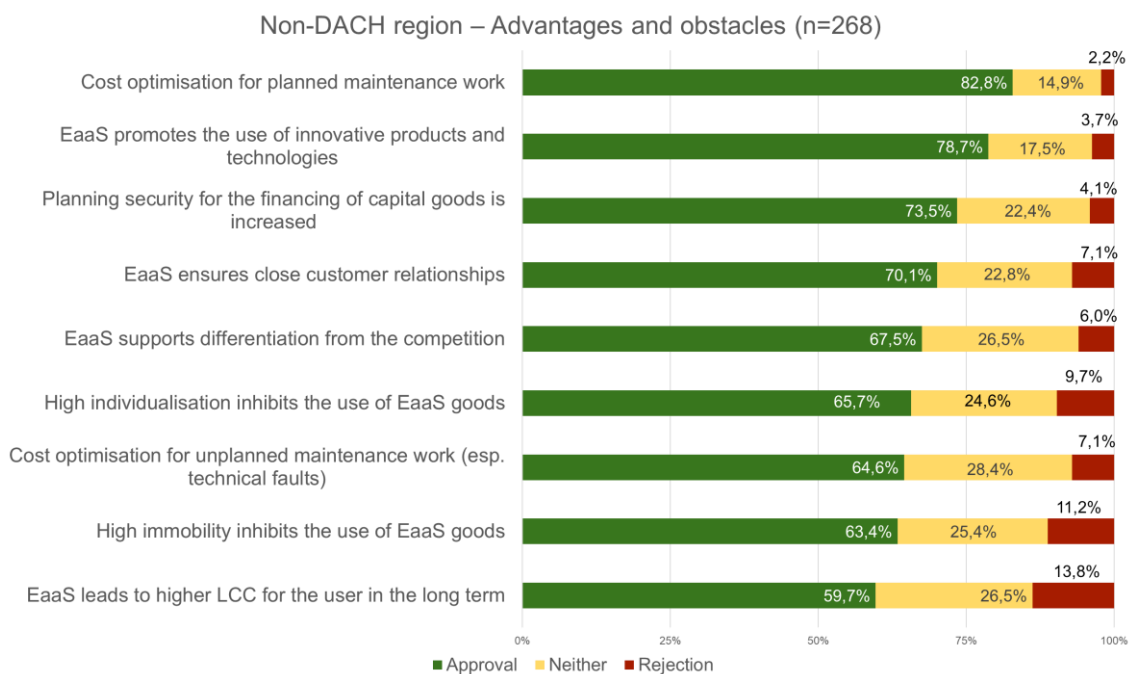


Figure 16: Non-DACH region advantages and obstacles

It is striking that the approval ratings tend to be similar. The disapproval range is almost always lower than in the DACH region. The proportion of "neither" ratings is always between 14% and 26% and is therefore high. As in the DACH region, the statements on cost optimization of planned maintenance work and better plannability of financing receive high approval ratings. In contrast to the German-speaking region, however, 78.7% agree that using EaaS promotes the use of innovative products and technologies.

The lowest level of agreement, at just 59.7%, is given to the statement that the use of EaaS leads to higher lifecycle costs for the user of the services in the long term than in the status quo. In the rest of the world, 36.6% also do not agree that the immobility of goods or assets contradicts a deployment of EaaS models. Even high complexity of the EaaS asset is not an inhibiting factor for many.

It can be assumed that both regions have a high level of confidence in EaaS. This is illustrated by the consistently high approval ratings and the relatively low ratings of inhibiting factors. Very striking is the difference in agreement with the statement that the use of EaaS ensures a closer customer relationship between user and provider. While almost 100% agree in the DACH region, the statement only receives 70.1% agreement in the other regions. The high value in the DACH region can be explained by the fact that 46.4% of the participants from the DACH region come from the "machinery and equipment" industry. This industry is characterized by high complexity and immobility of goods. This often results in a close customer relationship, which is further strengthened by EaaS in particular. If the machinery and equipment industry is considered in the entire data set (n = 39), 89.7% agree with the statement that the use of EaaS ensures a closer customer relationship, too.

From the low agreement values for the inhibiting factors, it can be concluded that the companies do not consider the use of EaaS to be significantly impaired by the high complexity of the goods. Whether there are statistically significant assessment differences between the participants from the DACH region and those from countries outside the DACH region is evaluated by means of the following hypothesis.

Hypothesis 3: Participants from countries outside the DACH region are more likely to agree with the benefits of EaaS than participants from the DACH region.

In the following table, the results of the independent-samples T-test relevant to the evaluation of the hypothesis can be traced.

	Variance homogeneity	T-test for independent samples		
	Significance	T-value	one-sided significance	Mean value
DACH	0.635	2.225	0.0135	4.0679
without-DACH				3.8899

Table 1: T-test comparison DACH and without-DACH for EaaS benefits.

Since variance homogeneity ($p = .635$) is given for the analysis at a significance level of 5%, the results of the T-test are considered at equal variances (Janssen & Laatz 2005). When comparing the means, it is noticeable that - contrary to expectations - participants from the DACH region are more likely to agree with the benefits of EaaS ($M = 4.07$) than participants from the non-DACH region ($M = 3.89$). While the one-sided significance of $p = .014$ narrowly does not indicate a statistically significant mean difference at a significance level of 1%. If the significance level is increased to 2%, the research hypothesis can consequently be rejected and furthermore the statement can be made that participants from the DACH region rate the statements regarding the benefits of EaaS significantly better than the participants from the non-DACH region.

This result can be explained primarily by the fact that almost all participants from the DACH region see a major advantage regarding a closer customer relationship between user and provider of EaaS goods. The evaluation of this statement represents a kind of outlier, which means that although the other statements were evaluated similarly in the region comparison, a significant evaluation difference could be found regarding the advantages of EaaS.

Hypothesis 3 is falsified.

Agreement of participants from the DACH region is significantly higher.

Comparison of IT industry with rest of data set without IT industry

Since 39.1% of the companies surveyed are based in the information technology sector, it is worth extracting them below to examine the data sets with and without an IT sector in more detail. Figure 17 shows the responses from companies operating in the IT sector. Analogous to the responses from the entire data set, particularly high levels of agreement and almost no disagreement can be recorded for the statement "Cost optimization for planned maintenance work". The advantage of EaaS in terms of promoting innovation was recognized almost as frequently, although this is comparably the case for all survey groups. A minor barrier is the immobility of as-a-service goods for IT companies. This may be since products in the information technology sector rarely have high weight or other expansive characteristics and thus the business area is little affected.

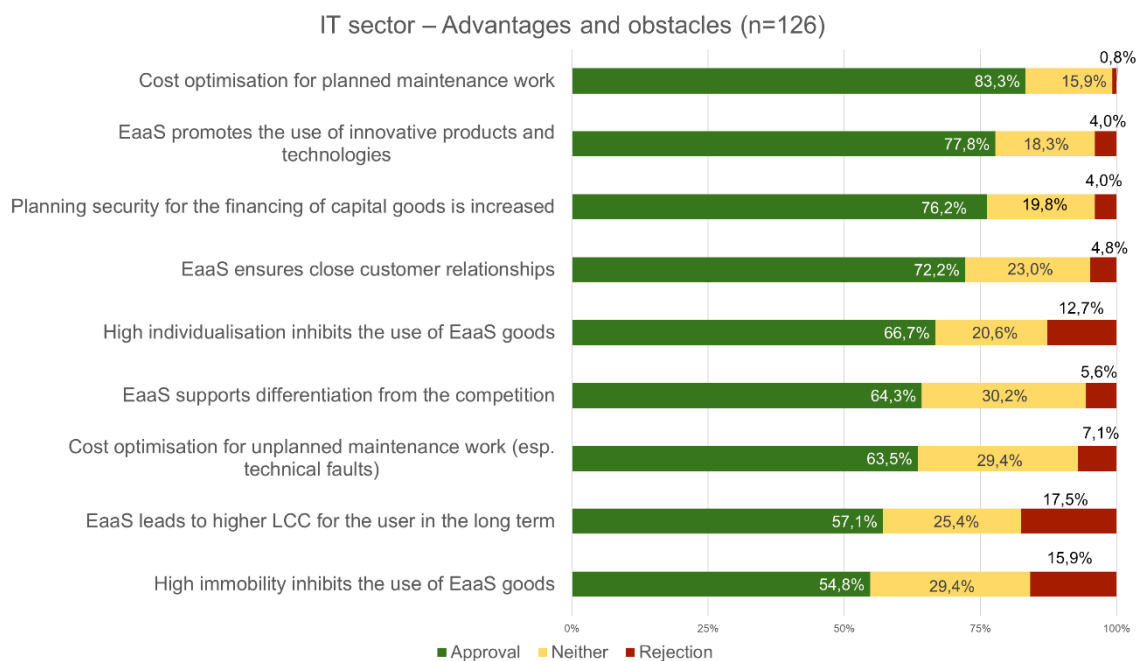


Figure 17: IT industry advantages and obstacles

Figure 18 reflects the agreement and disagreement values of the non-IT industry data sets. While the pattern of responses is similar, subtle differences between the two extractions are nevertheless apparent. The average mean values of the statements show little variation in the benefits, but IT companies are less likely to see the potential barriers to EaaS as problematic. It should be noted here, however, that the statement already mentioned regarding the immobility of goods carries a lot of weight.

The companies surveyed, apart from IT, see a difficulty in the lifecycle costs for the user of equipment-as-a-service and value the promotion of innovative products. The item "EaaS supports differentiation from the competition" seems to be much more polarizing, except for the information technology sector. Instead of a selection proportion of just under a third "Neither" among participants from the computer and software industry, respondents from various sectors tend to clearly agree or clearly disagree with the statement. The trend here is toward agreement with 71.4%.

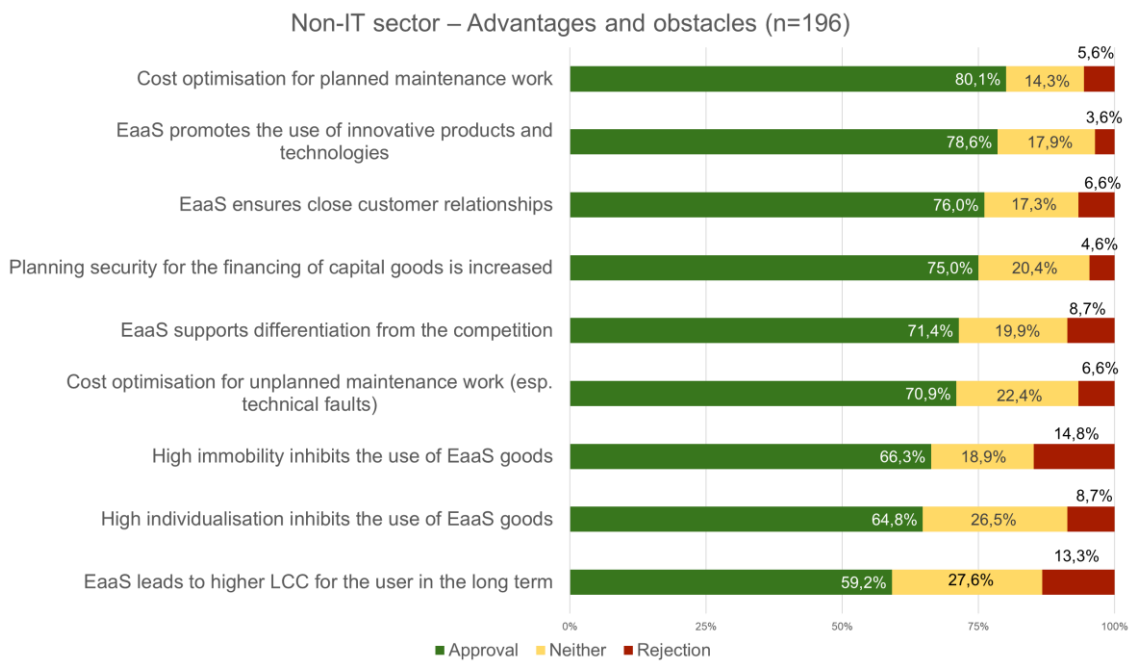


Figure 18: Data set without IT industry advantages and obstacles

Comparison of large companies and SMEs

The following bar chart (Figure 19) compares the information provided by respondents from large enterprises with that from SMEs.

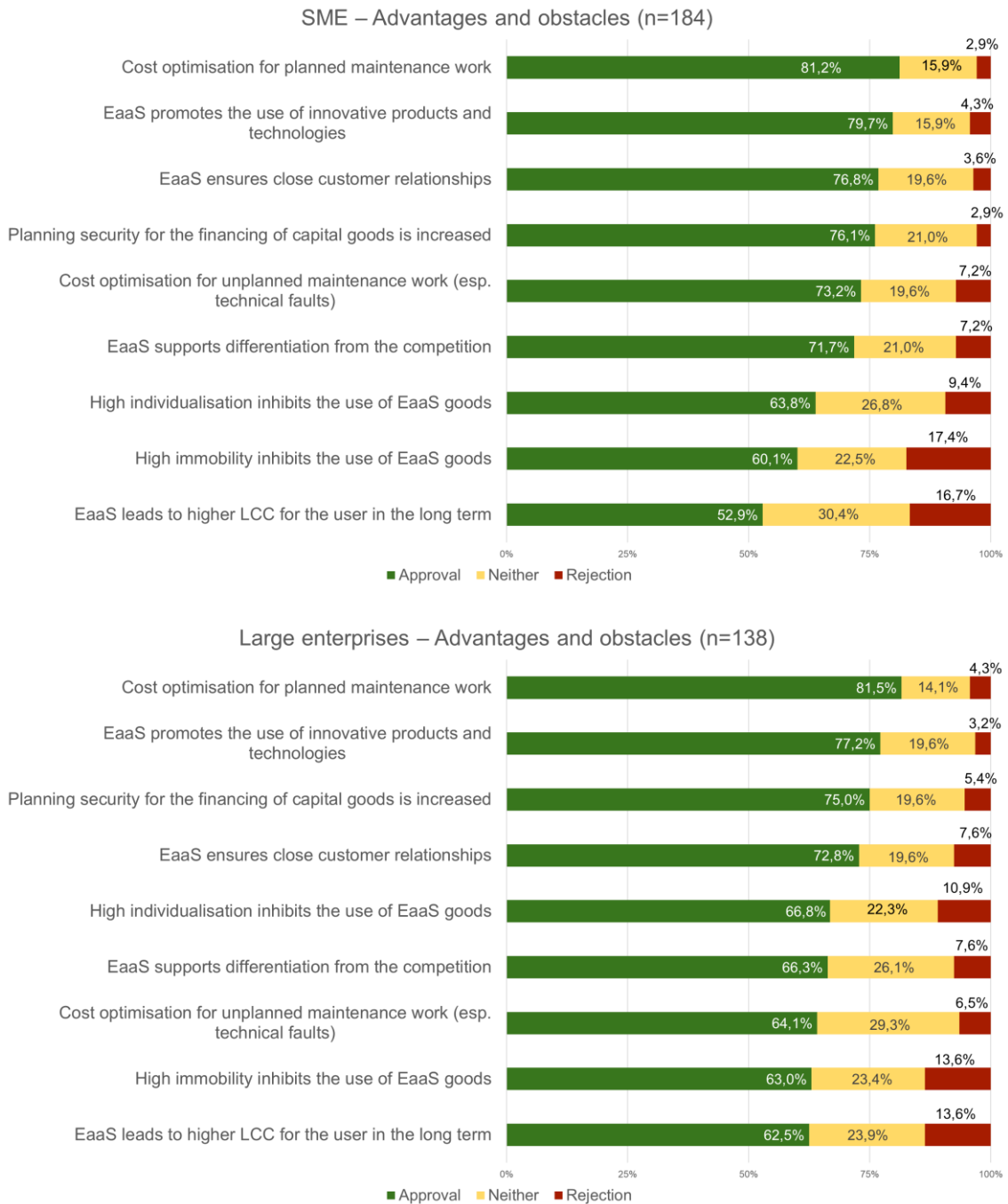


Figure 19: Comparison of large companies and SMEs Advantages and obstacles

Hypothesis 4: Large enterprises are more likely to agree with the benefits of EaaS than SMEs.

The following table presents the independent-sample T-test results relevant to the evaluation of the hypothesis.

	Variance homogeneity	T-test for independent samples		
	Significance	T-value	one-sided significance	Mean value
SME	0.378	-1.233	0.109	3.8877
Large enterprises				3.9626

Table 2: T-test comparison of SMEs and large enterprises for EaaS benefits.

Variance homogeneity is given due to the significance of $p = .378$, which is why the results of the T-test with equal variances are considered. The comparison of the mean values indicates no significant evaluation differences between the SMEs and large companies ($\Delta M = .07$). It can be observed that, as expected, large enterprises ($M = 3.96$) are more likely to agree with the benefits of EaaS than SMEs ($M = 3.89$). However, the mean difference is only marginal. Regarding the one-sided significance of $p = .109$, the observation that emerged from the descriptive evaluation can be statistically consolidated. At a significance level of 1%, the hypothesis is rejected.

Hypothesis 4 is falsified.

Hypothesis 5: SMEs are more likely to agree with the inhibiting factors of EaaS than large enterprises.

The following table shows the results of the independent samples T-test.

	Variance homogeneity	T-test for independent samples		
	Significance	T-value	one-sided significance	Mean value
SME	0.627	1.119	0.132	3.7065
Large enterprises				3.6087

Table 3: T-test comparison of SMEs and large companies for EaaS inhibition factors

The test for variance homogeneity has a high significance of $p = .627$. Thus, the results of the T-test with equal variances are used for the analysis. Mean differences are minimal ($\Delta M = .10$), with SMEs ($M = 3.71$) more likely to agree with EaaS inhibitors than large firms ($M = 3.61$), as hypothesized. Due to the one-sided significance of $p = .132$, with an error probability of 1% to be tested, the mean difference is not statistically significant, which is why *hypothesis 5* is also rejected.

Hypothesis 5 is falsified.

Comparison of management with entire data set

The following two bar charts (Figure 20) compare the information provided by management respondents with the entire data set.

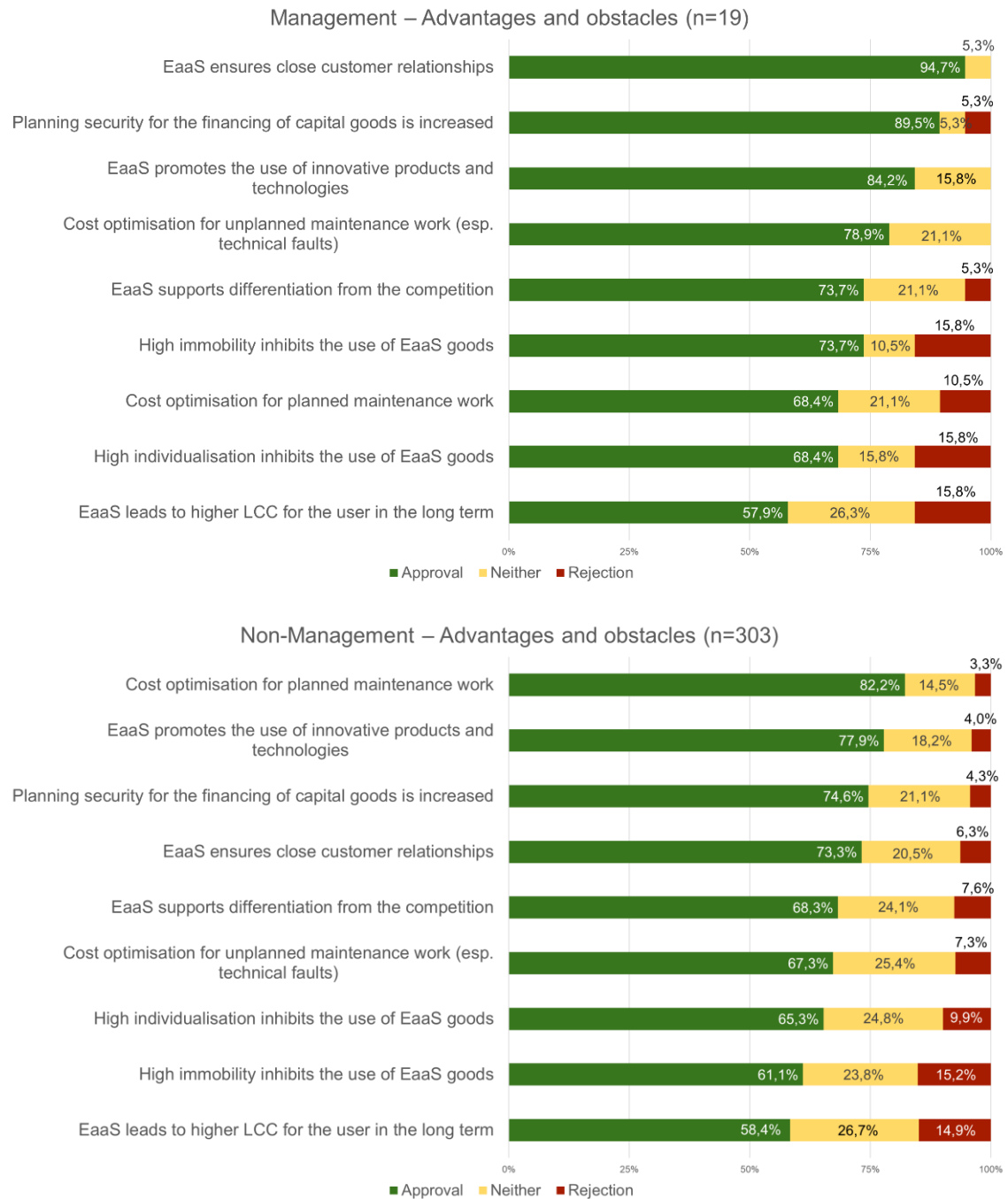


Figure 20: Comparison of management with the rest Advantages and obstacles

First, the limited significance of the results of the management evaluation must be mentioned, as only a small number of 19 managers participated. The evaluation of the statements is carried out chronologically, in which no significant differences between the bar charts are discussed in more detail.

The statement "By using EaaS, costs and efforts for planned maintenance work on EaaS-relevant machines can be optimized" receives significantly lower agreement from the managing directors ($\Delta M = .20$). In contrast, the statement "By using EaaS, costs and efforts for unplanned maintenance work and, above all, downtime due to technical faults on EaaS-relevant machines can be optimized or eliminated" receives higher approval ($\Delta M = .18$). Here the responsible persons of the management possibly see the advantages of the better data evaluation as for example with the help of Predictive Maintenance.

In addition, differences can be seen in the statement "The use of EaaS increases the planning security of the financing of capital goods - especially in times of economic crisis." ($\Delta M = .13$). The higher agreement of the management with 89.5% can possibly be explained by the fact that the management is more concerned with the planning of capital goods than their employees and thus perceive the advantage more strongly.

The statement "The use of EaaS provides a closer customer relationship between the user and the provider of EaaS goods" receives the highest level of agreement from management." ($\Delta M = .26$). This is also where the greatest discrepancy between the CEOs and all respondents can be seen.

In some cases, there are major differences between the two survey groups. In addition, it is evident that the advantages of EaaS are largely more highly rated by the managing directors. This may be since the responsible managers have a better overview of the company and therefore value the problems that EaaS solves more.

2.3 Influence of age on the attractiveness of EaaS

In the qualitative interviews, the assumption emerged that younger decision-makers in companies approach the equipment-as-a-service business model more positively than older ones. The following hypothesis was derived from this assumption.

Hypothesis 6: The older the decision-makers in the companies, the less attractive Equipment-as-a-Service appears.

To test this hypothesis, the construct of barriers was first used, and a sub-hypothesis was made:

H 6.1: The older the decision-makers in the companies, the more likely they are to see obstacles to the implementation of EaaS.

This relationship between age and inhibitions was examined in all groups using the Spearman correlation. No positive correlation was found in any group. In the case of large companies, a weak negative correlation was even found, which means that older persons in large companies rate barriers to EaaS less strongly than younger persons ($r = -.22$; $p = .009$).

The advantages construct from section 2.2 was also examined for the influence of age. The sub-hypothesis is as follows:

H 6.2: The younger the decision-makers in the companies, the more likely they are to see advantages in implementing EaaS.

Spearman correlation was again examined in all groups, but no correlation was found between age and ratings of the benefits of EaaS.

It can be concluded from this that the attractiveness of EaaS does not depend on the age of the decision-makers.

Hypothesis 6 is falsified.

In the large companies, barriers are rated less strongly by older employees.

2.4 Digitization

Digitization can enable more efficient implementation of EaaS offerings through remote monitoring, remote service, and predictive maintenance. The extent to which digitization is therefore perceived as a prerequisite for the holistic realization of Equipment-as-a-

Service, the extent to which digitization has progressed in the companies and how this view differs in the various subgroups is examined in this chapter. To see to what extent the offering or use of EaaS depends on digitization, a new sub-group of users/providers (this includes users, providers and those companies that are both users and providers) and non-users/non-providers of the EaaS model was analyzed for this study. In addition, the providers, and users of EaaS were considered separately. Looking at the overall data set (see Figure 21), 74.5% of respondents agree with the statement that "the use of EaaS depends on the level of digitization of the respective company." It is striking that in the DACH region only 61.1% of the participants agree with this statement. In the sub-group of management in, on the other hand, the vast majority (89.5%) agree with the statement that EaaS is dependent on digitization. Among the companies that have already implemented EaaS in their company, 75.5% also agreed with the statement - but only 68.9% of the rest.

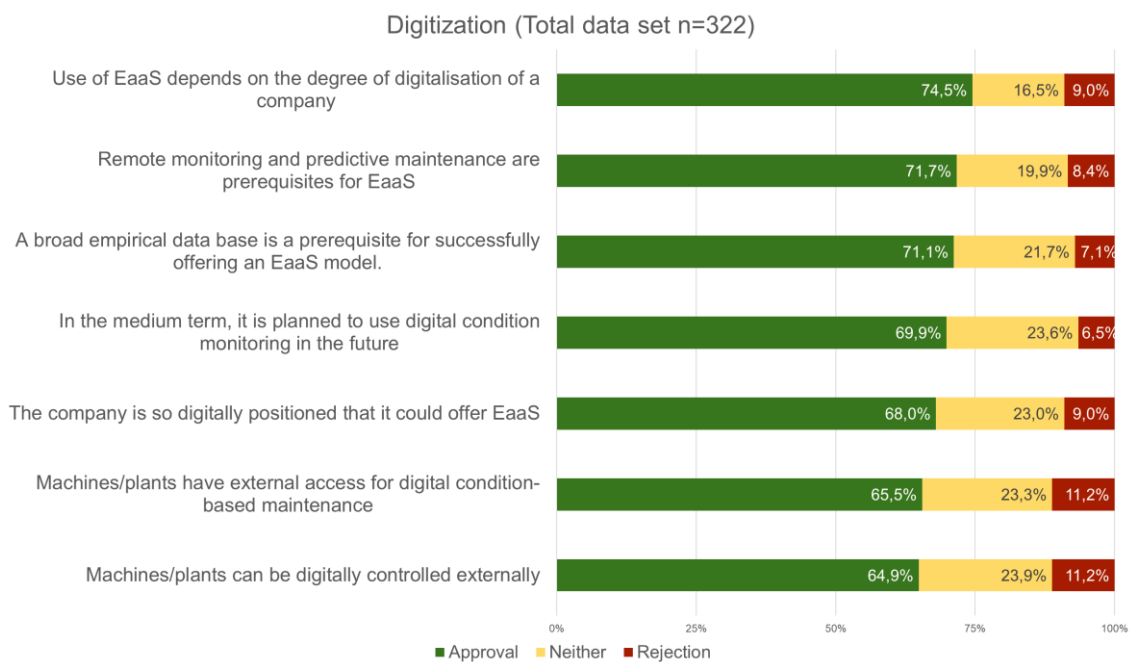


Figure 21: Importance of digitization for EaaS

Digitization enables the functions already mentioned, such as remote monitoring and predictive maintenance. Remote monitoring enables the remote monitoring of devices in all industries and application areas, such as machines or servers. Predictive maintenance, on the other hand, refers to a maintenance process that is based on the

evaluation of process and machine data from the past, their analysis and, based on this, their continuation regarding the best timing for optimized resource, risk and performance management.

71.7% of the participants agree that remote monitoring and predictive maintenance are further prerequisites for the use of EaaS in addition to the general level of digitization. Only 8.4% disagree and 19.9% abstain. With only 61.1% agreeing and 27.8% disagreeing, the DACH region again differs strongly from the other groups. The other groups do not show any significant differences compared with the overall data set.

For the successful use of these monitoring and maintenance services and consequently for the use of EaaS, the provider of the model needs an empirical data basis on the operation of the EaaS asset. While only 7.1% reject this statement, 71.1% see this necessity. What is striking about this statement is the strong differences when looking at providers and users. On the provider side, 77.2% of the participants agree with this statement, whereas only 64.2% of the users are also of this opinion and 26.3% have no tendency. This could possibly be due to users' uncertainties about the security of their data. In the management group, there is the highest level of agreement in this regard and no participant who considers the empirical data basis to be unnecessary.

The other questions in the digitization section then related to the current state of the companies themselves. First, the participants were asked whether their companies are fundamentally digitally positioned in such a way that they can offer EaaS. This was agreed to by only 44.4% of the participants who have not yet implemented the model in their company. Only 40% of the companies that do not use the EaaS model have external access for digital, condition-based maintenance of machines. The situation is similar for the option of controlling the machines externally (42.4% of non-users have such an option). For all three questions, however, there is also a high proportion (min. 31%) of participants who expressed a neutral opinion. Also, conspicuously low values are again shown here by the DACH region, where likewise only 57.4% have a possibility of external access for digital condition-based maintenance and 46.3% have external control of the machines. The reason for this could be the 35.2% of this group who do not yet offer or use EaaS in their company.

Finally, the participants were asked whether they plan to use digital condition monitoring (more) in the medium term. 69.9% of the total participants agree with this question and only 6.5% disagree. In particular, the DACH region with 75.9% and EaaS providers with 79.3% plan to use machine monitoring more in the medium term. This contrasts with the participants who do not yet use EaaS. In the group of non-users, half plan to expand digital condition monitoring.

When evaluating digitization as a prerequisite for EaaS, the descriptive view shows that the various groups in digitization are in fundamental agreement with the overall view and therefore have a positive attitude toward the topic of digitization. The exception is the fundamentally weaker tendency toward approval of digitization in the DACH region.

Hypothesis 7: Digitization enables the holistic realization of equipment-as-a-service business models.

Based on the descriptive results, to test hypothesis 8, a sub-hypothesis was first formulated to significantly test the impression that there is no difference in the groups. The *sub-hypothesis 8.1* is:

H7.1: The perception of digitization as a prerequisite for the holistic realization of Equipment-as-a-Service does not differ among the subgroups.

To test this hypothesis, a digitization index was formed from the three statements on the assessment of digitization as a prerequisite for EaaS models (see question 14 of the questionnaire in the appendix) using the mean values (Cronbach's alpha = .59; weak internal consistency). Since the digitization index is not normally distributed, the Mann-Whitney U test was used to examine the differences in the various groups (Shapiro-Wilk test: $p < .05$). Only in the group comparison of the DACH and non-DACH regions was there a small significant difference in the medians (Kolmogorov-Smirnov $p = .106$) in the perception of digitization as a prerequisite for the holistic realization of EaaS ($U = 5807.5$, $Z = -2.325$, $p = 0.02$, $r = -.13$) when the significance level was extended to 5%. In the DACH region ($Mdn = 3.67$), digitization is seen as less important as a prerequisite for implementing the EaaS business model compared with the other countries ($Mdn = 4.00$) (see Figure 22). Accordingly, the hypothesis must be rejected here - it is accepted in the

comparisons of the user/provider, IT industry/without IT industry and company size groups. The management group was not tested because, with $n = 19$, it is too small for meaningful results.

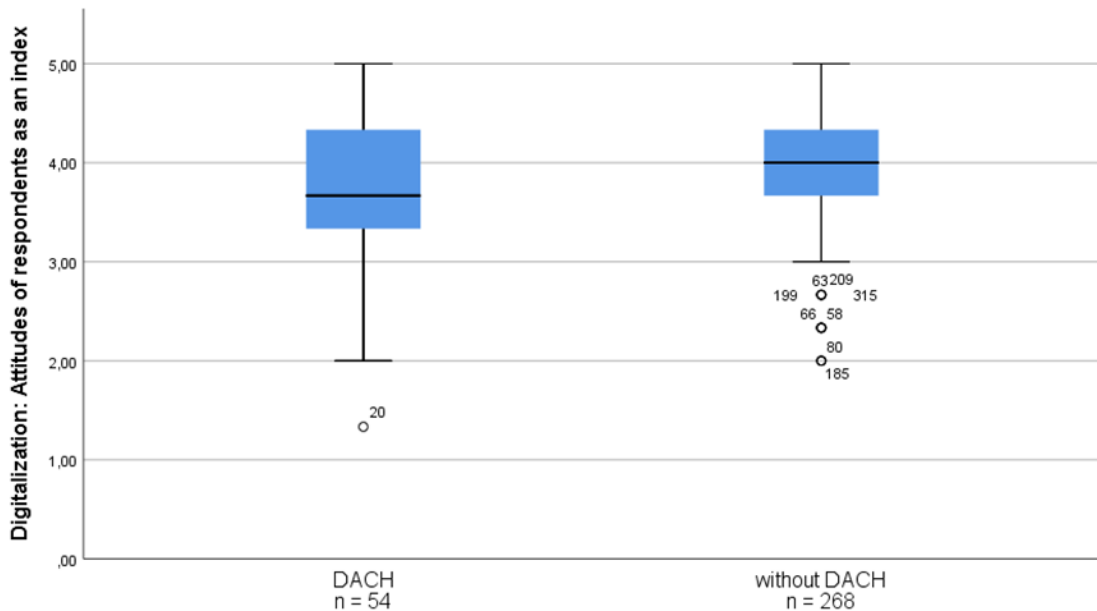


Figure 22: Boxplot "DACH" / "without DACH" regarding attitude toward digitization

In addition to the attitude toward digitization as a prerequisite for EaaS, the descriptive evaluation also looked at the progress of digitization in the companies. Here it became apparent that companies that do not yet use/offer EaaS are usually not yet digitally positioned enough to implement this model. Regarding the current state of the degree of digitization of the companies, the condition of the machines/equipment can be monitored digitally less from the outside or this service can be offered to their customers, especially in large companies compared to SMEs. This results in a further sub-hypothesis on digitization:

H7.2: The progress of digitization in the companies differs among the groups.

Here, too, an index was formed from the three questions on the progress of digitization in the companies (see question 14 of the questionnaire in the appendix; Cronbach's alpha = .66; low internal consistency). Due to the lack of normal distribution in the group comparisons, a Mann-Whitney U test was again used (Shapiro-Wilk $p < .05$). The distributions for all comparisons were the same (Kolmogorov-Smirnov $p > .05$).

By extending the significance level to 5%, a small significant difference was found when comparing the DACH region ($Mdn = 3.67$) and countries without DACH ($Mdn = 4.00$) ($U = 5910.00$, $Z = -2.146$, $p = 0.032$, $r = -.12$). Consequently, the DACH region lags the other countries in terms of digitization progress (cf. Figure 23).

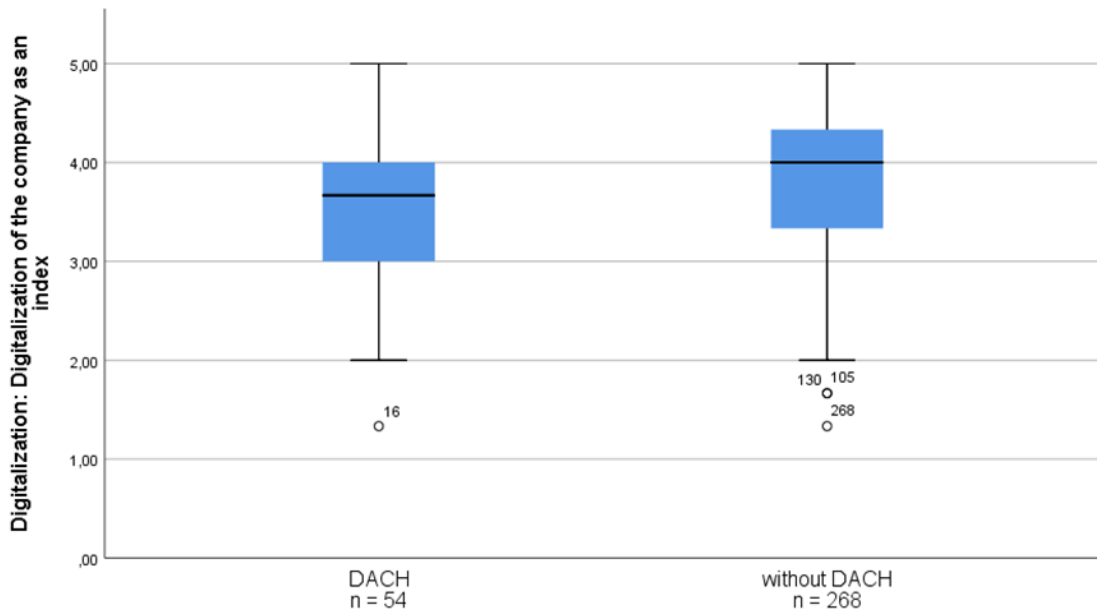


Figure 23: Boxplot "DACH" / "without DACH" regarding degree of digitization of companies

Likewise, when comparing users/providers ($Mdn = 4.00$) of EaaS to non-users/providers, a moderately significant difference is evident ($U = 3570.50$, $Z = -4.642$, $p = .0$, $r = -.26$). Accordingly, digitization is significantly more advanced among companies that are already heavily involved with EaaS than among companies that are not yet using the new model (cf. Figure 24).

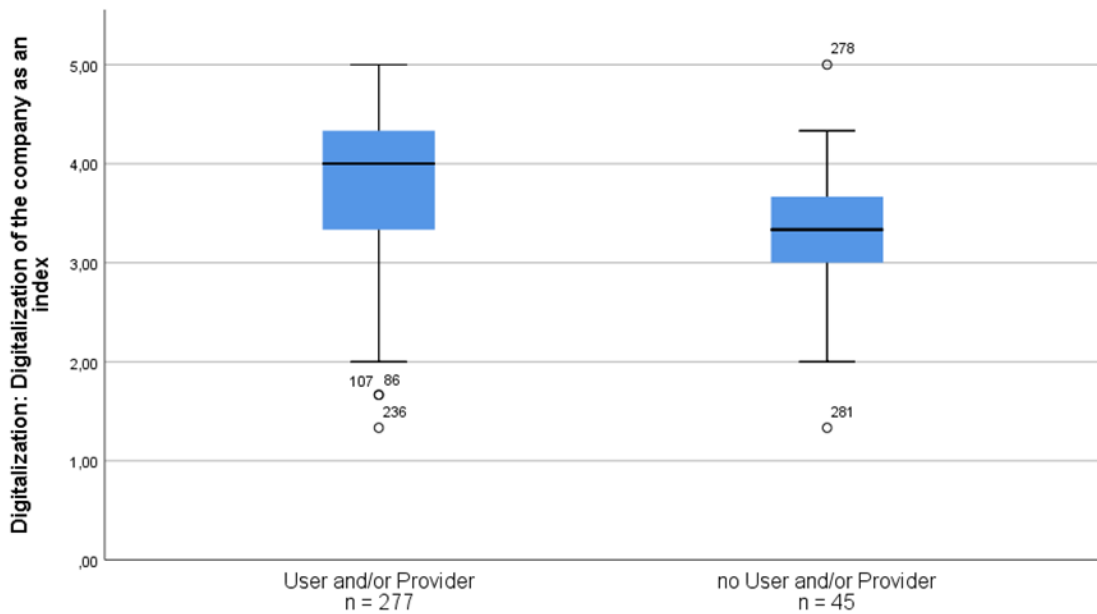


Figure 24: Boxplot "Users/providers" regarding the degree of digitization of companies

Derived from the two *sub-hypotheses 8.1 and 8.2* that digitization is seen as an important prerequisite for EaaS and that the users or providers of EaaS have a clear digitization lead, it can be assumed that digitization is an important prerequisite for holistically implementing EaaS business models.

Hypothesis 7 is verified.

2.5 Sustainability

Companies today are increasingly faced with the challenge of combining principles of profitability with principles of sustainability. Sustainable business models are based on business ideas that contribute to the environment and society. As with other business models, they focus on the benefits for their customers (Spindler et al. 2015).

Sustainable business models are not only giving rise to new sustainable products and services, but also to new industries, such as the "share economy," with digitization as the driver. The focus here is not on the sale, but on the use of goods and services. As a

result, industrial goods are being substituted by services. This also results in numerous service innovations that are reflected in the business models (Spindler et al. 2015).

The benefit of sustainable business models is that they contribute to reduced material use and thus resource consumption. Energy requirements are also reduced. As a result, resources can be conserved, and energy saved (efficient use of resources). With the help of sustainable business models, less is produced, more is repaired and there is a shift in responsibility for the services produced to the provider. At the same time, they enable a high availability of goods and services, reduce investment costs and space requirements (service and maintenance). The questionnaire asked whether the above-mentioned added values are given in the EaaS business model (Spindler et al. 2015)

The overall result of the questionnaire (see Figure 25) shows that at least 70% of the participants share the view that the EaaS model contributes to environmental sustainability. In the group analysis, it was found that when distinguishing between the DACH region and without the DACH region, the DACH region tends to be less convinced of the statement that the EaaS model contributes to environmental sustainability (10% less). This tendency is particularly evident in the question of the better condition of machines on the used market because of EaaS, with a difference of 20 percentage points. Something similar can be observed in the IT industry and non-IT industry group. The IT industry and large enterprise groups, like the DACH region, seem to agree less with the statement that the EaaS model contributes to environmental sustainability. Excluded from both here is the contribution of EaaS to environmental sustainability through the longer lifecycle of the machines. This means that the IT sector and large companies share a similar opinion to the participants in the overall view. In the group analysis of large companies and SMEs, there is also a difference of five percentage points to SMEs on the question of the lifecycle duration of the machines/equipment. Here, the large companies tend to agree with the statement that the longer life cycle of the machines contributes to environmental sustainability.

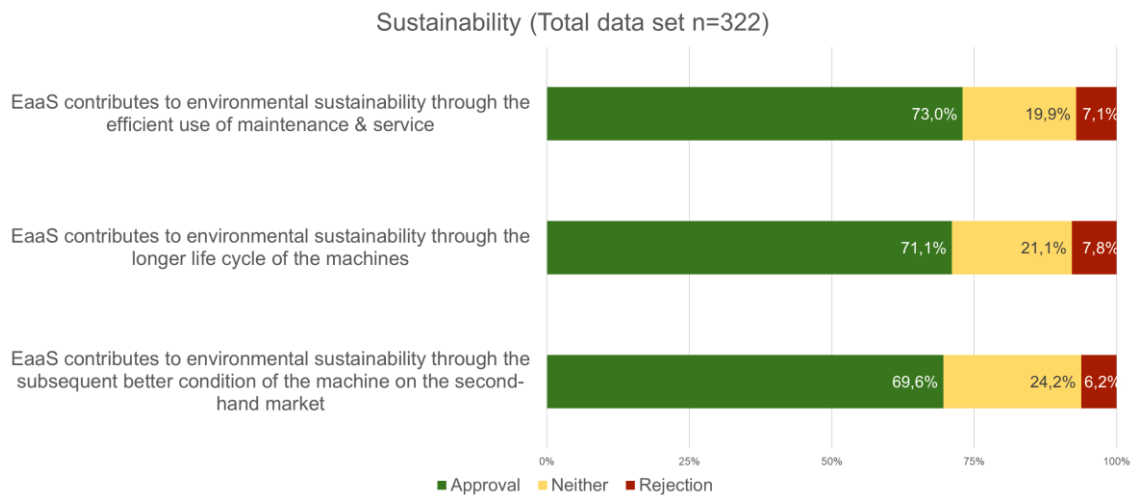


Figure 25: Sustainability as a result of EaaS

Compared to the overall assessment, the management group is generally more positive about the contribution of EaaS to environmental sustainability. In addition, there are no negative values regarding the contribution to environmental sustainability by service & maintenance and the longer life cycle. *Hypothesis 8* was derived based on these considerations.

Hypothesis 8: Equipment-as-a-service business models favor the environmentally sustainable use and service of the respective machinery and equipment.

In summary, the various views on environmental sustainability show fundamental agreement with the overall view. However, there are (strong) fluctuations within and outside the groups, particularly regarding the question of the longer life cycle. Therefore, the following sub-hypothesis was formulated:

H 8.1: The perception of EaaS as a business model that favors the environmentally sustainable use and service of the respective machinery and equipment does not differ across the groups.

An index was again formed from the three statements on sustainability, which is not normally distributed (Cronbach's alpha = .70; good internal consistency; Shapiro-Wilk $p < .05$). Comparing users/providers ($MRang = 166.24$) of EaaS to non-users/non-providers ($MRang = 132.31$), a small significant difference in mean rank was found after extending the significance level to 5% ($U = 4919.00$, $Z = -2.298$, $p = .022$, $r = -.13$). Since the two

groups are not equally distributed no median difference can be reported (Kolmogorov-Smirnov $p < .05$). This result suggests that the companies that already use or offer EaaS are more positive about the environmental consequences than companies that have no direct experience with EaaS. Since these companies have more experience in this regard, the conclusion seems plausible. Figure 24 shows the boxplot of the groups "user and/or provider" and "no user and/or provider" regarding the respondents' attitude to sustainability as a result of EaaS. With a median of 4 (= tend to agree), these companies see EaaS as having a positive impact on environmental sustainability, so *hypothesis 8* is accepted.

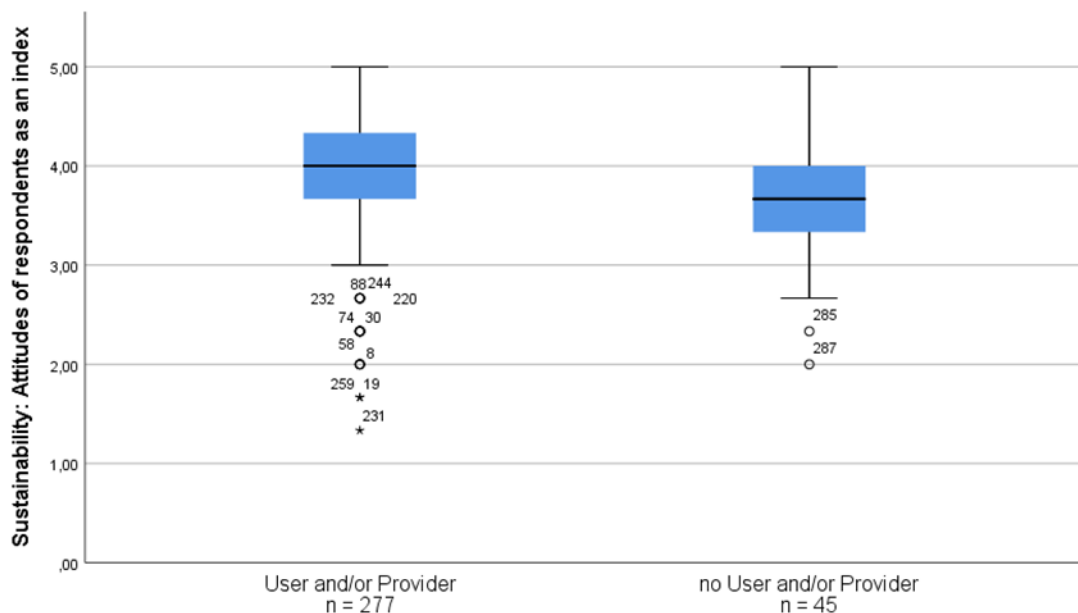


Figure 26: Boxplot of respondents' attitudes toward sustainability as a result of EaaS

Hypothesis 8 is verified.

2.6 Market and company situation

During the further investigation, the current market and company situation, as well as the future perspective of Equipment-as-a-Service will be examined in more detail. First, the prospects of EaaS are analyzed based on two predefined statements.

The first statement concerns the topic of digitization and the extent to which it will accelerate the implementation and broad offering of as-a-service projects. With an agreement of 84.7% (cf. Figure 27), the respondents agree that digitization favors EaaS. This is understandable when one considers that the collection, availability, and evaluation of machine data play an essential role in the topic of EaaS.

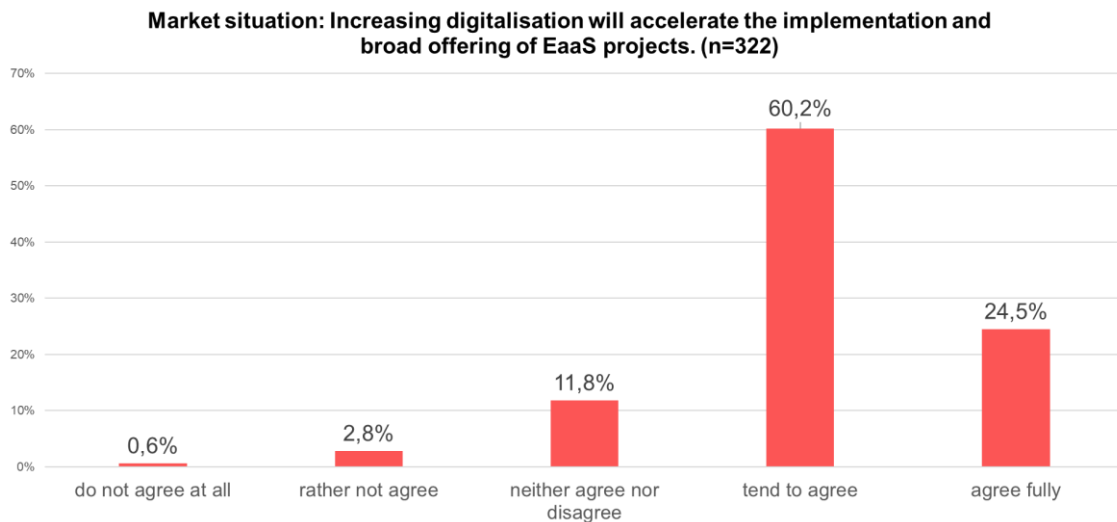


Figure 27: Digitization in relation to the implementation and offering of EaaS

It is interesting to note that top management agrees with this statement almost unreservedly (94.7%). None of the respondents with the function of management assumes that increasing digitization will not accelerate EaaS. A comparison with the entire data set shows that the level of agreement among all respondents, at 84.7%, is not quite as high as when looking exclusively at people from management. Across all data sets, the statement is rejected by 3.4%.

The second statement serves to find out whether EaaS has the potential to replace the fixed purchase of a capital good to a large extent. Most of the survey participants (70.2%) are of the opinion that this is certainly possible (cf. Figure 28). They assume that EaaS will largely replace the classic purchase sooner or later. This high level of agreement confirms once again the high future importance of EaaS, as already stated in the previous point.

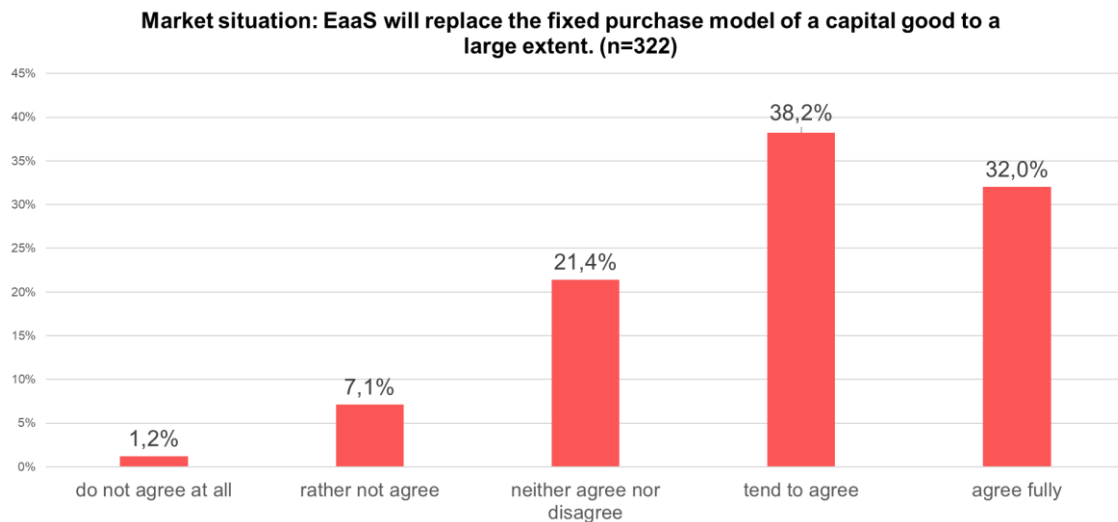


Figure 28: Replacing fixed purchase with EaaS

If this statement is considered in a comparison of the DACH region with the non-DACH region, it becomes clear that opinions on this differ. While in the data set without DACH the majority agree with the statement (75%) that EaaS will replace the model of fixed purchase of a capital good, there is no clear opinion on this in the DACH region: 46.3% agree with the statement, rejection is 24.1% and 29.6% neither agree nor reject the statement. This means that almost five times as many participants within the DACH region - in contrast to participants outside the DACH region (disagreement: 5.2%) - reject the statement. This indicates that the opinion that EaaS will replace the fixed purchase of a capital good is predominant among people from the non-DACH region, while the sentiment on this is not clear among people from the DACH region. The same picture emerges from a comparison of the two medians. In the data set excluding DACH, the median is 4.0 (tend to agree), while in the DACH data set it is only 3.0 (neither agree nor disagree).

Subsequently, the inhibiting factors, success factors and added values of EaaS are considered.

2.6.1 Inhibiting factors

During the current market and company situation, those factors that represent obstacles to the use or offering of EaaS are first examined. The respondents were able to rate a total of eight inhibiting factors. As can be seen in the Figure 29, all the inhibiting

factors named are also confirmed as such. The three statements with the highest agreement and thus the largest inhibiting factors of EaaS represent thereby the concern about data security, the missing knowledge over application and implementation and the missing offer and/or the missing providers of EaaS. The lack of technical options, as well as overly customized and complex products, are perceived as rather minor inhibitors in comparison. This is reflected in the somewhat lower level of agreement (lack of technical options: 61.2% and overly customized and complex products: 60.2%) and the higher level of disagreement (lack of technical options: 19.6% and overly customized and complex products: 18%) for the two statements.

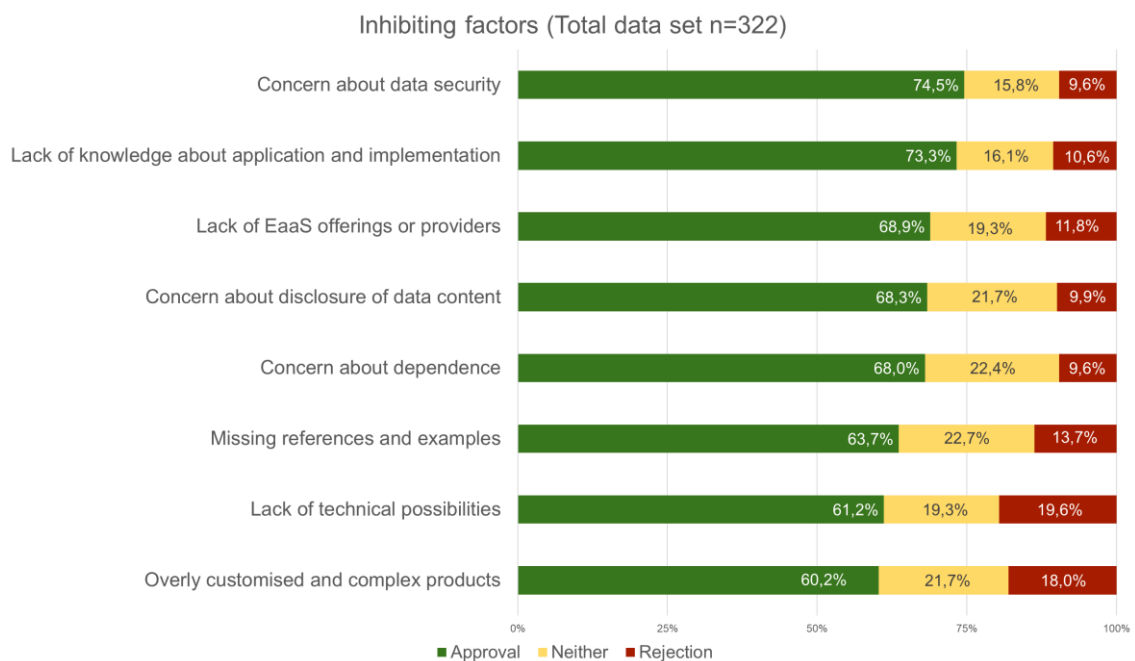


Figure 29: Inhibiting factors for EaaS

Now that the main inhibiting factors from the entire data set have already been presented, the following section will focus on differences within different groups of respondents.

The inhibiting factors of the two data sets DACH and without DACH are very similar overall in terms of the general distribution of approvals and rejections. One notable difference can be seen in the obstacle "lack of technical possibilities". Respondents from DACH see this as the smallest handicap. With an agreement of 46.3% and simultaneous

rejection of 40.7%, this suggests that the technical facilities for implementing EaaS are perceived to be better in the DACH region. Outside the DACH region, this factor is still seen more as an obstacle, as can be seen from an agreement of 64.2% and a lower rejection of only 15.3%. It could be concluded from this that companies in DACH are either already better equipped technically or they are more likely to see themselves in a position to upgrade accordingly than companies outside the DACH region.

In addition, differences can be seen in the ranking of inhibiting factors. While respondents outside the DACH region are very concerned about data security and thus perceive this as a particularly serious obstacle (76.9%), it only ranks sixth within the DACH region (63%). On the one hand, this could indicate that data security is already perceived as better in DACH or as less significant compared to the other obstacles. Nevertheless, from the provider's point of view, it would be worthwhile, especially in customer acquisition outside the DACH region, to address and emphasize the guarantee of data security, for example, to alleviate potential customers' possible concerns.

Even when taking a differentiated look at the data set for the IT industry and the one without the IT industry, the basic attitudes toward the various inhibiting factors are comparable. In both data sets, concerns about data security and the lack of knowledge about application and implementation are right at the top of the ranking. Analogously, as already mentioned above, it is advisable as a provider to allay potential customers' fears of data misuse or similar here. Regarding the lack of knowledge, there is therefore still a need for education about EaaS among the decision-makers in the company. A difference can be seen in the concern about dependency. Respondents who do not work in the IT sector express more agreement here (70.4%) than those who do work in the IT sector (64.3%). The latter view this neutrally (27.8%). It can thus be assumed that companies in the IT sector are less afraid of dependence on other companies than companies in other sectors.

The comparative view of SMEs and large companies also turns out to be very similar overall. Here, too, concerns about data security and a lack of knowledge about application and implementation are the biggest obstacles. The option "lack of technical capabilities" receives similar approval from both groups (SMEs: 64.1%; large enterprises: 57.2%), but a significantly higher rejection from large enterprises (SMEs:

14.1%; large enterprises: 26.8%). This indicates that large companies already see themselves as better positioned technically than SMEs. In addition, large companies are less concerned about becoming dependent on other companies through EaaS. This is reflected in the lower level of agreement (SMEs: 71.7%; large companies: 63%) on the "concern about dependency" option, coupled with a higher level of rejection (SMEs: 8.2% and large companies: 11.6%).

When looking at the CEOs separately, there are also only minor differences compared to the entire data set. However, across all inhibiting factors, managing directors show a higher overall level of agreement, but at the same time less neutrality. One exception to this lower neutrality is the concern about dependency, which is confirmed by 73.7% of managing directors as an inhibiting factor. The remaining 26.3% neither agree nor disagree with this obstacle.

The following evaluation of *hypotheses 10 and 11* is around inhibitors of Equipment-as-a-Service.

Hypothesis 9: Lack of knowledge is a major barrier to a positive as-a-service purchase decision.

Question 16 from the questionnaire was used to test *hypothesis 9*. This looks at the possible inhibiting factors for EaaS, including, for example, the lack of knowledge about application and implementation. Most respondents (73.3%) agreed with the statement that this is an inhibiting factor for EaaS. Across all inhibitors, lack of knowledge received the second highest level of agreement (concern about data security had the highest level of agreement at 74.5%). In this respect, the lack of knowledge can be described as a significant inhibiting factor.

Thus, it can be surmised that the lack of knowledge is a major barrier to a positive as-a-service purchase decision.

Hypothesis 9 is verified.

Hypothesis 10: A major problem with EaaS lies in the clarification of the storage and use of machine data and thus internal company data.

Hypothesis 10 could also be evaluated with the help of question 16. The possible inhibiting factors "concern about passing on data content" and "concern about data security" in the questionnaire can be used to investigate whether the storage and use of machine data and thus internal company data is a problem for the participants in relation to EaaS. Most respondents agreed that both are inhibiting factors for EaaS. As listed earlier, concern about data security received the highest level of agreement across all inhibitors (74.5%). The statement that the concern about sharing data content is an inhibiting factor was agreed to by 68.3%.

The results of the evaluation suggest that the storage and use of machine data, and thus in-house data, is a major issue with respect to EaaS.

Hypothesis 10 is verified.

2.6.2 Success factors

On the opposite side, after analyzing the inhibiting factors, the key success factors of EaaS were evaluated during the survey. As the Figure 30 shows, here too there is fundamental agreement across the six success factors mentioned. The three biggest success factors for respondents are "More information, references and education," the growing number of industry-specific providers or offerings, and know-how and technologies in predictive maintenance and remote services. The factor "More regional providers or offerings," on the other hand, is seen as the least promising.

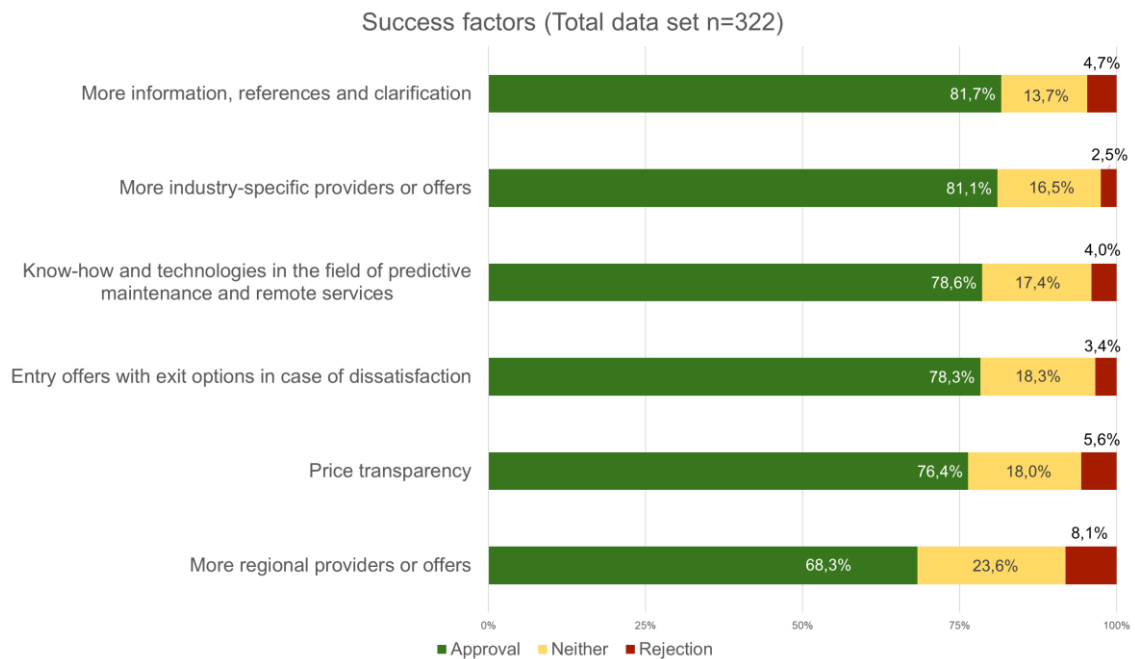


Figure 30: Success factors for EaaS

If we now compare the success factors within the various study groups, it is noticeable that here, too, there is agreement in principle across all success factors. However, the individual groups differ in the level of agreement and in the resulting order of importance of the individual factors.

Within the DACH region, the factor "More regional providers or offerings" receives significantly less agreement (51.9%) that this represents a success factor. On the one hand, this could mean that providers in the DACH region are often already close enough to the customer to be able to intervene quickly in the event of disruptions to the machines, but on the other hand it could also mean that this factor is less relevant for companies in DACH to be able to use EaaS successfully. In the DACH region, with an agreement of 88.9%, the entry offers with exit options in the event of dissatisfaction are the most important success factor, whereas this plays a comparatively minor role in the data set without DACH (agreement of 76.1%). This could be inferred from the lack of experience of the companies in DACH, which therefore want to test the EaaS model within a certain period to familiarize themselves with EaaS and its advantages and disadvantages.

If the data set without the IT industry is considered, it is noticeable that this topic also has a high relevance here. 83.2% of respondents outside the IT industry agree that entry offerings with exit options are a success factor for EaaS. Among respondents who work in the IT industry, the level of agreement is only 70.6%. This could be because in the software sector a test period is often easier to implement than testing the machine on site. Therefore, this test period tends to be standard in the IT sector and is therefore not seen as a particular success factor for EaaS.

A difference was also found between SMEs and large companies regarding this success factor. For SMEs, this success factor is in first place (agreement of 78.8%) and is thus rated as most important, whereas for large companies, entry offers with exit options are rated as the penultimate success factor (agreement of 77.5%). This could be because SMEs are concerned about becoming dependent on a provider, which is also in line with their responses on "concern about dependency" in the inhibiting factors, and therefore want to have the option to exit.

For managing directors, entry offers with exit options play a subordinate role (agreement of 68.4%).

The topic of know-how and technologies around predictive maintenance and remote services is assigned a more important role as a success factor within the DACH region with an agreement of 85.2%, compared to the agreement outside the DACH region of 77.2%. This also indicates that technology and know-how for EaaS are assigned a higher significance and importance for the successful use of EaaS in the DACH region than in the non-DACH region.

The topic of price transparency as a success factor plays a major role for management. While overall price transparency is mostly rated as a rather low success factor, it is the second most important success factor for management at 84.2%. In general, it is striking that when comparing the IT industry and non-IT industry data sets, respondents outside the IT industry express greater agreement across all success factors. In the IT industry data set, the answer option neither agree nor disagree is more pronounced for the statements. The same behavior can be observed when comparing SMEs and large companies. Large companies generally have greater agreement and lower neutrality across all statements.

2.6.3 Added value through EaaS

Finally, in market and company situation and prospects, the added values of EaaS are examined in more detail. These are the criteria that are decisive in determining whether a company is prepared to use EaaS and pay for it. Here, too, the respondents generally agree with all seven added values mentioned (see Figure 31). The following three aspects are considered most important: Support in optimizing the company's internal production processes, optimization of liquidity and transparency regarding the reduction of lifecycle costs of EaaS goods.

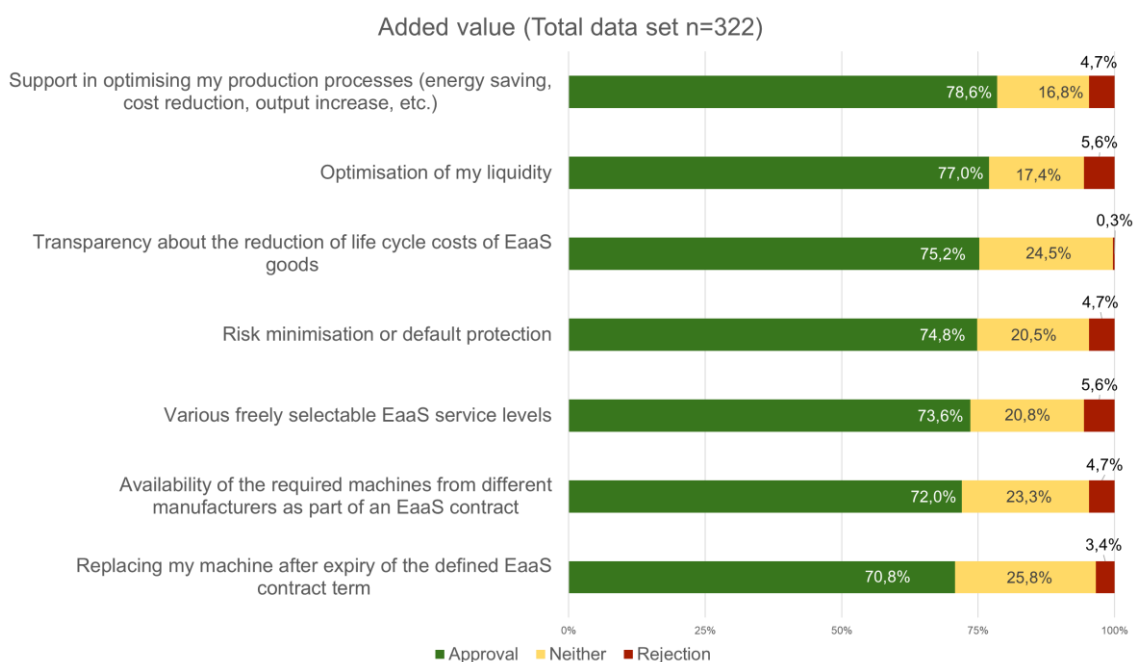


Figure 31: Added value of EaaS

After the general consideration, the added values are also considered separately in the different study groups. Here, too, there is general agreement on all added values.

An important added value of EaaS for the survey participants from the DACH region is risk minimization or default protection (agreement of 94.4%). The median for this statement is 5.0, i.e., complete agreement. Outside the DACH region, risk minimization is also seen as an added value, but agreement is not as strong (70.9%). Even within the IT sector, agreement with this added value is lower (69.8%) than outside the IT sector (79.1%). For the management sector, risk minimization represents the most important

added value of EaaS (agreement of 89.5%). The question arises as to whether this is more about the financial impact caused by downtime or whether, for other reasons, the reduction in the risk of machine failure is seen as an important added value by management.

The availability of the required machines from different manufacturers as part of an EaaS contract is rated as the lowest added value within the DACH region. Only 59.3% see this factor as an added value and 14.8% even disagree with the statement that this is an added value of EaaS. Outside the DACH region, however, 74.6% of respondents see the availability of the required machines from different manufacturers as an added value. Accordingly, companies in DACH see complete offers across different manufacturers for a complete production line, for example, as a lower added value of EaaS than companies in the non-DACH region.

Support in optimizing production processes is seen as an important added value (agreement of 83.3%) of EaaS in the DACH region. Accordingly, companies within this region hope that EaaS will support them in optimizing their production processes, for example in terms of increasing output or saving costs. For managing directors, this is the lowest added value of EaaS (agreement of 63.2%), whereas for the entire data set, support in optimizing production processes was named as the most important added value (agreement of 78.6%).

Optimizing the liquidity of individual companies is seen as the greatest added value (81.6%) of EaaS outside the IT industry. Within the IT industry, the level of agreement is lower (69.8%), and neutrality (25.4%) on this statement is particularly high. Here it can be considered whether this is due to the different investment volumes of the various sectors. In the area of the surveyed managing directors, only 68.4% see the optimization of liquidity as an added value.

Compared to all respondents, the managing directors see the replacement of the machines after the defined EaaS contract term has expired as a much more important added value (agreement by managing directors: 84.2% and overall: 70.8%).

Agreement with various freely selectable EaaS service levels as added value is less pronounced within the IT industry and technology (agreement of 67.5%) than in the other industries (agreement of 77.6%).

If the different responses from SMEs and large companies are compared, differences can also be seen in added value. However, there are no significant differences between the two data sets.

In general, it is noticeable that in the added value of EaaS, the selection option "neither agree" nor "disagree" is more pronounced within the IT industry than in the other industries.

3 Conclusion

After discussing the data obtained, the main findings of the areas studied are summarized and critically appraised below.

Regarding the area of terminology and application of EaaS analyzed at the beginning, it can be concluded that there is a uniform understanding of EaaS both within the companies and in the industry. Here, in the data set without DACH, the understanding within the companies was more pronounced than in the rest of the analyses. For without DACH, SMEs, and the entire dataset, understanding was higher within the industry than in the rest of the datasets analyzed. Nevertheless, confusion of terms is an issue - especially among management respondents. In general, the number of companies that indicated they were users, providers, both users and providers, or neither providers nor users was similar. Nevertheless, respondents in the non-DACH region, the IT industry and management are more likely to be users of EaaS. The EaaS business model is more widespread outside the DACH region. Mainly EaaS is used directly by the manufacturer or with a bank or financial service provider. EaaS is also mainly offered by the manufacturer itself or with a bank or financial services provider. According to the respondents, the use or offering of EaaS within companies will increase slightly in the next two to three years (in the medium term).

Regarding the advantages and obstacles concerning the use of EaaS, it can be concluded that the advantages of EaaS receive more approval than the inhibiting factors. The cost optimization and the exact plannability of the financing of capital goods receive the highest approval. Furthermore, respondents from the DACH region are more likely to agree with the advantages of EaaS than those who do not belong to the DACH region. The same result is seen among management. These respondents also agree more strongly with the benefits of EaaS than do all respondents. In addition, there is a large difference in terms of the benefit of closer customer loyalty through EaaS between the DACH region and the rest of the data set. This may be because half of the participants from the DACH region belong to the machinery and equipment industry. Overall, it can be said that EaaS receives a high level of approval among the respondents and is positively received.

In the area of digitization, digitization is not seen as strongly as a prerequisite for EaaS in the DACH region as in the other countries. In addition, users, and providers of EaaS state that they are more advanced in digitization than participants from companies that neither use nor offer EaaS. In general, the DACH region lags somewhat behind the non-DACH subgroup in terms of progress in digitization. Furthermore, in sustainability, it was found that users and providers of EaaS are more likely to perceive the sustainable consequences of EaaS than companies that have no direct experience with EaaS.

Regarding the prospects of EaaS, it can be stated that the respondents believe that increasing digitization will accelerate EaaS. In particular, the management is of this opinion. In addition, respondents believe that EaaS will replace the model of fixed purchase of a capital good. This opinion is particularly prevalent in the data set excluding DACH, whereas there is no clear opinion on this in DACH.

Regarding the last analyzed area of the market & company situation of EaaS, the findings on inhibiting factors, success factors and added values can be summarized as follows for the entire data set: All mentioned inhibiting factors, success factors and added values were confirmed as such. However, in all areas there were also differences in the individual groups analyzed or in the ranking of the various factors.

Concerns about data security, lack of knowledge about application and implementation, and lack of EaaS offerings or providers were perceived as the biggest inhibitors.

Outside the DACH data set, concern about data security was selected as the strongest inhibitor of EaaS, and in DACH only as the sixth most important inhibitor. In addition, it is noteworthy that higher agreement and lower neutrality was evident among management across all inhibitors.

The greatest success factors were perceived to be more information, references and education, more industry-specific providers or offers, and know-how and technologies around predictive maintenance and remote services. Respondents from the DACH region saw the option of entry offers with exit options in the event of dissatisfaction as the most important success factor; this option played a rather minor role among respondents from outside DACH. This success factor also ranked first for SMEs, but

second to last for large companies. The success factor know-how and technologies around predictive maintenance and remote services received higher approval in the DACH area than outside the DACH area. Interestingly, price transparency was the second most important success factor for management.

The greatest added values perceived were support in optimizing production processes (energy savings, cost reductions, output increase, etc.), optimization of liquidity, and transparency regarding the reduction of lifecycle costs of EaaS goods. Respondents in the DACH region saw risk minimization or default protection as the most important added value, but agreement outside the DACH region was not as strong here. Management likewise saw this option as the most important added value. Optimizing liquidity was the greatest added value outside the IT sector, but within the IT sector there is less agreement and a relatively high level of neutrality. Among management, this added value even ranks second to last. Support in optimizing production processes was the least relevant added value for management.

It should be viewed critically that, in addition to the direct contact with individual companies, this is a random sample. Ultimately, the number of respondents within the various sub-groups analyzed must also be viewed critically in terms of the meaningfulness and representativeness of the results. Both the DACH region (n=54) and the management (n=19) thus had a low number of respondents.

The present results nevertheless demonstrate that EaaS is a promising and important business model across companies and industries, particularly regarding digitization and environmental sustainability. The present study provides the corresponding mood in an international and industry-independent context of the capital goods segment and identifies a consensus regarding the prerequisites, obstacles, and success factors.

4 Credits

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