Dominant Business Model Patterns of Regional IaaS Providers – An Exploratory Multiple-Case Study

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Abstract. The fast growing worldwide market for Infrastructure as a Service (IaaS) has long been increasingly dominated by the few globally acting hyperscalers. In turn, the market share and number of small and medium-sized regional IaaS providers have been declining over the past years. This battle for market shares has, however, been astonishingly widely neglected in research. The goal of this paper is therefore to identify and analyze the dominant business model patterns of regional IaaS providers in Germany and compare them regarding their long-term survival prospects. Based on an exploratory multiple-case study with 18 successful regional IaaS providers, two dominant business model patterns were identified: Whereas customizers consciously pursue a business model being considerably different from the hyperscalers by particularly addressing the discrepancy between the hyperscalers' standardized offerings and more individual customer requirements, superscalers exhibit several similarities with the hyperscalers and thus act in direct competition. Due to a missing unique selling proposition, except the guaranteed sole data storage in Germany, but at a higher price, superscalers might fall victim to the market consolidation significantly stronger. While scholars obtain a first classification schema of regional IaaS providers which opens up fruitful areas for future research, practitioners get inspirations for their business model innovation process.

Keywords: Cloud computing · Infrastructure as a Service (IaaS) · Regional IaaS providers · Business models · Business model patterns · Hyperscalers · Customizers · Superscalers · Exploratory multiple-case study

1 Introduction

Infrastructure as a Service (IaaS) is the fundamental layer of cloud computing delivering basic infrastructure services to customers via networks. IaaS services include hardware (e.g., computation, storage and network) and software (e.g., operating systems and virtualization technologies) components [1]. IaaS is currently the fastest growing cloud computing market segment globally [2], but at the same time the service model with the least research on from a business perspective [3]. The low level of research is astonishing as the IaaS market composition is unique: According to a recent study by Gartner [4], a leading American research and advisory company, the worldwide IaaS market is

K. Djemame et al. (Eds.): GECON 2019, LNCS 11819, pp. 140–153, 2019.
https://doi.org/10.1007/978-3-030-36027-6_12

dominated by the few globally acting hyperscalers, in particular Alibaba, Amazon Web Services (AWS), Google and Microsoft. Their IaaS offerings are primarily characterized by a high level of standardization and a comparably low price [5]. In 2017, the hyperscalers' global market share was about 75%, showing a clearly rising tendency [6]. The rest of the IaaS market is shared by several large international and national IT companies and a multitude of small and medium-sized providers [7]. The latter mostly restrict their IaaS services to one country, one region or even only one city [8]. But although the IaaS market has been growing enormously since its inception, the market share and number of the regional IaaS providers have been declining over the past years [6, 7]. A major reason for this development is that basic IaaS services – without extensions such as managed or platform services – have become a commodity [3, 8]. Commodities are products and services that are highly standardized and to a large extent equivalent with respect to functionality and quality, irrespective of the specific vendor [9]. The IaaS providers simply use similar hardware, operate at similar locations and offer similar basic IaaS services. Therefore, the price has turned into the central decision criterion for customers [3]. As the regional IaaS providers do, however, not possess the huge server farms, they are unable to achieve the necessary economies of scale in order to keep up in the price competition with the hyperscalers. As a way out, regional IaaS providers have to design and implement business models that differ from the hyperscalers to survive in the long term [8].

Whereas the cloud computing-specific literature on success-driving business model characteristics has generally grown over the recent years, e.g., [3, 10, 11], the specific competition between regional IaaS providers and the hyperscalers has been widely neglected. Only Floerecke and Lehner [8] proposed eight initial hypotheses on business model characteristics for regional IaaS providers for counteracting the increasing market consolidation. However, the study covered only parts of the business model and remained on a high level of abstraction, i.e., it did not take into account that there are fundamentally different types of regional IaaS providers pursuing various business models and that their individual prospects of success hence may vary.

Beyond this background, this paper addresses the following research question: **What dominant business model patterns of small and medium-sized regional IaaS providers exist and how are their long-term survival prospects in view of the growing dominance of the hyperscalers?** To this end, an exploratory multiple-case study [12] with 18 regional IaaS providers in Germany is conducted, which recorded profitable revenue growth over the past years, notwithstanding the precarious market situation. In expert interviews with high-level company representatives their business models are analyzed in-depth using the Business Model Canvas (BMC) [13]. The business model patterns of regional IaaS providers are derived by examining the individual business models for matches. Their respective survival prospects are evaluated based on the hyperscalers' business models, the customer demand and already foreseeable future market and technological developments.

The rest of this paper is organized as follows: Section 2 contains the background on cloud computing, business models and business model patterns. In addition, the development of the global as well as the German IaaS market is described. Third, the research design is explained in detail. Fourth, the derived dominant business model

patterns of regional IaaS providers are depicted based on the BMC's components. Fifth, their central differences and their long-term survival prospects are discussed critically. Moreover, arguments for and against the survival of regional IaaS providers in general are given and weighed against each other. The paper concludes with a brief summary, limitations, contributions and an outlook on future research.

2 Background

2.1 Cloud Computing

Literature has come up with numerous definitions of cloud computing over the years, either with a stronger business or technical focus [14]. The technical orientated definition of the National Institute of Standards and Technology (NIST) has become the standard both in science and practice in the meantime. According to NIST, "*[c]loud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*" [1]. Cloud services are classified into three service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). IaaS supplies infrastructural resources (compute, storage and network). PaaS allows developing and deploying applications based on a software development environment with programming languages, libraries and tools. SaaS refers to directly usable applications. These service models form layers that are interrelated and build upon each other [15]. Cloud services on each service layer can be delivered via four main deployment models, namely as public, private, hybrid and community cloud [16]. The general key characteristics of cloud services are on-demand self-service, broad network access, resource pooling, rapid elasticity and service measurement. These characteristics distinguish cloud services from traditional on-premise IT solutions [1].

Research on cloud computing has rather focused on the technical aspects so far. Significantly less consideration has been given to the major changes within the business perspective of IT provisioning [5, 17]. The most frequently addressed business issues are adoption, cost, trust and privacy, legislation and ethics [18]. This technical focus is astonishing, because cloud computing has fundamentally changed the way IT resources are implemented, provided and used [15, 16]. Several scholars hence regard cloud computing as a co-evolution of computing technology and business models [3].

2.2 Business Models and Business Model Patterns

No commonly accepted definition of the term "business model" has been established to date [19]. Besides textual definitions there exists a component-based view, which dominates the discussion on business models. According to that, a business model is a system comprising a set of interrelated components or partial models for depicting, implementing and evaluating the business logic of a company [20]. The business model concept builds upon central theories, in particular, the transaction cost theory, the

resource-based view, the cooperation theory and the strategic network theory [21]. According to Amit and Zott [22], this cross-theoretical perspective is necessary as no existing theory can fully explain value creation alone. Business models have long taken a central role in explaining the differences in company performance [20, 23]. It has been shown that the same technology can result in significantly different economic output, depending on the way it is marketed by a business model [24]. Companies therefore differentiate and compete rather through business models and less through products or processes [25].

The scientific literature provides a variety of cross-industry and industry-specific business model frameworks, which include design options for various subsets of components [23]. A comprehensive and widespread cross-industry framework among both researchers and practitioners is the Business Model Canvas (BMC) [13]. The BMC comprises nine components: value propositions, key resources, key activities, partner network, customer segments, channels, customer relationships, revenue streams and cost structure. The BMC as a whole offers a common instrument to describe, visualize, evaluate and adapt business models [13].

Business model patterns are "*[…] business models with similar characteristics, similar arrangements of business model Building Blocks, or similar behaviors*" [13]. The use of business model patterns provides an efficient way to undertake business model innovation by drawing upon aspects that have already been proven to be successful for other firms and industries [26]. The importance of this concept is underlined by the finding that around 90% of all business models are a recombination of existing business model patterns [25]. However, business model patterns must not be misunderstood. They do not focus on imitating, but rather support creativity and efficiency within the business model innovation process [27]. Beyond this background, several scholars (e.g., [25, 28]) have proposed various, partly overlapping collections of cross-industry and industry-specific business model patterns. Research on business model patterns in the cloud domain is nascent. Only Labes, Erek and Zarnekow [29] identified four patterns, which, however, are mainly based on leading international providers and do not distinguish between the cloud service models.

In general, research on cloud business models has widely neglected so far that the cloud ecosystem entails a multitude of companies, which offer a variety of products and services such as IaaS, PaaS and SaaS and additionally act, e.g., as integrator, aggregator or consultant and thus are characterized by a high degree of heterogeneity [30]. An undifferentiated, ecosystem role-independent analysis of cloud business models therefore has only a low level of explanatory significance [3]. The majority of ecosystem role-specific studies has focused on SaaS providers [11]. The battle for market shares between regional IaaS providers and the hyperscalers has been largely ignored. Only Floerecke and Lehner [8] proposed eight initial hypotheses on business model characteristics for regional IaaS providers. However, the authors mainly only addressed the value propositions component and remained on a high level of abstraction, i.e., they did not take into account that there are fundamentally different types of regional IaaS providers pursuing various business models and that their individual prospects of success hence may vary. A more fine-granular categorization schema of regional IaaS providers is missing and therefore derived in this study.

2.3 IaaS Market Development

According to a current study by Gartner [2], the worldwide cloud market is projected to grow 17.5% in 2019 to total 214.3 billion USD, up from 182.4 billion USD in 2018. With regard to the three cloud service models, SaaS will remain the largest segment with 94.8 billion USD, followed by IaaS with 38.9 billion USD and PaaS with 19.0 billion USD. For all three segments, substantial growth rates are predicted over the next years. IaaS is the fastest-growing segment, with an estimated growth rate of 27.5% in 2019. In particular the hyperscalers – Alibaba, Amazon Web Services (AWS), Google and Microsoft – benefit from this massive growth [2]. In 2017, their global market share was 75%, with the trend clearly rising [6]. Figure 1 shows the development of global market shares of the hyperscalers in comparison with the rest of the providers in the IaaS segment between 2015 and 2017.

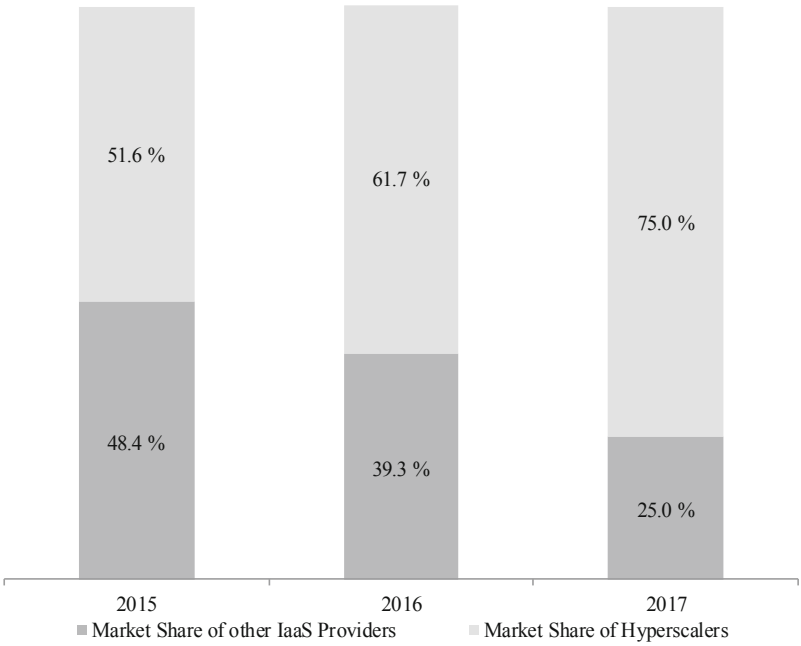

Fig. 1. Development of global market shares in the IaaS segment between 2015 and 2017 [6].

Figure 2 illustrates the development of the global IaaS market volume between 2015 and 2017 – once with and once without the hyperscalers. Whereas the market volume of the rest of IaaS providers increased slightly from 2015 to 2016, a significant reduction can be noted in 2017 – despite the enormous growth of the overall IaaS market. As can be seen, both provider categories follow an opposite trend, whereby the difference between them is growing.

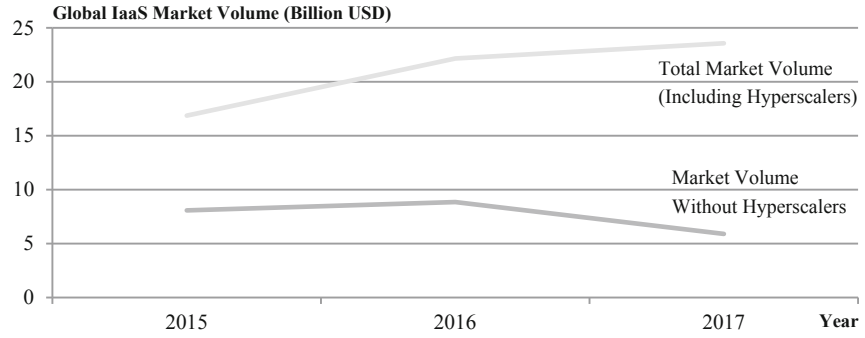

Fig. 2. Development of the global IaaS market volume (in Billion USD) with and without the hyperscalers between 2015 and 2017 [31].

Limited to Germany, the following picture emerges: According to a recent study by Information Services Group [7], a leading American technology research and advisory firm, German companies are going to invest around 1.4 billion Euro in IaaS in 2019. This represents a 30% increase compared to the previous year. The IaaS segment in Germany thus grows even faster than globally. Also here the hyperscalers are extending their market dominance: The German IaaS revenue of AWS is estimated to grow by 40% in 2019, Microsoft by 60% – i.e., significantly faster than the total market segment. Together with Google, the third largest IaaS provider, almost two thirds of the German IaaS market is dominated by these three American companies. Alibaba is, at least at present, playing only a minor role. The remaining third is shared among particularly IBM, Deutsche Telekom and Oracle, and the multitude of small and medium-sized regionally operating IaaS providers [7].

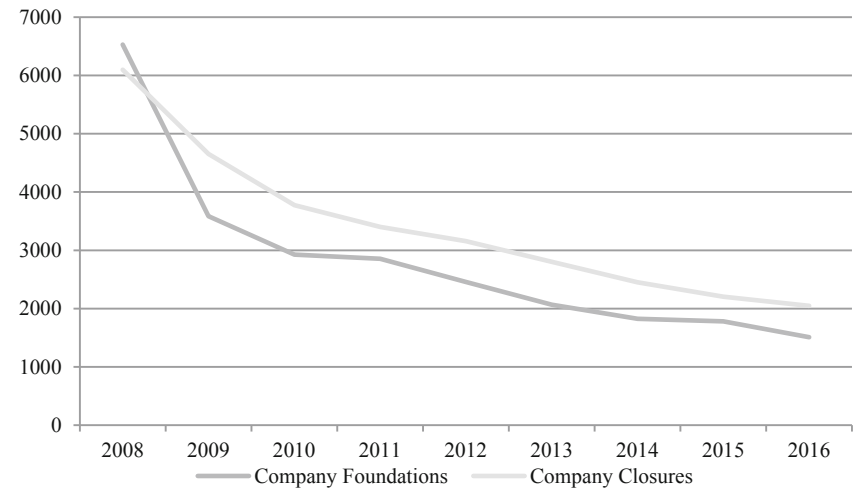

Fig. 3. Number of company foundations and closures in the information services segment in Germany between 2008 and 2016 according to destatis.

Summarizing, the German IaaS market still has a comparatively high share of regional providers. This makes it particularly interesting for this study. Nevertheless, according to data from Destatis, the federal statistical office of Germany, the overall number of providers of so-called information services, consisting of IaaS services, server hosting and related services, has been decreasing continuously between 2008 and 2016. The number of company foundations was, except at the beginning, always lower than the number of company closures in this time period (Fig. 3).

A few examples for the IaaS market consolidation in Germany provide anecdotal evidence: United Internet acquired Profit Bricks with its 120 employees at the end of 2017, a medium-sized IaaS provider from Berlin concentrating on the German market. Another example is Dogado with its head office in Dortmund. Since its inception in 2001, Dogado has taken over eleven providers of IaaS and related services, such as WebControl and Hostingparadise, and now has around 100 employees.

3 Research Design

In order to identify and analyze the dominant business model patterns of regional IaaS providers in Germany and to compare them regarding their individual survival prospects in the precarious market situation, an exploratory multiple-case study according to Yin [12] was conducted. Case studies are particularly suitable to investigate widely unexplored areas, to answer "why", "what" and "how" questions and to learn about the state of the art and generate theories from practice [32]. All these three conditions apply to this study. In expert interviews with high-level company representatives, their business models were analyzed in-depth using the BMC. The business model patterns were derived by examining the individual business models for matches. Their respective survival prospects were evaluated by comparing them with hyperscalers' business models, the customer demand and already foreseeable future market and technological developments stated by the interviewees.

The units of analysis were small and medium-sized regional IaaS providers in Germany. Potential companies had to have at least one IaaS service in their portfolio and have recorded profitable revenue growth over the past years. In order not to unnecessarily limit the sample space, the size constraint of 250 employees (EU Recommendation 2003/361/EC) has been weakened and companies up to 400 employees have been approved. As no comprehensive list of German IaaS providers exists, a Google search for potential candidates was conducted. The 64 identified providers were contacted by contact form on their website, via e-mail or private message on the Xing networking platform. On that occasion, the IaaS-specific sales development over the last five years was asked. As there is no ranking of regional IaaS providers and only few of them report business figures, the sales growth served as proof of success. This is the most commonly used proxy for company success for small and medium-sized companies in literature [33]. Providers with stagnant or shrinking sales were not included as the central intention of business model patterns research is to identify those that have been proven to be successful [25, 26]. The selection procedure resulted in 18 cases. The companies employ between 10 and 400 persons (mean: 112) and are distributed over nine of the 16 federal states in Germany. Three companies have more than

250 employees. This is, however, not regarded as conflicting with the research question as each of them is a division of a corporation that accounts for only a small proportion of the company's total workforce and focus exclusively on IaaS. With regard to the cloud service models, seven companies offer solely IaaS, eight IaaS and SaaS and three IaaS, PaaS and SaaS. The representative of each company was required to be responsible or at least co-responsible for the initial development and/or the continuous innovation of the business models and to have knowledge specific to the company's IaaS business segment. The final interview partners were eight managing directors and/or founders, three department managers, three product managers, three sales representatives and one business developer. They have been with the company for about ten years on average.

Due to the application of the BMC, the interview guide was largely predetermined. In the first part, general information about the person and the company was collected. Moreover, the current and expected future competitive situation between regional IaaS providers and the hyperscalers in Germany was analyzed. In the second part, the characteristics of the single BMC's components of the respective company and the reasons for this specific choice were asked. The third part addressed recently undertaken as well as planned business model adaptations and the intentions behind them.

The 18 interviews took place between October and December 2018. The interview language was German. All interviews were conducted by phone. The interview duration ranged from 29 to 62 min (mean: 45 min). When conducting the interviews, the laddering technique [34] was applied whenever appropriate, so that the interviews were rather guided conversations. All interviews were recorded, transcribed and anonymized. The data analysis was performed using qualitative content analysis by Mayring [35] with the tool MAXQDA. In this process, for all companies the specific BMC was created and subsequently examined for overarching patterns.

4 Two Dominant Business Model Patterns of Regional IaaS Providers in Germany

Two dominant business model patterns of regional IaaS providers in Germany were identified during the analysis. The first and significantly larger group in the sample will be referred to as customizers. These firms are characterized above all by a high degree of customization and a highly personal customer service. The second group offers particularly highly standardized basic IaaS services through automated business processes. Due to the similarity of their business model to hyperscalers but smaller company size, this group is named superscaler. Hereafter, the two business model patterns are first described textually and then summarized and compared graphically.

4.1 Customizers

The key element of customizers' value propositions are customer-specific cloud solutions. Based on the specific requirements, the company structure and the IT landscape of the customer a custom-tailored solution concept is developed and implemented. To this end, customizers additionally have integration, transition and multi-cloud services in

their portfolio. Beyond that, customizers generate a significant percentage of their sales with managed services. Managed services are basic IaaS services extended by additional components, such as monitoring, update, security or backup services, based on clearly defined service level agreements. The scope can range from individual items to a complete IT outsourcing. Overall, customizers' offerings are almost entirely based on private clouds. Their customers are mainly medium-sized but also small firms, starting from around 100 employees, with limited technical IT expertise and therefore with a high dependence on provider support. Even smaller companies and private customers do not fall within their scope as their individual approach is commonly too expensive for these groups. The clients are from all industries and predominantly located in the region with a maximum distance of about 200 km. With regard to pricing models, customizers usually offer fixed prices, whereby the total price is frequently broken down to the employee level (pay-per-user). In the contract negotiations and the design of the pricing model, they take customers' wishes, general conditions and business models into account. As customizers mainly offer customized cloud solutions and managed services, they sell their services personally, not via self-service. Customizers build and maintain long-term and personal customer relations, where they continuously further develop and improve the individual cloud solutions in use. Each customer commonly has a firmly assigned contact person. Two thirds of the analyzed customizers operate an own data center, the rest rents server space at a specialized third-party provider. Due to their comparatively low level of automation and scalability, the employees are the most important and at the same time the most expensive resource. The personnel thus are the business model's bottleneck resource.

4.2 Superscalers

In the center of superscalers' value propositions are highly standardized basic IaaS services without the possibility of customer-specific adaptations. Customers can only choose out of a predefined set of variants. Superscalers offer both public and private clouds, but private clouds are significantly more demanded. They commonly do not offer any integration, transition or multi-cloud services. Instead of focusing on medium-sized companies and setting a lower bound of customer size, superscalers target a larger segment of small and medium-sized enterprises from all industries as well as private customers throughout Germany. In contrast to the customizers' clients, their customers usually possess IT skills and hence can find, book and deploy the IaaS services on the provider's website. The customer relationships are aimed towards online business without personal contact. Consequently, superscalers can serve significantly more customers compared to customizers. Nevertheless, superscalers offer service and help desks for answering questions that arise while ordering and using the IaaS service. As the IaaS services are provisioned automatically, process automation is particularly important. Superscalers commonly offer multiple pricing models: Flexible, monthly usage-based offers and fixed monthly prices and flat rates, similar to customizers. Superscalers operate own data centers and although they describe personnel as an important resource, automated business processes are decisive. The major cost drivers are hardware and electricity – staff costs are of minor significance.

Figure 4 summarizes and compares the two business model patterns based on the BMC's components. Not all of the nine components are listed: In case of key activities, it is attributable to a certain redundancy with respect to other components. Regarding the partner network, the business model patterns do not fundamentally differ from each other. Both have similar suppliers for software (e.g., operating systems and virtualization software) and hardware (e.g., servers). Further types of partnerships, e.g., with consulting firms or other IaaS providers, exist only in exceptional cases.

BMC's Component	Customizer	Superscaler
Value Propositions	• Customer-specific cloud solutions • Integration, transition and multi-cloud services • Managed services • Private clouds	• Standardized basic IaaS services without the possibility of customer-specific adaptations • Private and public clouds
Customer Segments	• Medium-sized, but also small companies (>100 employees) with limited technical IT expertise • Located in the region (maximum distance: 200 km) • All industries	• Small and medium-sized companies as well as private customers (with technical IT expertise) • Located throughout Germany • All industries
Customer Relationships	• Long-term, personal customer relationships • Firmly assigned contact person	• Both short and long-term, impersonal customer relationships • Changing contact persons (help-desk)
Channels	• Personal sale process	• Self-service sale process via website
Revenue Streams	• Fixed prices • Customer-specific pricing models	• Both usage-based and fixed prices
Cost Structure	• Personnel as major cost driver	• Hardware and electricity as major cost drivers
Key Resources	• Personnel as key resource • Own or rented data centers	• Process automation as key resource • Own data centers

Fig. 4. Comparison of dominant business model patterns of regional IaaS providers.

5 Discussion

The two dominant business model patterns of regional IaaS providers in Germany differ widely from each other. Customizers consciously pursue a business model that is considerably different from the hyperscalers. They occupy a niche in the IaaS market by particularly addressing the existing discrepancy between the hyperscalers' standardized offerings and more individual customer requirements. This approach could ensure their survival. Closer inspection, however, shows that the customizers' offerings do not correspond with the key characteristics of cloud computing, such as self-service, rapid elasticity and service measurement. It is rather a traditional server hosting model that is labeled as cloud service for marketing reasons (cloud washing).

By contrast, the superscalers' business models exhibit many similarities with the hyperscalers and thus they act in direct competition with them. Superscalers do not offer customer-specific adaptations within any BMC's component. Customers can only

select one option out of predefined alternatives. In view of the fact that basic IaaS services have become a commodity, the future of superscalers can be viewed particularly critically. With the exception of the guaranteed exclusive data storage in Germany, they do not have a unique selling proposition, but demand a significant higher price. It probably is just a matter of time until the hyperscalers find ways, e.g., by defining specific cooperation forms, to bypass the Cloud Act, which obliges them to provide requested data stored on servers regardless of whether it is stored in the USA or abroad. Compared to customizers, superscalers can thus be expected to fall victim to the market consolidation to a significant larger extent. One representative of a customizer summed up the superscalers' situation this way: "*[…] to believe that we could build a data center and offer IaaS in competition with AWS is ridiculous.*"

Overall, the study participants were convinced that the general willingness of customers to buy IaaS services locally will further decrease. This expectation is particularly based on four already foreseeable future developments, stated by the interviewees: First, the hyperscalers will presumably further reduce prices by exploiting their growing economies of scale which will lead to a growing price difference. Second, the hyperscalers are expected to increasingly address medium-sized companies and facilitate the ordering, configuration und usage process also for persons with low IT expertise. This will be given priority at latest once a certain saturation level of the global IaaS market has been reached. Third, the hyperscalers will likely continue to expand their modular cloud portfolio at a fast pace and thus cover more and more special cases. Superscalers will not be able to keep up with this breadth of the portfolio and customizers will be confronted with a reduction of their niche. Fourth, a far greater number of digital natives with a higher level of IT know-how will work in customer firms, who will not depend so much on the personal and individual support of particularly the customizers.

Putting all these aspects together let appear a further IaaS market consolidation and an increasing domination of the hyperscalers almost unavoidable. If the hyperscalers indeed dominate nearly the entire IaaS segment in future, it can be assumed that they will raise their prices and reduce investments in research and development, in order to achieve higher profits. It is therefore of utmost importance from a total customer perspective that the regional IaaS providers can maintain their place in the cloud ecosystem. Otherwise, it is according to Floerecke and Lehner [8] likely that the IaaS market will become subject of governmental regulations, similar to other utility markets, such as the gas and electricity market, as a consequence of the lack of competition.

In spite of this negative outlook, there are also positive developments from the viewpoint of regional IaaS providers: Particularly customizers might profit from the rising shortage of skilled IT professionals in Germany, which has recently reached a new all-time high of 82.000 job vacancies [36]. It can be expected that several small and medium-sized companies will therefore have to downsize their IT departments and to increasingly use cloud services. In this situation, the support of customizers will presumably be further needed in future. Two aspects speak in favor of both types of regional IaaS providers: First, especially in Germany, where many companies are still skeptical towards cloud computing because of privacy and security issues [37], a data center in the region guaranteeing that the data is exclusively stored in Germany, without a non-European mother company, will find its supporters. Second, regional

data centers might gain importance due to the increasing usage of edge computing as key technology for industry 4.0, where a high bandwidth and a low latency are indispensable. In summary, the ultimate outcome of this competition for market shares is still open. Although the hyperscalers are clearly in the leading position, the regional IaaS providers can actively influence the outcome by their business model design.

6 Conclusion

Based on an exploratory multiple-case study with 18 successful regional IaaS providers in Germany, two dominant business model patterns were identified, analyzed and compared regarding their survival prospects in the difficult market conditions. Whereas customizers consciously pursue a business model being considerably different from the hyperscalers by particularly addressing the discrepancy between the hyperscalers' standardized offerings and more individual customer requirements, superscalers show several similarities with the hyperscalers and thus act in direct competition. Due to a missing unique selling proposition, except the guaranteed exclusive data storage in Germany, but at a higher price, superscalers might fall victim to the market consolidation to a significant larger extent. Overall, there are many indications that the general willingness of customers to buy IaaS services locally will further decrease.

This study is the first that explored business model patterns of regional IaaS providers. Scholars thus obtain a classification schema which opens up areas for future research. This is also the first study that investigated arguments for and against the survival of regional IaaS providers. As a practical contribution, superscalers are sensitized regarding the urgent necessity to reconsider and adapt their current business models. As a whole, the use of the two business model patterns provide practitioners an efficient way to undertake business model innovation by drawing upon business models or single characteristics that have already been proven to be successful.

However, this study is not free of limitations: First, whereas the majority of cases could be identified as customizers, the number of superscalers was small. Superscalers should hence increasingly be addressed in future. A second limitation is the small sample size, whereby this exploratory study cannot claim to have identified all existing dominant business model patterns. In the case selection process, providers were identified that solely offer managed services based on hyperscalers' IaaS services or act as their direct resellers. Although such aggregators were not included as none of them has reported revenue growth in the recent years, they are surely a worthwhile topic for future research. Third, the geographic scope of case sites and interviewees was restricted to Germany. It is necessary to investigate the regional IaaS market in other countries in order to address country-specific particularities. Fourth, it was neglected that several providers do not solely offer IaaS, but also PaaS and SaaS. This can also be a source for differentiation and should hence be included in future studies.

Scholars should specifically investigate how superscalers could modify their business models in order to achieve stronger differentiation from the hyperscalers. In general, it might be interesting to examine the fight for market shares from the hyperscalers' perspective. Moreover, it should not be forgotten that the IaaS market also contains large

international and national IT companies, neither hyperscalers nor regional providers, whose business models should be analyzed in detail as well.

To conclude, despite the undoubtedly difficult and in future probably even more critical situation for regional IaaS providers, it is very likely that there will always be a place for them in the cloud ecosystem. This applies primarily to customizers, but also to superscalers, provided they begin to adapt their business models. Decisive for the survival of regional IaaS providers in general will be that they quickly respond to changing business models of the hyperscalers and customer demand and thus, are constantly seeking for new market niches. Acting in direct competition with the hyperscalers certainly will be a hopeless endeavor in the long-run.

References

1. Mell, P., Grance, T.: The NIST Definition of Cloud Computing. NIST (2011)
2. Costello, K.: Gartner Forecasts Worldwide Public Cloud Revenue to Grow 17.5 Percent in 2019. Gartner (2019)
3. Floerecke, S., Lehner, F.: Success-driving business model characteristics of IaaS and PaaS providers. Int. J. Cloud Comput.: Serv. Arch. (IJCCSA) **8**(6), 1–22 (2018)
4. Costello, K., Hippold, S.: Gartner Forecasts Worldwide Public Cloud Revenue to Grow 17.3 Percent in 2019. Gartner (2018)
5. Herzfeldt, A., Floerecke, S., Ertl, C., Krcmar, H.: Examining the antecedents of cloud service profitability. Int. J. Cloud Appl. Comput. (IJCAC) **9**(4), 37–65 (2019)
6. Statista: Vendor Share of the Public Cloud Infrastructure as a Service (IaaS) Market Worldwide from 2015 to 2017. Statista (2018)
7. ISG: ISG Provider Lens Germany 2019 – Cloud Transformation/Operation Services & XaaS. ISG (2018)
8. Floerecke, S., Lehner, F.: Business model characteristics for local IaaS providers for counteracting the dominance of the hyperscalers. In: 15th International Conference on Economics of Grids, Clouds, Systems, and Services, Pisa, Italy (2018)
9. Bruhn, M.: Commodities im Dienstleistungsbereich: Besonderheiten und Implikationen für das Marketing. In: Enke, M., Geigenmüller, A. (eds.) Commodity Marketing: Grundlagen – Besonderheiten – Erfahrungen, pp. 58–77. Gabler, Wiesbaden (2011). https://doi.org/10.1007/978-3-8349-6388-8_3
10. Labes, S., Hanner, N., Zarnekow, R.: Successfull business model types of cloud providers. Bus. Inf. Syst. Eng. **59**(4), 223–233 (2017)
11. Floerecke, S.: Success factors of SaaS providers' business models – an exploratory multiple-case study. In: 9th International Conference on Exploring Service Science, Karlsruhe, Germany (2018)
12. Yin, R.K.: Case Study Research: Design and Methods. Sage Publications, Thousand Oaks (2018)
13. Osterwalder, A., Pigneur, Y.: Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. Wiley, New Jersey (2010)
14. Madhavaiah, C., Bashir, I., Shafi, S.I.: Defining cloud computing in business perspective: a review of research. Vis.: J. Bus. Perspect. **16**(3), 163–173 (2012)
15. Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., Ghalsasi, A.: Cloud computing – the business perspective. Decis. Support Syst. **51**(1), 176–189 (2011)

16. Armbrust, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R., Konwinski, A., Zaharia, M.: A view of cloud computing. Commun. ACM **53**(4), 50–58 (2010)
17. Herzfeldt, A., Floerecke, S., Ertl, C., Krcmar, H.: The role of value facilitation regarding cloud service provider profitability in the cloud ecosystem. In: Khosrow-Pour, M. (ed.) Multidisciplinary Approaches to Service-Oriented Engineering, pp. 121–142. IGI Global, Hershey (2018)
18. Senyo, P.K., Addae, E., Boateng, R.: Cloud computing research: a review of research themes, frameworks, methods and future research directions. Int. J. Inf. Manag. **38**(1), 128–139 (2018)
19. Goyal, S., Kapoor, A., Esposito, M., Sergi, B.S.: Understanding business model – literature review of concept and trends. Int. J. Compet. **1**(2), 99–118 (2017)
20. Veit, D., Clemens, E., Benlian, A., Buxmann, P., Hess, T., Spann, M., Kundisch, D., Leimeister, J.M.: Business models – an information systems research agenda. Bus. Inf. Syst. Eng. **56**(1), 55–64 (2014)
21. Morris, M., Schindehutte, M., Allen, J.: The entrepreneur's business model: toward a unified perspective. J. Bus. Res. **58**(6), 726–735 (2005)
22. Amit, R., Zott, C.: Value creation in e-business. Strat. Manag. J. **22**(6–7), 493–520 (2001)
23. Wirtz, B., Pistoia, A., Ullrich, S., Göttel, V.: Business models: origin, development and future research perspectives. Long Range Plan. **49**(1), 36–54 (2016)
24. Zott, C., Amit, R.: Business model design: an activity system perspective. Long Range Plan. **43**(2–3), 216–226 (2010)
25. Gassmann, O., Frankenberger, K., Csik, M.: Geschäftsmodelle entwickeln: 55 innovative Konzepte mit dem St. Galler Business Model Navigator. Carl Hanser, Munich (2017)
26. Abdelkafi, N., Makhotin, S., Posselt, T.: Business model innovations for electric mobility – what can be learned from existing business model patterns? Int. J. Innov. Manag. **17**(1), 1–41 (2013)
27. Chesbrough, H.: Business model innovation: opportunities and barriers. Long Range Plan. **43**(2–3), 354–363 (2010)
28. Taran, Y., Nielsen, C., Montemari, M., Thomsen, P., Paolone, F.: Business model configurations: a five-V framework to map out potential innovation routes. Eur. J. Innov. Manag. **19**(4), 492–527 (2016)
29. Labes, S., Erek, K., Zarnekow, R.: Common patterns of cloud business models. In: 19th Americas Conference on Information Systems, Chicago, Illionis, USA (2013)
30. Floerecke, S., Lehner, F.: Cloud computing ecosystem model: refinement and evaluation. In: 26th European Conference on Information Systems, Istanbul, Turkey (2016)
31. Statista: Revenues from Public Cloud Infrastructure as a Service (IaaS) Market Worldwide from 2015 to 2017, by Vendor (in Million U.S. Dollars). Statista (2019)
32. Benbasat, I., Goldstein, D.K., Mead, M.: The case research strategy in studies of information systems. Manag. Inf. Syst. Q. **11**(3), 369–386 (1987)
33. Mendelson, H.: Organizational architecture and success in the information technology industry. Manag. Sci. **46**(4), 513–529 (2000)
34. Corbridge, C., Rugg, G., Major, N.P., Shadbolt, N.R., Burton, A.M.: Laddering: technique and tool use in knowledge acquisition. Knowl. Acquis. **6**(3), 315–341 (1994)
35. Mayring, P.: Qualitative Inhaltsanalyse: Grundlagen und Techniken. Beltz, Weinheim (2010)
36. Bitkom: 82.000 freie Jobs: IT-Fachkräftemangel spitzt sich zu. Bitkom (2018)
37. Karunagaran, S., Mathew, S., Lehner, F.: Differential adoption of cloud technology: a multiple case study of large firms and SMEs. In: 37th International Conference on Information Systems, Dublin, Ireland (2016)